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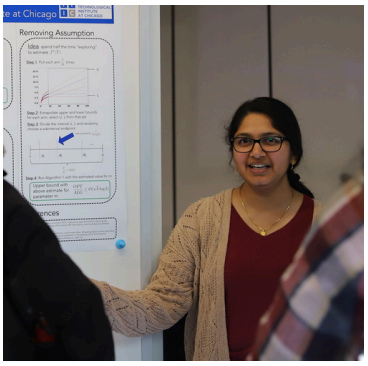

TOYOTA TECHNOLOGICAL INSTITUTE AT CHICAGO

20 years

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Institute Mission

Achieving international impact through world-class research and education in fundamental computer science and information technology.

The Research Mission

TTIC aims to achieve international impact through world-class research in fundamental computer science and information technology. Here we clarify the intended meaning of the terms in this statement.

Impact. The mission statement focuses on academic impact. A number of criteria may serve to evaluate such impact. These include volumes of peer-reviewed publications; reputation of venues in which publications appear; visibility of work in the community, as expressed in citations by others; number and reputation of co-authors, in particular in other institutions; recognition by the research community, including awards, prizes, invited talks, and invitation or election to serve in senior service positions in professional organizations; reports by external advisory bodies comprised of reputable senior researchers, etc. Precise objective measures of academic impact are controversial and elusive, and no one of the criteria above is alone a solid measure in itself. However, the combined evaluation of these and similar criteria helps assess the academic impact achieved by TTIC researchers.

Note that the number of patents filed, or the amount of extramural research funding, are not considered measures of academic impact. Although funding is clearly an important tool in achieving impact, it is only a tool and not an end in itself.

Fundamental. The mission statement is intended to focus on scientifically fundamental research. A scientific result is fundamental to the extent that it has open-ended implications. It is important to distinguish being fundamental from being economically important. A calendar program can be economically successful, and hence important, without adding to fundamental knowledge. The concept of NP-completeness adds greatly to the fundamental understanding of computation without having clear economic significance.

Computer Science and Information Technology. Computer science and information technology encompass many sub-disciplines. In the selection of sub-disciplines for study at TTIC, there should be some consideration of relevance to society as a whole. The interpretation of “computer science” and “information technology” should be such that TTIC remains relevant to the societal impact of computation and information.

The Education Mission

The education mission of TTIC is to achieve international impact through the accomplishments of its graduates as productive scientists and citizens. The notion of “impact” in the education mission is broader than in the research mission. Graduates of TTIC may achieve impact by starting successful companies, managing successful products, or influencing government directions in research funding. Of course, TTIC also strives to produce Ph.D.s who achieve academic impact throughout their careers.

The institute strives to produce graduates who contribute to society through their intellectual leadership in computer science and information technology. Success in the education mission requires appropriate selection of curriculum, effective teaching to enable learning, effective assessment and mentorship of students, and effective marketing of students in the job market. TTIC strives to place its Ph.D. graduates at high-quality research institutions. TTIC also strives to make its Ph.D. students visible to the academic community before graduation. This can be done most effectively through publications prior to graduation.

Diversity, Inclusion and Equity

TTIC is committed to effective and compliant policies that foster and expand a supportive and inclusive environment to encourage success for students, staff, and faculty. The institute should exploit the intellectual abilities and talents of all segments of society. TTIC's collective success in its research and education missions depends on the robust exchange of ideas, as well as on collaboration, innovation, creativity, and broad participation. This requires a dedication to promoting diversity, equity and inclusion in its faculty, staff, student body, and educational programs.

Vision and Values

The 21st century will see enormous progress in automation. Automated systems may drive cars, do housekeeping, and translate between spoken languages. But technological progress raises social concerns. Technology must not extinguish our right to privacy, make people unemployable, or destroy cultural diversity. While technology presents important challenges, it also holds great promise. Language translation can reduce misunderstanding. Information management can improve medical care. Communication systems can bring people together. If we can reap the benefits while avoiding the pitfalls, technology may create and sustain harmony and prosperity for mankind. TTIC's vision is to discover and explore fundamental principles of computation and to improve our world through the technologies those principles enable. At the same time, TTIC is committed to the values of human freedom, dignity, prosperity, and diversity. The institute's mission and its work have been formulated and are carried out consistent with this vision and these values.

People

The strength of TTIC lies in its people. Whether directly involved in research and education, such as faculty and students, or providing the infrastructure and support needed for these activities to take place, all of our people are important to the success of TTIC's mission. TTIC acknowledges the value provided by each member of its community and aims to provide all its members with the tools and support they need to do their part in advancing the institute's mission.

Message from the President

TTIC celebrated its 20th anniversary last fall – a perfect opportunity to reflect on our remarkable accomplishments and the significant impact we've made since our humble beginnings in 2003. Following our recent graduation ceremony in September, we now have a total of 44 Ph.D. graduates – finally surpassing the number of our current students! Our former students are making noteworthy and impressive contributions in academia, industry, startup companies, and various other roles around the world. We also have 79 former Research Assistant Professors (RAPs) who have gone on to great positions and are leaders in their fields. Through the achievements of our students and faculty, both past and present, TTIC continues to have a tremendous impact on both the theory and practice of computing.

We were delighted to welcome Prof. Zhiyuan Li, an expert in machine learning, optimization, and deep learning theory, who joined TTIC as an assistant professor last fall after completing his Ph.D. at Princeton University and a yearlong postdoc at Stanford. This year, we are excited to have Prof. Shiry Ginosar from UC Berkeley joining us as an assistant professor. We also added seven new RAPs and several exceptional Ph.D. students. The 2023–24 academic year has been marked by excellent research activity and vibrant energy, leading to new insights, technical advancements, strong collaborations, numerous publications in top-tier conferences, and several awards and recognitions. Over the past year, we celebrated many research accomplishments, important publications, completed dissertations, interesting seminars and distinguished lectures, and we hosted many visitors. We held a series of six outstanding workshops last summer, from mid-June to mid-September, bringing top researchers in several areas to Chicago to interact with the TTIC community and each other. TTIC continues to be a special place for research and education at the highest level, a top research-focused academic institution. I continue to be exceedingly proud of how TTIC functions as an intellectual community and how our faculty, postdocs, and students make the institute a world-class environment for learning and research in our fields.

Our accomplishments would not be possible without our superb administrative staff, who support TTIC's academic mission and ensure that researchers can focus on what they do best. The staff keep our finances sound, our academic programs running smoothly, our communications effective, our events seamless, and even ensure that we always have coffee available – and much more. We have also increased our outreach activities, primarily to high school students in the local area, providing additional ways for the TTIC community to have a meaningful impact.

The Board of Trustees had some notable changes last year. We welcomed a new Trustee, Dr. Ka Yee Lee, the Interim Dean of the Division of Physical Sciences at the University of Chicago. Three of our Trustees took on significant new leadership roles as Provosts – Dr. Charles Isbell at the University of Wisconsin-Madison, Dr. Angela Olinto at Columbia University, and Dr. Kavita Bala at Cornell University. TTIC's 20th Anniversary celebration took place on the evening of the Board meeting in November, allowing the Trustees to celebrate along with the TTIC community, friends, and alumni. At that event, we announced a generous gift from Manuel and Lenore Blum that enabled our first faculty endowed chairs. Prof. Julia Chuzhoy is now the Manuel Blum Professor, and Prof. David McAllester is the Lenore Blum Professor.

TTIC's partnerships with TTIJ in Nagoya, Japan, and the University of Chicago continue to be important and active. I was honored to participate in TTIJ's matriculation ceremony in April, and there have been several exchanges between TTIC and TTIJ this year. We continue to engage with University of Chicago students and faculty in Computer Science and several other departments and to benefit from the vibrant University of Chicago ecosystem.

TTIC is a unique institution and a wonderful place for students, faculty, and staff to learn, collaborate, discover, and work. As always, I am excited to see the research, collaborations, and accomplishments that the coming year will bring.

Matthew Turk,
President

Message from the Chief Academic Officer

This year was TTIC's 20th Anniversary, and it was great to see so many student alumni, faculty alumni, and friends of TTIC at our celebration and workshop in November. Part of the event included a timeline of TTIC's history, which also gave me a chance to reflect on my own time here since I joined TTIC in summer 2017. For instance, at that time, TTIC had a total of 10 Ph.D. alumni; as of September 2024, TTIC will have a total of 44 (including my own first TTIC advisee graduates!). Our alumni are, or soon will be, faculty at Cornell, Yale, UIUC, University of Maryland, University of Waterloo, UNIST, Tsinghua University, and the University of Edinburgh, as well as researchers and engineers at a wide range of exciting companies. The anniversary celebration also included awarding TTIC's first ever endowed chairs: Julia Chuzhoy was named Manuel Blum Professor of Computer Science and David McAllester was named Lenore Blum Professor of Computer Science.

In addition to the 20th Anniversary workshop, we hosted a large number of other events this past year including a Junior Theorists Workshop joint with Northwestern, our Student Workshop, the Midwest Robotics Workshop (possibly our largest event ever held at TTIC), and six workshops in summer 2024 as part of the TTIC Summer Workshop Program.

We were excited to have Zhiyuan Li join us as a new Assistant Professor in Fall 2023, coming to us from Princeton (Ph.D.) and Stanford (Postdoc), and to have Shiry Ginosar join us as a new Assistant Professor in Fall 2024, coming to us from UC Berkeley (Ph.D. and Postdoc). Also new Research Assistant Professors joining Fall 2024: Kanishka Misra, Zhewei Sun, Jingyan Wang, and Tianhao Wang, and postdocs Dravyansh Sharma and Suprovat Ghoshal.

TTIC students and faculty won some impressive best-paper awards this year. Student Kumar Kshitij Patel and collaborators received an IJCAI 2024 Distinguished Paper Award, RAP Ali Vakilian and collaborators received an AISTATS 2024 Outstanding Student Paper Award, students Gene Li and Naren Manoj, myself, and collaborators received an ALT 2024 Outstanding Paper Award, student Davis Yoshida and collaborators received an ACL 2024 Outstanding Paper Award, and students Chung-Ming Chien and Ju-Chieh Chou together with Karen Livescu and collaborators received an ASRU 2023 Best Student Paper Award. As you will see in this report, TTIC faculty and students were highly productive in their research this past year, publishing in major AI and Theory research venues including ACL, AISTATS, ALT, ASRU, COLT, CoRL, CSLaw, CVPR, EC, ECCV, EMNLP, ESA, FOCS, FORC, ICALP, ICASSP, ICCV, ICLR, ICML, ICRA, IJCAI, IROS, ITCS, NAACL, NeurIPS, RSS, SODA, STOC, and TACL.

Congratulations to TTIC's 2024 Ph.D. graduates (our largest graduating class ever): Lingyu Gao (advised by Kevin Gimpel) joining ETS as an AI Engineer, Ben Lai (advised by Jinbo Xu) who will be joining the Chan-Zuckerberg Biohub Chicago as an AI Fellow, Han Shao (advised by me) who will be joining Harvard as a postdoc and then the University of Maryland as an Assistant Professor, Freda Shi (advised by Kevin Gimpel and Karen Livescu) joining the University of Waterloo as an Assistant Professor, Shashank Srivastava (advised by Madhur Tulsiani) joining Rutgers and IAS as a postdoc, Kevin Stangl (advised by me) joining the startup HiddenLayer as a Research Scientist, Takuma Yoneda (advised by Matthew Walter) joining Google DeepMind as a Research Scientist, and Davis Yoshida (advised by Kevin Gimpel) joining Continua AI as a Machine Learning Engineer. Congratulations also to Han, Freda and Shashank for having their theses named as Theses of Distinction.

And finally, wishing all the best to our departing RAPs: Emily Diana joining Carnegie Mellon University, Hongyuan Mei joining Purdue, Theodor Misiakiewicz joining Yale, Lingxiao Wang joining NJIT, and Jiawei Zhou joining Stony Brook University.

Wishing everyone a happy and successful year, and for alumni reading this, please feel free to reach out anytime with updates, stories, questions, or just to say hi!

Avrim Blum,
Chief Academic Officer

Institute Overview

Faculty and Staff

Professors	11
Assistant Professors	1
Research Assistant Professors	15
Adjoint Faculty	9
Administrative Staff	13
Postdocs	5

Ph.D. Program

Students enrolled 2023-24	39
New matriculants for 2023-24	3
Master's degrees awarded (in September 2023)	3
Ph.D. degrees awarded (in September 2023)	7
Anticipated enrolling (fall 2024)	10


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TTIC
20 years

Awards and Honors

April 2024 - Santhoshini Velusamy
Research Assistant Professor Santhoshini Velusamy received an NSF CRII award to support her research at TTIC from April 2024 to March 2026. Her work focuses on streaming and sublinear algorithms for combinatorial optimization. The project, "Streaming Approximability of Maximum Directed Cut and Other CSPs," explores the efficiency of algorithms in processing large datasets with limited memory. Velusamy, a 2023 Harvard Ph.D. graduate, aims to develop more space-efficient streaming algorithms for Constraint Satisfaction Problems.

April 2024 - Julia Chuzhoy
Professor Julia Chuzhoy and University of Pennsylvania Professor Sanjeev Khanna received a National Science Foundation CCF award for their project, "Fast Combinatorial Algorithms for (Dynamic) Matchings and Shortest Paths." The research focuses on designing efficient algorithms for solving key graph problems like Maximum Flow and Maximum Matching, with applications ranging from social media to traffic routing. The project, running from 2024 to 2028, aims to advance both static and dynamic algorithm techniques.

May 2024 - Ali Vakilian
Professor Ali Vakilian and University of Chicago students Erasmo Tani and Adela DePavia were recipients of the Outstanding Student Paper Highlight Award at the 26th International Conference on Artificial Intelligence and Statistics (AISTATS 2024) for “Learning-Based Algorithms for Graph Searching Problems.”

April 2024 - Gene Li, Naren Manoj, Avrim Blum
TTIC students Gene Li and Naren Sarayu Manoj, TTIC professor Avrim Blum, and collaborators received an Outstanding Paper award at the 35th International Conference on Algorithmic Learning Theory (ALT 2024) for “Dueling Optimization with a Monotone Adversary.”

February 2024 - Zhiyuan Li
TTIC Professor Li and Princeton’s Sanjeev Arora received OpenAI’s Superalignment Fast Grant to study the “weak-to-strong generalization” problem, a challenge for aligning superhuman AI systems with human oversight. Their research explores how humans, as "weak supervisors," can steer AI systems surpassing their own abilities. The grant was awarded to 50 of 2,700 applicants, reflecting the project's importance in advancing the future of AI alignment. Li's work aims to design algorithms that improve alignment between weak and stronger AI models.

December 2023 - Chung-Ming Chien, Ju-Chieh Chou, and Karen Livescu
TTIC students Chung-Ming Chien and Ju-Chieh Chou, along with University of Chicago student Mingjiamei Zhang and TTIC Professor Karen Livescu, won the Best Student Paper Award at ASRU 2023 for “Few-Shot Spoken Language Understanding via Joint Speech-Text Models.” Their research reduced the need for labeled speech data in language tasks by 10 times using a pre-trained joint model, highlighting the potential of integrating speech and text data. This work originated from a TTIC course project.

September 2023 - Xiaodan Du
Student Xiaodan Du was the recipient of TTIC's 2023 Outstanding TA Award, which recognizes a student's stand-out dedication and effort as a teaching assistant.

September 2023 - Deree Kobets
Deree Kobets, TTIC's Controller, was announced as the recipient of the 2023 Latrice Richards Outstanding Administrator Award. This annual award recognizes an administrative staff member's outstanding performance and dedication.

August 2023 - Karen Livescu
Professor Karen Livescu's 2013 paper, "Deep Canonical Correlation Analysis" was recognized as runner-up for the International Conference on Machine Learning (ICML 2023) Test of Time Award, highlighting its influence on multimodal and self-supervised learning. This award is shared with collaborators Galen Andrew, Raman Arora, and Jeff Bilmes.

August 2023 - Nati Srebro, Lingxiao Wang, Nirmit Joshi, Kumar Kshitij Patel
TTIC students Nirmit Joshi and Kshitij Patel, along with Professors Nati Srebro and Lingxiao Wang, received Honorable Mention for their paper, "On the Still Unreasonable Effectiveness of Federated Averaging for Heterogeneous Distributed Learning," at the 2023 International Conference on Machine Learning (ICML) Workshop on Federated Learning and Analytics in Practice.

New Faculty

Research Assistant Professors







Anand Bhattad | Ph.D. - University of Illinois Urbana-Champaign

Emily Diana | Ph.D. - University of Pennsylvania

Jungo Kasai | Ph.D. - University of Washington

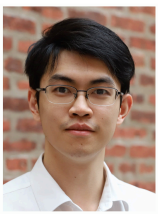
Theodor Misiakiewicz | Ph.D. - Stanford University

Liren Shan | Ph.D. - Northwestern University

Santhoshini Velusamy | Ph.D. - Harvard University

Jiawei Zhou | Ph.D. - Harvard University

Assistant Professor



Zhiyuan Li | Ph.D. - Princeton University

Faculty Listing by Area

Algorithms and Complexity

Siddharth Bhandari
Avrim Blum
Julia Chuzhoy
Yury Makarychev
Liren Shan
Ohad Trabelsi
Madhur Tulsiani
Ali Vakilian
Santhoshini Velusamy

Computational Biology

Derek Reiman
Jinbo Xu

Computer Vision

Anand Bhattad
Greg Shakhnarovich
Matthew Turk

Machine Learning

Sam Buchanan
Emily Diana
Zhiyuan Li
David McAllester
Hongyuan Mei
Theodor Misiakiewicz
Saeed Sharifi-Malvajerdi
Nati Srebro
Lingxiao Wang

Robotics

Matthew Walter

Speech and Language

Jungo Kasai
Karen Livescu
Jiawei Zhou

Post-Docs

Saba Ahmadi | Ph.D. - University of Maryland College Park

Chen Dan | Ph.D. - Carnegie Mellon University

Suprovat Ghoshal | Ph.D. - Indian Institute of Science, Bangalore

Jafar Jafarov | Ph.D. - University of Chicago

Gal Vardi | Ph.D. - Hebrew University

TTIC Celebrates 20th Anniversary

TTIC's 20th anniversary is an opportunity to reflect on TTIC's beginnings, celebrate the achievements and milestones of the past two decades, and anticipate the exciting ventures yet to come. Since its inception in 2003, TTIC has established itself as a preeminent computer science academic institution, producing important research contributions, international leadership in our fields, and graduates who have gone on to successful and productive careers in academia and industry. We have so much to be proud of, even at this young age of twenty.

Our areas of focus are going to shape the future, and we have boundless opportunities to lead and to further our impact in the coming years.

Our unique trajectory to this point is due to the vision of our founders, the support of our partners, the leadership of our Board of Trustees, and the great work and accomplishments of our faculty and staff. With much appreciation for the actions and efforts that have shaped our journey so far, I look forward to what the next twenty years will bring. TTIC is just getting started!

Thank you for being part of this adventure and celebrating this significant milestone with us.

Matthew Turk,
President

20th Anniversary Logo

On January 27, 2023, a survey was sent out to the community to vote on a logo to represent the 20th anniversary of TTIC. Out of 9 different designs, the logo presented here was the one with the highest number of votes from respondents.

The official Institute colors are used, as well as an arrow that points to the right. This arrow represents our growth and symbolizes our dedication to move forward and become even stronger as we continue our mission to achieve international impact through world-class research and education in fundamental computer science and information technology.

This logo represented TTIC's 20th anniversary for the academic year of 2023-2024.

20th Anniversary Reception

TTIC hosted a dinner reception and banquet on November 8, 2023, at the Langham Hotel in Chicago to celebrate its 20th anniversary with students, faculty, staff, alumni, friends, and partners.

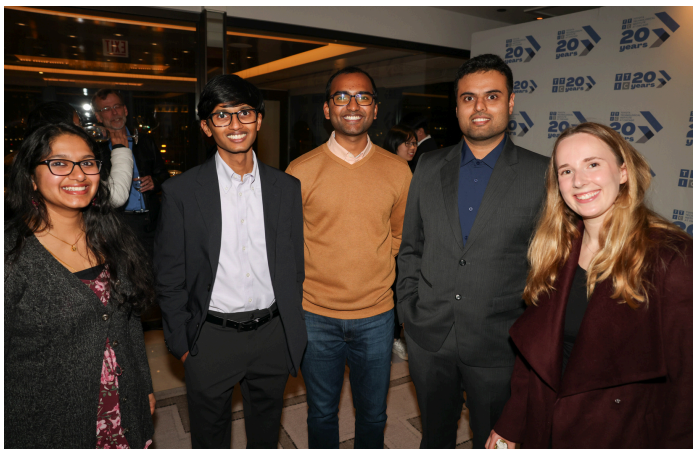
The evening began with invited speakers from members and friends of the TTIC community, including Matthew Turk (third President of TTIC), Eric Grimson (Chair of the Board of Trustees), David McAllester (Professor), Chrissy Coleman (Administrative Director of Graduate Studies, Secretary of the Institute), Paul Alivisatos (14th President of the University of Chicago), and narration by Amy Minick (Director of Human Resources and International Affairs Office).

Avrim Blum, Chief Academic Officer, announced a significant philanthropic donation from distinguished computer scientists Lenore Blum and Manuel Blum. Their generous donation marks the institute's first substantial private donation and its inaugural faculty-endowed chairs. The Lenore Blum Endowed Chair was awarded to Prof. David McAllester and the Manuel Blum Endowed Chair was awarded to Prof. Julia Chuzhoy.

Yoshihiko Masuda (Trustee, Chair of the Board of Trustees for the Toyota School Foundation in Japan), presented a gift on behalf of Toyota Technological Institute Japan (TTIJ): a woven fabric artwork titled "Open the shoji (paper doors), it's a big world out there." The fabric art, inspired by a photograph captured by Kazuyoshi Miyoshi, was crafted using Toyota Industries' air jet loom, enhanced with an electronic jacquard device.

"In celebration of TTIC's 20th anniversary, TTIJ hereby presents this fabric artwork with our sincere hope that TTIC will continue its current path, seeking and opening new doors and opportunities along the way, to become a graduate institute that pioneers the new era of engineering innovation and invention," Mr. Masuda shared with the community.

After the speakers concluded their remarks and announcements, live entertainment by pianist and vocalist Lauren Hall and cocktails were served after the dinner reception.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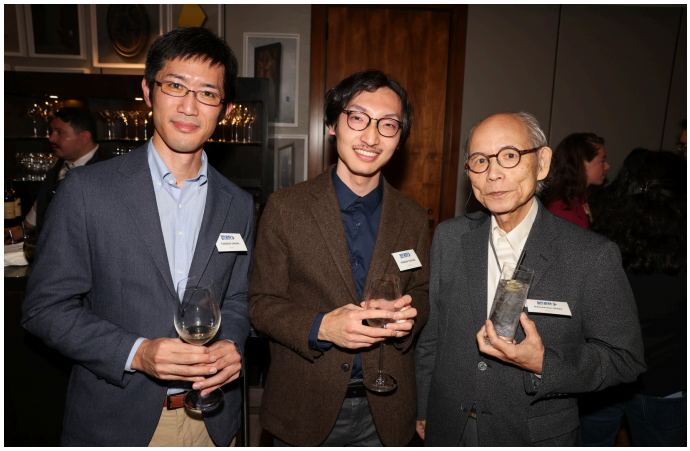



20 years


SIDDARTH BHANDARI
SONGCHENG CAI
JIADANG FANG
SHESTER GUEUWOU
LINGYU GAO
SAM BUCHANAN
JUNGO KASAI
NIRMIT JOSHI
JESSICA JACOBSON AND GUEST
QIXING HUANG
FENG LI
GENE LI
MLADEN KOLAR
MARY MARRE
OSTENDORF MARI
SEPIDEH MAHABADI
THEODOR MISIAKIEWICZ
ANGELA OLINTO
ROBERT NOWAK
RAD NAZADEH
DAVID MCALLESTER
AUDREY SEGAL
ALEXANDER RAZBOROV
LIREN SHAN
GREG SHAKHNAROVICH
HAN SHAO
ALI YAKILIAN
FREDA SHI
CHENDI WU

20th Anniversary Workshop

TTIC held a 20th Anniversary Workshop celebrating 20 years of excellence in research, education, and early-career training on November 9-10, 2023.

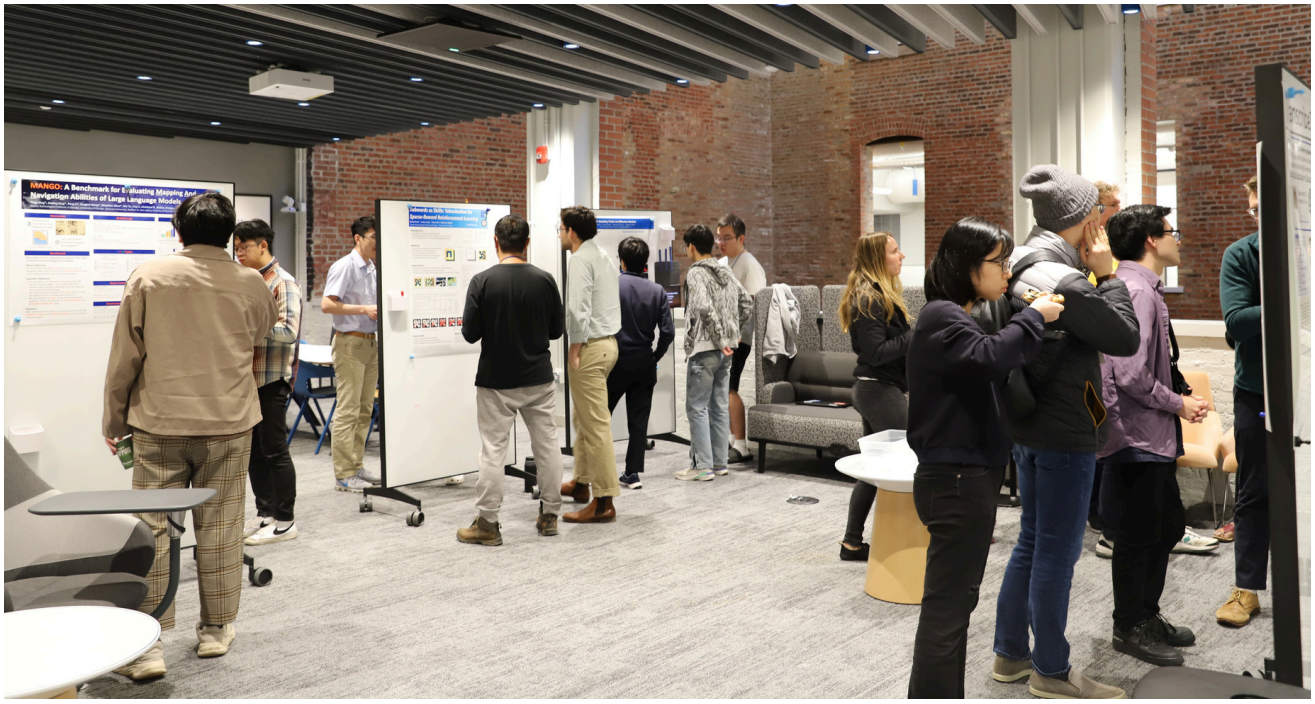
About 100 people attended the workshop, which featured student alumni, faculty alumni, current faculty, panel discussions, and a poster session, as well as a history and timeline of TTIC.

Speakers presented cutting-edge research on topics ranging from large language models to computational immunology to robotics to graph algorithms to computer vision, and more.

Speakers included two TTIC student alumni: Karthik Sridharan (Cornell University) and Shubham Toshniwal (NVIDIA), nine faculty alumni: Sepideh Mahabadi (Microsoft Research, Redmond), Mohit Bansal (UNC Chapel Hill), Suriya Gunasekar (Microsoft Research, Redmond), Adam Kalai (Microsoft Research New England), Audrey Sedal (McGill University), Harald Räcke (Technical University of Munich), Aly Azeem Khan (University of Chicago), Qixing Huang (UT Austin), and Thatchaphol Saranurak (University of Michigan), as well as three current TTIC faculty: David McAllester, Karen Livescu, and Matthew Walter.

The workshop also included an exciting poster session with posters by Kumar Kshitij Patel, Chung-Ming Chien, Hongyuan Mei, Saba Ahmadi, Kevin Stangl, Kavya Ravichandran, Jiading Fang, Ju-Chieh Chou, Takuma Yoneda, Peng Li, Shengjie Lin, Tianchong Jiang, David Yunis, Jiawei (Joe) Zhou, and Ankita Pasad on topics in machine learning, speech and language, robotics and embodied agents, computer vision, and cross-connecting directions.

The workshop additionally had two panel discussions: one on career issues and one speculating on the future of AI. The career panel featured Rob Nowak (UW-Madison), Shubham Toshniwal (NVIDIA), Julia Chuzhoy (TTIC), and Matthew Turk (TTIC) and included issues of choosing and changing research directions, the job application process, strategies for interviewing well, junior faculty life, and being a researcher in industry. The speculation panel consisted of Shai Ben-David (University of Waterloo), Adam Kalai (MSR), David McAllester (TTIC), and Manuel Blum (CMU/UC Berkeley emeritus), and featured a wide-ranging discussion on possible futures for our dynamic field.

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Marks of Progress

Sponsored Research

In FY 23-24, TTIC faculty were awarded seven grants totaling $2.5M; federal grant expenditures were $2.2M.

The current grants portfolio includes:

- 6 National Science Foundation basic and collaborative research awards
- 3 National Institutes of Health awards
- 1 Department of Defense award
- 2 Simons Foundation awards
- 1 National Science Foundation Graduate Research Fellowship award
- 1 National Science Foundation CSGrad4US Fellowship award
- Recent awards from Open AI and the Intelligence Community Postdoctoral Research Fellowship program

New Director of Outreach

Randall (Randy) Landsberg, M.S., joined the TTIC community as its Director of Outreach in June 2024, as part of the institute's efforts to expand its ongoing outreach activities which aim to expose young people to expanded access to computer science study, broadening the pipeline of future computer scientists. As an innovator in science education and outreach, Randy has developed and implemented a wide variety of acclaimed programs and has managed outreach efforts for research organizations and nonprofits including the University of Chicago and the Griffin Museum of Science and Industry. At TTIC, Randy is implementing new programs, collaborating with local schools and nonprofits, and ensuring that outreach activities are running smoothly in a growing department.

TTIC Receives Generous Donation from Lenore Blum and Manuel Blum

TTIC is thrilled to announce a significant philanthropic donation from distinguished computer scientists Lenore Blum and Manuel Blum. Their generous contribution has enabled the establishment of two faculty-endowed chairs at TTIC, marking both the institute's first substantial private donation and its inaugural faculty-endowed chairs.

The Lenore Blum Endowed Chair has been awarded to Prof. David McAllester and the Manuel Blum Endowed Chair has been awarded to Prof. Julia Chuzhoy. These prestigious appointments aim to foster TTIC's academic mission of supporting dynamic scholars and attracting top-tier talent.

Lenore Blum holds the title of Distinguished Career Professor Emerita of Computer Science at Carnegie Mellon University. She is renowned for her pioneering contributions to model theory, inductive inference, pseudorandomness, and computation over the reals. She is also a founder of the Association for Women in Mathematics. Lenore's dedication to increasing female participation in STEM fields has earned her accolades such as the US Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring.

Manuel Blum is Professor Emeritus of Computer Science at both Carnegie Mellon University and UC Berkeley. His groundbreaking research on computational complexity theory and its applications to cryptography have earned him numerous accolades including the A.M Turing Award. In addition to his groundbreaking research, Manuel was thesis advisor to a Who's Who of Theoretical Computer Science stars, including three Turing Award winners and a constellation of faculty at MIT, Carnegie Mellon University, University of California Berkeley, Stanford University, UCSD, USC, UC Irvine, Yale, the Weizmann Institute, and Penn, as well as the founder of Duolingo. Manuel is a member of the National Academy of Sciences and the National Academy of Engineering.

Both Lenore and Manuel share a deep commitment to education and to nurturing young talent. They have been particularly impressed by TTIC's focus on nurturing early-stage researchers and its unwavering dedication to Ph.D. candidates and early career scholars. With this gift, they are expressing their sincere affection and encouragement for the institute's cohort of young researchers. Their decision to support TTIC was influenced in part by their recognition of the Institute's unique position in the Midwest, as the "AI and Algorithms hub in Chicago."

Institute Research

Research Philosophy

Research is the heart and soul of activity at the Toyota Technological Institute at Chicago. The institute has an energetic and determined team of professors, visiting professors, assistant professors, research assistant professors, adjoint professors, and post-docs encompassing many areas of research interests, and from many countries and backgrounds, each bringing their own specialty to the Institute.

With a generous budget, distinguished professors, and an environment that promotes learning and sharing, there are ample opportunities for collaborative research. Being on the campus of the University of Chicago, there is opportunity for close and cooperative research with not only the Computer Science Department, but with the departments of Mathematics, Statistics, and the Booth Graduate School of Business. There are also many guests and visitors who come to TTIC to give talks, participate in workshops, and share their research findings, all heightening the feeling of enthusiasm that pulses through the Institute.

The mission of TTIC includes "…achieving international impact through world-class research and education in fundamental computer science and information technology." The research component of the mission is implemented through high quality research in high impact areas. Currently, there are active research programs in six areas: machine learning, algorithms and complexity, computer vision, speech and language, computational biology, and robotics. The areas are introduced below, and in some, TTIC's strategy for achieving impact is also described. A key part of the strategy for achieving impact in all areas is to foster collaboration and communication between these areas.

Algorithms and Complexity

The area of algorithms focuses on designing algorithms, and more generally developing powerful algorithmic tools, for solving fundamental computational problems that frequently occur in different areas of computer science. Complexity theory is the study of the power and the limits of efficient computation. The central problem studied by complexity theorists is, "Which computational problems can, and which cannot, be solved efficiently?" The study of algorithms and complexity is a part of a broader area called "theory of computer science," or just "theory." The area of theory develops theoretical foundations for computer science, which lead to a deeper understanding of computation in general, and specific computational tasks in particular, as well as of important issues connecting algorithms to society including privacy, fairness, and incentives. The area of theory works on developing theoretical foundations for computer science, which lead to a deeper understanding of computation in general, and specific computational tasks in particular, which include better algorithms and faster software. Below is a list of the work done at TTIC this year in the area of Algorithms and Complexity.

Siddharth Bhandari
Research Assistant Professor
ttic.edu/bhandari

PUBLISHED/SUBMITTED PAPERS
Raghavendra Addanki, Siddharth Bhandari, “Limits of Approximating the Median Treatment Effect.” [arxiv:2403.10618]. Appeared at the Conference on Learning Theory (COLT) 2024.
Siddharth Bhandari, Abhishek Khetan, “Improved Upper Bound for the Size of a Trifferent Code.” [arXiv:2402.02390]. IEEE International Symposium on Information Theory (ISIT) 2024.

TALKS
Applied Math Seminar: Limits of Approximating the Median Treatment.” COLT 2024, Argonne National Lab.
“Improved Upper Bound for the Size of a Trifferent.” ISIT 2024 (presented by Prof. Guruswami on our behalf).

INVOLVEMENT
Refereed conference/journal papers: ISIT, STOC, SICOMP, SODA.
Organizer: IDEAL Kickoff Workshop at TTIC (2024), IDEAL Special Program on Networks and Inference 2024.

Avrim Blum
Professor and Chief Academic Officer
ttic.edu/blum

PUBLISHED/SUBMITTED PAPERS
Saba Ahmadi, Avrim Blum, Kunhe Yang: “Fundamental Bounds on Online Strategic Classification.” 24th ACM Conference on Economics and Computation (EC), 2023.
Han Shao, Lee Cohen, Avrim Blum, Yishay Mansour, Aadirupa Saha, Matthew R. Walter: “Eliciting User Preferences for Personalized Multi-Objective Decision Making through Comparative Feedback.” Neural Information Processing Systems (NeurIPS), 2023.
Han Shao, Avrim Blum, Omar Montasser: “Strategic Classification under Unknown Personalized Manipulation.” Neural Information Processing Systems (NeurIPS), 2023.
Avrim Blum, Melissa Dutz: “Winning Without Observing Payoffs: Exploiting Behavioral Biases to Win Nearly Every Round”. 15th Innovations in Theoretical Computer Science (ITCS), 2024.
Avrim Blum, Meghal Gupta, Gene Li, Naren Sarayu Manoj, Aadirupa Saha, Yuanyuan Yang: “Dueling Optimization with a Monotone Adversary.” 35th International Conference on Algorithmic Learning Theory (ALT), 2024.
Avrim Blum, Princewill Okoroafor, Aadirupa Saha, Kevin M. Stangl: “On the Vulnerability of Fairness Constrained Learning to Malicious Noise.” 27th International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.
Saba Ahmadi, Avrim Blum, Omar Montasser, Kevin M Stangl: “Agnostic Multi-Robust Learning using ERM.” 27th International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.

Chaochao Lin, Maria-Florina Balcan, Avrim Blum, Matteo Pozzi: “Multi-agent Value of Information for Components' Inspections.” 14th International Conference on Applications of Statistics and Probability in Civil Engineering (ICASP), 2023.

TALKS
“Robustly-reliable learners for unreliable data.” 23rd Annual Kanellakis Memorial Lecture at Brown University. May 13, 2024.
“Eliciting User Preferences for Personalized Multi-Objective Decision Making.” Workshop on Reinforcement Learning and Multi-Agent Systems. November 17, 2023.
“Robustly-reliable learners for unreliable data.” CCDC Seminar Series at UC Santa Barbara. January 12, 2024.

INVOLVEMENT
Editorial board: Journal of the ACM.
Steering Committee: Symposium on Foundations of Computer Science (FOCS), Innovations in Theoretical Computer Science (ITCS), Foundations of Responsible Computing (FORC), Algorithmic Learning Theory (ALT).
Advisory Board: TheoretiCS journal.
External Advisory Board, TILOS (The Institute for Learning-enabled Optimization at Scale).
Program Committee, ITCS 2024.
Advisory Committee: Learning Theory Alliance.

HONORS/AWARDS
Outstanding Paper award at the 35th International Conference on Algorithmic Learning Theory (ALT 2024).

RESEARCH FUNDING AWARDS
DARPA: Theoretical Foundations for Highly Robust Learning Systems, $3,088,765, 12/6/2019- 2/16/2024.
NSF: AF: Small: Foundations for Societal Machine Learning, $597,194, 10/1/2022-9/30/2025.
NSF: Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), $1,664,441, 9/1/2022-8/31/2027.
Simons Foundation: Simons Collaboration on the Theory of Algorithmic Fairness, $900,000, 9/1/2020-8/31/2027.

CLASSES/SEMINARS
TTIC 31260, “Algorithmic Game Theory.”

OUTREACH/DIVERSITY
Participation in the Northwestern STEAM Scholars CS Summer Camp for students in third grade through high school.
Presentation at the UIC Young Scholars Program (YSP), a free summer math program for Chicago-area high schoolers.
Mentor at Learning Theory Alliance mentoring workshop (June 2024).

MISCELLANEOUS
Internal service: Chief Academic Officer, Colloquium series chair, student support chair.
Ph.D. advisor: Melissa Dutz (TTIC), Naren Manoj (TTIC, co-advised with Yury Makarychev), Keziah Naggita (TTIC, co-advised with Matthew Walter), Kavya Ravichandran (TTIC), Donya Saless (TTIC), Han Shao (TTIC), Kevin Stangl (TTIC).
Ph.D. Thesis Committee: Ben Lai (TTIC), Gene Li (TTIC), Kumar Kshitij Patel (TTIC), Dravyansh Sharma (CMU), Tom Yan (CMU).
Hosted summer interns: Roy Long (University of Chicago; Co-hosted with Saeed Sharifi-Malvajerdi), Vaidehi Srinivas (Northwestern University), Chirag Pabbaraju (Stanford University) and Pawan Poojary (Northwestern University).

Julia Chuzhoy
Professor
ttic.edu/chuzhoy

PUBLISHED/SUBMITTED PAPERS
Julia Chuzhoy and Sanjeev Khanna. “Maximum Bipartite Matching in $n^{2+o(1)}$ Time via a Combinatorial Algorithm,” STOC 2024, oral presentation. Invited to the SICOMP special issue for STOC 2024 (conditioned on shortening the paper; invitation declined).
Julia Chuzhoy and Sanjeev Khanna. “A Faster Combinatorial Algorithm for Maximum Bipartite Matchin,” SODA 2024, oral presentation. Invited to the TALG special issue for STOC 2024 (invitation declined). The paper was invited for presentation in “Highlights of Algorithms” (HALG) 2024; Sanjeev Khanna gave the talk. (June 3, 2024, Warsaw).

TALKS
“Faster Combinatorial Algorithms for Bipartite Matching.” TCS+, May 15, 2024.
“Faster Combinatorial Algorithms for Bipartite Matching.” Algorithms seminar at the Weizmann Institute of Science, March 14, 2024.

INVOLVEMENT
Steering committee: ITCS, SODA.

RESEARCH FUNDING AWARDS
NSF HDR TRIPODS award 2216899 “Institute for Data, Econometrics, Algorithms and Learning (IDEAL),” $1,967,500, Sept 1, 2022 - Aug 31, 2027 (split among a number of institutions and PI's).
NSF grant “AF: Small: Graph Theory and Its Uses in Algorithms and Beyond,'' $398,163, Jul. 1, 2020-June 30, 2024.
NSF grant “AF: Medium: Fast Combinatorial Algorithms for (Dynamic) Matchings and Shortest Paths'' with Sanjeev Khanna, $599,330, Jul. 1, 2024-Jun 30,2028.

CLASSES/SEMINARS
TTIC 31080 and CMSC 37503, “Approximation Algorithms.”

OUTREACH/DIVERSITY
Invited guest, “Women Forum Faculty of Mathematics & Computer Science,” Weizmann Institute.

MISCELLANEOUS
Internal service: Faculty representative at management meetings, curriculum chair.

Yury Makarychev
Professor
ttic.edu/makarychev

PUBLISHED/SUBMITTED PAPERS
Yury Makarychev, Naren Manoj, and Max Ovsiankin. “Near-Optimal Streaming Ellipsoidal Rounding for General Convex Polytopes.” In Proceedings of the Symposium on Theory of Computing (STOC 2024).
Yury Makarychev, Max Ovsiankin, and Erasmo Tani. “Approximation Algorithms for ℓp-Shortest Path and ℓ p-Group Steiner Tree.” In Proceedings of the International Colloquium on Automata, Languages and Programming (ICALP 2024).

Konstantin Makarychev, Yury Makarychev, Liren Shan, and Aravindan Vijayaraghavan. “Higher-Order Cheeger Inequality for Partitioning with Buffers.” In Proceedings of the Symposium on Discrete Algorithms (SODA 2024).
Hanan Zaichyk, Armin Biess, Aryeh Kontorovich, and Yury Makarychev. “Efficient Kirszbraun Extension with Applications to Regression.” Mathematical Programming 2023.

TALKS
“Old Questions and New Directions in Theory of Clustering.” University of California San Diego Encore Workshop, March 2024.
Mini course on beyond worst-case analysis of algorithms and algorithmic fairness, Max Planck Advanced Course on the Foundations of Computer Science (ADFOCS 2023), Saarbrücken, Germany, August, 2023.

INVOLVEMENT
Program committee member: FOCS 2024.
Executive committee member: Institute for Data, Econometrics, Algorithms, and Learning (IDEAL).
Director of the Postdoctoral Program at IDEAL.
NSF panel reviewer.
Reviewer: STOC 2024, SODA 2024, ICALP 2024, and The Journal of the ACM.

RESEARCH FUNDING AWARDS
NSF HDR TRIPODS Award ECCS- 2216899, jointly with A. Blum, J. Chuzhoy, M. Walter, N. Srebro, and our colleagues at partnering institutions. TTIC’s share is $1,967,500 (2022-27).
NSF Medium Award CCF-1955173, jointly with K. Makarychev (Northwestern). TTIC’s share is $475,645 (2020-2024).
NSF HDR TRIPODS Award CCF-1934843, jointly with N. Srebro and our colleagues at Northwestern University and the University of Chicago. TTIC's share is $511,610 (2019–2023).

CLASSES/SEMINARS
TTIC 31010/CMSC 37000-1, “Algorithms.”

MISCELLANEOUS
Ph.D. advisor: Naren Manoj (TTIC, jointly with A. Blum) and Max Ovsiankin (TTIC).
Mentored: Suprovat Ghoshal (postdoc, jointly with K. Makarychev).
Co-mentored summer visiting students: Aditya Anand and Xinyuan Cao.
Internal service: Faculty Hiring Committee chair.

Liren Shan
Research Assistant Professor
ttic.edu/shan

PUBLISHED/SUBMITTED PAPERS:
Konstantin Makarychev, Yury Makarychev, Liren Shan, Aravindan Vijayaraghava.“Higher-Order Cheeger Inequality for Partitioning with Buffers.” SODA 2024.
Konstantin Makarychev, Liren Shan. “Random Cuts are Optimal for Explainable k-Medians.” Neurips 2023 (Oral presentation).
Jinshuo Dong, Jason D. Hartline, Liren Shan, Aravindan Vijayaraghavan. “Error-Tolerant E-Discovery Protocol.” CSLaw 2024.

Charlie Carlson, Jafar Jafarov, Konstantin Makarychev, Yury Makarychev, Liren Shan. “Approximation Algorithm for Norm Multiway Cut.” ESA 2023.

TALKS
“Error-Tolerant E-Discovery Protocol.” Argonne-TTIC Collaboration Kickoff Meeting, May 3, 2024.
“Error-Tolerant E-Discovery Protocol.” IDEAL Talk Series. April 12, 2024.
“Random Cuts are Optimal for Explainable k-Medians.” EnCORE Old Questions and New Directions in Theory of Clustering workshop. March 6, 2024.

INVOLVEMENT:
Conference Reviewer: ITCS 2024, STOC 2024, COLT 2024, IPCO 2024, ICALP 2024, FOCS 2024.
Journal Reviewer: TCS.
Organizer: IDEAL winter/spring quarter special program on Networks and Statistical Inference kickoff meeting, IDEAL Workshop “Learning in Networks: Discover Hidden Structures.”

CLASSES
IDEAL Fall Quarter Reading Group: Learning with Untrusted Data.

Ohad Trabelsi
Research Assistant Professor
ttic.edu/trabelsi

PUBLISHED/SUBMITTED PAPERS
Greg Bodwin, Gary Hoppenworth, and Ohad Trabelsi. “Bridge Girth: A Unifying Notion in Network Design.” FOCS'23.

TALKS
“(Almost) Ruling Out SETH Lower Bounds for All-Pairs Max-Flow.” Research at TTIC series, February 23, 2024; Algorithms Seminar at Bar Ilan University, Israel, January 31, 2024; Algorithms seminar at Tel Aviv University, Israel, February 5, 2024.

INVOLVEMENT
Reviewer: SODA’24 (two papers)
Program Committee member: STOC’24

MISCELLANEOUS
Hosted summer intern: Gary Hoppenworth.

Madhur Tulsiani
Professor and Director of Graduate Studies
ttic.edu/tulsiani

PUBLISHED/SUBMITTED PAPERS
A. Bakshi, P. Kothari, G. Rajendran, M. Tulsiani, A. Vijayaraghavan.” Efficient Certificates of Anti-Concentration Beyond Gaussians.” FOCS 2024.

TALKS
“Decoding Codes via Proofs.” Tutorial in FSTTCS workshop on “Spectral Methods in Algorithms, December 2023.

“Decoding Codes via Proofs.” Princeton CS Theory Lunch, March 2024.
“Hypergraph expansion, CSPs, and algorithmic decoding of epsilon-balanced codes.” FSTTCS workshop on “Spectral Methods in Algorithms,” December 2023.
“Decoding Codes via Proofs.” Oberwolfach workshop on Proof Complexity, March 2024.

INVOLVEMENT
Managing editor: Theory of Computing.
Program committee member: STOC 2024, SODA 2025.
Reviewer: FOCS, SODA, TOCT.

CLASSES/SEMINARS
TTIC 31150/CMSC 31150, “Mathematical Toolkit,” Autumn 2023.

MISCELLANEOUS
Advised students: Shashank Srivastava (TTIC), Tushant Mittal (University of Chicago), June Wu (University of Chicago), Victor Hugo Almendra Hernandez (University of Chicago).
Internal service: Director of Graduate Studies.

Ali Vakilian
Research Assistant Professor
ttic.edu/vakilian

PUBLISHED/SUBMITTED PAPERS
Aditya Bhaskara, Sepideh Mahabadi, Ali Vakilian. “Tight Bounds for Volumetric Spanners and Applications.” NeurIPS 2023.
Anders Aamand, Justin Chen, Huy Nguyen, Sandeep Silwal, Ali Vakilian. “Improved Frequency Estimation Algorithms with and without Predictions.” NeurIPS 2023 (spotlight presentation).
Anders Aamand, Justin Chen, Allen Liu, Sandeep Silwal, Pattara Sukprasert, Ali Vakilian, Fred Zhang. “Constant Approximation for Individual Preference Stable Clustering.” NeurIPS 2023 (spotlight presentation).

Adela DePavia, Erasmo Tani, Ali Vakilian. “Learning-Based Algorithms for Graph Searching Problems.” AISTATS 2024 (oral presentation).
Ron Mosenzon, Ali Vakilian. “Scalable Algorithms for Individual Preference Stable Clustering.” AISTATS 2024.
Ce Jin, Michael Kapralov, Sepideh Mahabadi, Ali Vakilian. “Streaming Algorithms for Connectivity Augmentation.” ICALP 2024
Eden Chlamtáč, Yury Makarychev, Ali Vakilian. “Approximating Red-Blue Set Cover.” APPROX 2023.

TALKS
“Streaming Algorithms for Connectivity Augmentation Problems.” Extroverted Sublinear Algorithms Workshop at Simons Institute, University of California, Berkeley. June 20, 2024.
“Algorithms in the AI Age: Fair and Learning-Augmented.” Nokia-Bell Labs Research Seminar. June 12, 2024.
“Algorithms in the AI Age: Fair and Learning-Augmented.” CS Department Seminar at University of California Santa Barbara. February 8, 2024.
“Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms.” A&C Seminar at MIT. December 6, 2023.
“Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms.” Theory Seminar at University of Washington. November 13, 2023.

"Learning-Augmented Algorithms for Massive Data." INFORMS Annual Meeting, Phoenix, USA. October 18, 2023.
"Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms." INFORMS Annual Meeting, Phoenix, USA. October 15, 2023.
"Tight Bounds for Volumetric Spanners in All Norms." Sketching and Algorithm Design Workshop at Simons Institute, University of California, Berkeley. October 11, 2023.
"Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms." Theory Seminar at University of Texas at Austin. October 6, 2023.
"Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms." Algorithmic Fairness Seminar at Stanford University. October 2, 2023.
"Individual Preference Stability for Clustering." TRIPODS Postdoc Workshop, Toyota Technological Institute at Chicago. August 22, 2023.

INVOLVEMENT
Program Committee member: ICALP 2024, COLT 2024.
Area Chair: AISTATS 2024.
Reviewer: ICML 2024, SODA 2024, ITCS 2024, SoCG 2024, WebConf 2024, Journal of ACM.

HONORS/AWARDS
Outstanding Student Paper Highlight Award at AISTATS 2024.

OUTREACH/DIVERSITY
Fatima Fellowship Program: an international mentoring program for students from underrepresented communities to gain research experience and strengthen their applications.

MISCELLANEOUS
Ph.D. Thesis committee member: Kevin Stangl (TTIC), Erasmo Tani (University of Chicago), Thy Nguyen (Northeastern University).

Santhoshini Velusamy
Research Assistant Professor
ttic.edu/velusamy

PUBLISHED/SUBMITTED PAPERS
Raghuvansh Saxena, Noah Singer, Madhu Sudan, and Santhoshini Velusamy. "Improved Streaming Algorithms for Maximum Directed Cut via Smoothed Snapshots." (FOCS 2023).
Sarah Ahmadian, Sreenivas Gollapudi, Kostas Kollias, Vivek Kumar, Ameya Vellingker, and Santhoshini Velusamy. "Efficient Local Sampling Algorithms for Road Networks." (ICML 2023 SODS workshop, WWW 2024 companion proceedings).
Chi-Ning Chou, Alexander Golovnev, Madhu Sudan, and Santhoshini Velusamy. "Sketching approximability of all finite CSPs." JACM, 0004-5411, 2024.
Noah Singer, Madhu Sudan, and Santhoshini Velusamy. "Streaming approximation resistance of every ordering CSP." Computational Complexity, 33(6), 2024.

TALKS
"Streaming algorithms for Maximum Directed Cut." Sketching and Algorithm Design workshop at Simons Institute, October 2023, Research at TTIC, December 2023.
"An improved lower bound for matroid intersection prophet inequalities." Northwestern University Theory seminar, April 2024.

INVOLVEMENT
Co-organizer: Junior Theorists Workshop jointly organized by Northwestern University and TTIC (2023).
Organizer: Algorithms and Theory at TTIC (ATTIC) seminar (2024).
Subreviewer: COCOON 2024, CCC 2024, STOC 2024.

RESEARCH FUNDING AWARDS
National Science Foundation Computer and Information Science and Engineering Research Initiation Initiative (CRII) award CCF 2348475 (2024).

OUTREACH/DIVERSITY
Volunteer, GAINS conference at University of Chicago - a conference for high school girl students to connect with women in STEM (2023).

MISCELLANEOUS
Hosted summer intern: Aditya Anand (University of Michigan), 2024.

Computational Biology

Computational biology studies biological systems (e.g., cell, protein, DNA and RNA) through mathematical modeling and optimization. Machine learning methods (e.g., probabilistic graphical model and deep learning) and optimization techniques (e.g., linear programming and convex optimization) have significant applications in this field. Algorithm design and complexity analysis also play an important role, especially when we want to know if there is an efficient algorithm that can find an exact or approximate solution to a specific biological problem. Below is a list of the work done at TTIC this year in the area of Computational Biology.

Derek Reiman
Research Assistant Professor
ttic.edu/reiman

PUBLISHED/SUBMITTED PAPERS
Weber, Leah L., Derek Reiman, Mrinmoy S. Roddur, Yuanyuan Qi, Mohammed El-Kebir, and Aly A. Khan. "TRIBAL: Tree Inference of B cell Clonal Lineages." In International Conference on Research in Computational Molecular Biology, pp. 364-367. Cham: Springer Nature Switzerland, 2024.
Lee, Jean, Derek Reiman, Samara Singh, Anthony Chang, Laurence Morel, and Alexander V. Chervonsky. "Microbial influences on severity and sex bias of systemic autoimmunity." Immunological Reviews (2024).
Weber, Leah L., Derek Reiman, Mrinmoy S. Roddur, Yuanyuan Qi, Mohammed El-Kebir, and Aly A. Khan. "Isotype-aware Inference of B cell Clonal Lineage Trees from Single-cell Sequencing Data." Cell Genomics (Accepted).
Lee, Jean, Leonid A. Yurkovetskiy, Pierre Fontanillas, Derek Reiman, LaraFrommer, Zoe Strong, Anthony Chang, 23andMe Research Team, George J. Kahaly, Aly A. Khan and Alexander V. Chervonsky. “Androgen regulation of T cell-intrinsic mechanisms contributes to the sex bias in autoimmunity.” Nature Communications (In Review).

TALKS
"TRIBAL: Tree Inference of B cell Clonal Lineages." RECOMB 2024. Massachusetts Institute of Technology. May 2, 2024.

“Modeling Host-Microbiome Interactions at the Metabolic Interface.” TMC 2024: Microbiome Research Symposium. University of Chicago. April 5, 2024.
“Computational Modeling Approaches in Biological Systems: Investigating the Microbiome and Adaptive Immune System.” Argonne-TTIC Collaboration Kickoff Meeting. Argonne National Labs. May 23, 2024.

INVOLVEMENT
Guest Editor for Special Issue of Metabolites: “Impact of Microbiome Community Changes on Host Health through Metabolic Dysregulation.”
Co-organizer: TTIC Midwest Computational Biology Workshop 2023.
Reviewer: PLOS One.

CLASSES/SEMINARS
TTIC 31050, “Introduction to Bioinformatics,” Winter 2024.

OUTREACH/DIVERSITY
Judge and Panelist for African Society for Bioinformatics and Computational Biology omics codeathon. Fall 2023, Spring 2024.

MISCELLANEOUS
Hosted student: Tina Khajeh (University of Illinois Chicago).

Jinbo Xu
Professor (on sabbatical)
ttic.edu/xu

PUBLISHED/SUBMITTED PAPERS
Xiaoyang Jing, Fandi Wu, Xiao Luo, and Jinbo Xu. “Single-sequence protein structure prediction by integrating protein language models.” Proceedings of the National Academy of Sciences, 121 (13), 2024.
Nan Zhao, Bingqing Han, Cuicui Zhao, Jinbo Xu, Xinqi Gong. “ABAG-docking benchmark: a non-redundant structure benchmark dataset for antibody–antigen computational docking.” Briefings in Bioinformatics, 25 (2), 2024.
Fang Wu, Lirong Wu, Dragomir Radev, Jinbo Xu, Stan Z Li. “Integration of pre-trained protein language models into geometric deep learning networks.” Communications Biology, 6 (1), 2023.
Bo Chen, Ziwei Xie, Jiezhong Qiu, Zhaofeng Ye, Jinbo Xu, Jie Tang. “Improved the heterodimer protein complex prediction with protein language models.” Briefings in Bioinformatics, 24 (4), 2023.

MISCELLANEOUS
Ph.D. advisor: Ben Lai (TTIC), Xiao Luo (TTIC), Ziwei Xie (TTIC).

Computer Vision

The goal of computer vision is to make computers understand images and videos. It has applications in robotics, human-computer interaction, information retrieval, scientific research, medicine, and many other domains. Historically, vision has been an important research area within computer science, and one of the pillars of work towards artificial intelligence. Below is a list of the work done at TTIC this year in the area of Computer Vision.

Anand Bhattad
Research Assistant Professor
ttic.edu/bhattad

SUBMITTED/PUBLISHED PAPERS

X. Fan, A. Bhattad*, R. Krishna*. “Videoshop: Localized Semantic Video Editing with Noise-Extrapolated Diffusion Inversion.” ECCV 2024. (* for equal advising)

A. Sarkar*, H. Mai*, A. Mahapatra*, S. Lazebnik, D.A. Forsyth, A. Bhattad. “Shadows Don’t Lie and Lines Can’t Bend! Generative Models don’t know Projective Geometry...for now.” CVPR 2024. (* for equal contribution)

A. Bhattad, J. Soole, D. A. Forsyth. “StyLitGAN: Image-based Relighting via Latent Control.” CVPR 2024.

A. Bhattad, D. McKee, D. Hoiem, D. A. Forsyth. “StyleGAN Knows Normals, Depth, Albedo, and More.” NeurIPS 2023.

O. Michel, A. Bhattad, E. Vanderbilt, R. Krishna, A. Kembhavi, T. Gupta. “OBJect 3DIT: Language-guided 3D-aware Image Editing.” NeurIPS 2023.

Yuanyi Zhong, A. Bhattad, Y. Wang, D. A. Forsyth. “Improving Equivariance in State-of-the-Art Supervised Depth and Normal Predictors.” ICCV 2023.

X. Du, N. Kolkin, G. Shakhnarovich, A. Bhattad. “Intrinsic LoRA: A Generalist Approach for Discovering Knowledge in Generative Models.” CVPR-W 2024. (Oral presentation).

Z. Lin, B. Liu, Y. Chen, D.A. Forsyth, J. Huang, A. Bhattad, S. Wang. “UrbanIR: Large-Scale Urban Scene Inverse Rendering from a Single Video.” CVPR-W 2024 (SynthData4CV).

K. Marathe, M. Bigverdi, N. A. Khan, T. Kundu, P. Howe, S. Ranjit, A. Bhattad, A. Kembhavi, L. Shapiro, R. Krishna. “MIMIC: Masked Image Modeling with Image Correspondences.” CVPR-W 2024. (Archival long paper at 3D with Multi-View Supervision workshop).

TALKS

“What do Generative Image Models Know?”
Jan 2024, IIIT Hyderabad Seminar Series, Hyderabad, India.
Oct 2023, Research@TTIC, Chicago.
Oct 2023, Exactech, Inc.; Tech Talk.

INVOLVEMENT

Area Chair: WACV 2024.
Lead Organizer, CV 20/20: A Retrospective Vision Workshop at CVPR 2024.
Reviewer: ICCV 2023, NeurIPS 2023, CVPR 2024, ECCV 2024, NeurIPS 2024, PAMI.

HONORS/AWARDS

Outstanding Reviewer at ICCV 2023.

CLASSES

TTIC 41000, “Past Meets Present: A Tale of Two Visions.”

MISCELLANEOUS
Mentored Ph.D. students: Xiao Zhang (University of Chicago) Matthew Wallingford (University of Washington) Xiaodan Du (TTIC), Zitian Zhang (Université Laval), Xiang Fan (University of Washington), Ayush Sarkar (University of Illinois Urbana-Champaign), Vaibhav Vavilala (University of Illinois Urbana-Champaign), Kalyani Marathe (University of Washington) Zhi-Hao Lin (University of Illinois Urbana-Champaign).
Mentored master's students: Hanlin Asher Mai (University of Illinois Urbana-Champaign), Frédéric Fortier-Chouinard, (Université Laval), Seemandhar Jain (University of Illinois Urbana-Champaign), James Soole (University of Illinois Urbana-Champaign).
Mentored bachelor's students: Joshua Ahn (University of Chicago), Amitabh Mahapatra, (University of Illinois Urbana-Champaign), Kuan-Sheng Chen (University of Illinois Urbana-Champaign), Oscar Michel (AI2).
Doctoral committee: Xin Yuan (University of Chicago).
Organizer: UC Berkeley Summer Computer Vision Reading Group.

Greg Shakhnarovich
Professor and Director of Admissions
ttic.edu/gregory

PUBLISHED/SUBMITTED PAPERS
J. Fang, X. Tan, S. Lin, I. Vasiljevic, V. Guizilini, H. Mei, R. Ambrus, G. Shakhnarovich, M. Walter, "Transcrib3D: 3D Referring Expression Resolution through Large Language Models." IROS 2024.
J. Ahn, H. Wang, R. Yeh, G. Shakhnarovich, "Alpha Invariance: On Inverse Scaling Between Distance and Volume Density in Neural Radiance Fields." CVPR 2024.
J. Li, H. Tan, H. Zhang, Z. Xu, F. Luan, Y. Xu, Y. Hong, K. Sunkavalli, G. Shakhnarovich, S. Bi, "Instant3D: Fast Text-to-3D with Sparse-view Generation and Large Reconstruction Model." ICLR 2024.
S. Babu, R. Liu, Z. Zhou, M. Maire, G. Shakhnarovich, R. Hanocka, "HyperFields: Towards Zero-Shot Generation of NeRFs from Text." ICML 2024.
M. Sandoval-Castaneda, Y. Li, B. Shi, D. Brentari, G. Shakhnarovich, K. Livescu, "TTIC's Submission to WMT-SLT 23." Proceedings of the Eighth Conference on Machine Translation (ACL), 2023.
S. Gueuwou, X. Du, G. Shakhnarovich, K. Livescu, "SignMusketeers: An Efficient Multi-Stream Approach for Sign Language Translation at Scale." arXiv 2406.06907 (under review).
X. Du, N. Kolkin, G. Shakhnarovich, A. Bhattad, "Generative Models: What do they know? Do they know things? Let's find out!", arXiv 2311.17137 (under review).
T. Yoneda, T. Jiang, G. Shakhnarovich, M. Walter, "6-DoF Stability Field via Diffusion Models." arXiv 2310.17649.
M. Sandoval-Castaneda, Y. Li, D. Brentari, K. Livescu, G. Shakhnarovich, "Self-supervised video transformers for isolated sign language recognition." arXiv 2309.02450.

TALKS
"Lifting 2D Image Models to 3D." Invited talk at C3AI Generative AI Workshop, University of Illinois Urbana-Champaign, October 2023.

INVOLVEMENT
Reviewer: CVPR, ECCV.
Ph.D. advisor: Marcelo Sandoval-Castaneda (TTIC), Haochen Wang (TTIC), Jiahao Li (TTIC), Xiaodan Du (TTIC), Sudarshan Babu (University of Chicago, primary advisor is Michael Maire).
Undergrad/Master's advisor: Josh Ahn, Kevin Suk (both graduated in 2024).

Hosted NDVS intern: Shester Gueuwou (with K. Livescu).
Postdoc: Jim Franke.
Thesis committees: Joshn Ahn (Bx/MS, University of Chicago), Kevin Suk (Bx/MS, University of Chicago), Jiading Fang (Ph.D., TTIC), Takuma Yoneda (Ph.D., TTIC), Andrew Fan (Ph.D., University of Chicago), X. Yuan (Ph.D., University of Chicago).
Internal service: Faculty Director of IT.

RESEARCH FUNDING AWARDS
Renewed TRI University 2.0 grant for two more years, $351,000, 2024-2026.
Adobe gift in support of research, $35,000.

Matthew Turk
President
ttic.edu/turk

PUBLISHED/SUBMITTED PAPERS
Book: Md. Ahad, U. Mahbub, Matthew Turk, and Richard Hartley (eds.), Computer Vision: Challenges, Trends, and Opportunities, CRC Press.
Y. Gizatdinova, O. Špakov, O. Tuisku, M. Turk, and V. Surakka, "Vision-Based Interfaces for Character-Based Text Entry: Comparison of Errors and Error Correction Properties of Eye Typing and Head Typing," Journal of Advances in Human-Computer Interaction, Hindawi, Volume 2023. https://doi.org/10.1155/2023/8855764
P. Shukla, S. Bharati, and M. Turk, "CAVLI – Using image associations to produce local concept-based explanations," Workshop on Explainable AI for Computer Vision, CVPR 2023.

INVOLVEMENT
Editorial Board: ACM Transactions on Interactive Intelligent Systems (TiiS), International Journal of Computer Vision and Signal Processing.
Presentation to San Diego Chapter of the IEEE Computer Society, May 14, 2024.
CRA Computing Community Consortium Council (CCC) member.
Area Chair, Winter Conference on Applications of Computer Vision (WACV) 2024.
IAPR Maria Petrou Prize Selection Committee.
General Co-Chair, International Conference on Informatics, Electronics & Vision (ICIEV).
International Advisory Board member for IDIAP (Switzerland), 2021-2025.
Member, TTIJ Board of Councilors.

MISCELLANEOUS
Advisor to Pushkar Shukla (TTIC).
Mentored Leadership Alliance student Kiri Salij (Summer 2023).

Machine Learning

Machine learning generally refers to an engineering or design paradigm where systems are built based on automatic training from examples, rather than detailed expert knowledge, much in the same way humans learn how to perform tasks and interact with the world. Most of modern machine learning is statistical in nature, and builds on statistical and probabilistic tools, as well as on algorithmic and computational developments. Machine learning plays a key role in classic artificial intelligence problems, such as computer vision, robotics, machine translation, question answering and dialogue systems, as well as a variety of "non-human" problems such as information retrieval, search, bioinformatics and stock market prediction. Below is a list of the work done at TTIC this year in the area of Machine Learning.

Sam Buchanan
Research Assistant Professor
ttic.edu/buchanan

PUBLISHED/SUBMITTED PAPERS

Yaodong Yu, Sam Buchanan, Druv Pai, Tianzhe Chu, Ziyang Wu, Shengbang Tong, Benjamin D. Haeffele, Yi Ma. "White-Box Transformers via Sparse Rate Reduction." NeurIPS 2023.

Druv Pai, Ziyang Wu, Sam Buchanan, Yaodong Yu, and Yi Ma. "Masked Completion via Structured Diffusion with White-Box Transformers." ICLR 2024.

Zhenghan Fang*, Sam Buchanan*, and Jeremias Sulam. "What's in a Prior? Learned Proximal Networks for Inverse Problems." ICLR 2024.

Yaodong Yu*, Tianzhe Chu*, Shengbang Tong, Ziyang Wu, Druv Pai, Sam Buchanan, and Yi Ma. "Emergence of Segmentation with Minimalistic White-Box Transformers." CPAL 2024 Oral Track.

Yaodong Yu, Sam Buchanan, Druv Pai, Tianzhe Chu, Ziyang Wu, Shengbang Tong, Hao Bai, Yuexiang Zhai, Benjamin D Haeffele, and Yi Ma. White-Box Transformers via Sparse Rate Reduction: Compression Is All There Is? arXiv preprint, 2023. Partially presented at NeurIPS 2023 workshop and CPAL 2024 spotlight track (workshop).

TALKS

"White-Box Transformers via Sparse Rate Reduction." Redwood Seminar (UC Berkeley Neuroscience), February 2024.

"White-Box Transformers via Sparse Rate Reduction." Mathematics of Deep Learning Workshop, Casa Matemática Oaxaca (CMO), June 2024.

"White-Box Architecture Design via Unrolled Optimization and Compression." Mathematics of Deep Learning Workshop, Casa Matemática Oaxaca (CMO), June 2024.

"White-Box Transformers via Sparse Rate Reduction." Toyota Technological Institute Research Center for Smart Information Technology Research Seminar, April 2024.

"Deep Networks and the Multiple Manifold Problem." KU Eichstätt-Ingolstadt MIDS Seminar, December 2023.

INVOLVEMENT

Conference organizer: Conference on Parsimony and Learning 2024, web chair.

Journal reviewer: Mathematics of Control, Signals and Systems; IEEE Transactions on Information Theory; IEEE Journal of Special Topics in Signal Processing; JMLR; TMLR.

Conference AC: NeurIPS 2024.

Conference reviewer: ICLR 2024.

Workshop reviewer: CPAL 2024.

Workshop organizer: MoDL meeting 2024 at UCSD .

OUTREACH/DIVERSITY
TTIC DEI Committee member, 2023-2024.

MISCELLANEOUS
Mentored students: Druv Pai (Ph.D. UC Berkeley), Zhenghan Fang (Ph.D. Johns Hopkins University).

Emily Diana
Research Assistant Professor
ttic.edu/diana

PUBLISHED/SUBMITTED PAPERS
Siqi Deng, Emily Diana, Michael Kearns, and Aaron Roth. “Balanced Filtering via Disclosure-Controlled Proxies.” In Guy N. Rothblum, editor, 5th Symposium on Foundations of Responsible Computing (FORC 2024), volume 295 of Leibniz International Proceedings in Informatics (LIPIcs), pages 4:1–4:23, Dagstuhl, Germany, 2024. Schloss Dagstuhl – Leibniz-Zentrum f¨ur Informatik.
Tina Behzad, Silvia Casacuberta, Emily Diana, and Alexander Williams Tolbert. “Reconciling predictive multiplicity in practice.” ICML Humans-Algs-Society Workshop, 2024.
Emily Diana, Alexander Williams Tolbert, Kavya Ravichandran, and Avrim Blum. “Adaptive algorithmic interventions for escaping pessimism traps in dynamic sequential decisions.” ICML Humans-Algs-Society Workshop, 2024.
Emily Diana and Alexander Williams Tolbert. “Correcting underrepre sentation and intersectional bias for classification.”arXiv Preprint, 2024.

TALKS
“Adaptive Algorithmic Interventions for Escaping Pessimism Traps in Dynamic Sequential Decisions.” IDEAL Annual Meeting, 2024.
“Balanced Filtering via Disclosure-Controlled Proxies.” FORC, 2024. TOC4Fairness, 2023.
“Balanced Filtering via Non Disclosive Proxies.” TTIC, 2023.
“Balanced Filtering via Non-Disclosive Proxies.” University of Wisconsin-Madison (2023), YinzOR 2023 at Carnegie Mellon University (2023).

INVOLVEMENT
Program Committees: AISTATS 2024, AAAI 2024.

HONORS/AWARDS
FORC Best Paper.

MISCELLANEOUS
Two patents filed with Amazon AWS.
Student Collaborators at TTIC: Kavya Ravichandran, Pushkar Shukla.
Student Mentoring as part of AI & Philosophy Lab: Silvia Casacuberta, Tina Behzad, Audrey Chang.
Mentor for WiML at ICML 2023.
Pre-FORC Panelist in ”Navigating the Academic Job Market” Panel .
Speaker at 2024 Summer Institute on EITM: Empirical Implications of Theoretical Models.

Zhiyuan Li
Assistant Professor
ttic.edu/li

PUBLISHED/SUBMITTED PAPERS

Mohamad Amin Mohamadi, Zhiyuan Li, Lei Wu, Danica J. Sutherland. “Do You Grok? A Theoretical Analysis on Grokking Modular Addition.” ICML 2024.

Shuo Xie, Zhiyuan Li. “Implicit Bias of AdamW: $\ell\infty$ Norm Constrained Optimization.” ICL 2024.

Khashayar Gatmiry, Zhiyuan Li, Sashank J. Reddi, Stefanie Jegelka. “Bias via Global Convergence of Sharpness Minimization.” ICML 2024.

Zhiyuan Li, Hong Liu, Denny Zhou, Tengyu Ma. “Chain of Thought Empowers Transformers to Solve Inherently Serial Problems.” ICLR 2024.

Kaifeng Lyu, Jikai Jin, Zhiyuan Li, Simon Shaolei Du, Jason D. Lee, Wei Hu. “Dichotomy of Early and Late Phase Implicit Biases Can Provably Induce Grokking.” ICLR 2024.

Runzhe Wang, Sadhika Malladi, Tianhao Wang, Kaifeng Lyu, Zhiyuan Li. “The Marginal Value of Momentum for Small Learning Rate SGD.” ICLR 2024.

Hong Liu, Zhiyuan Li, David Leo Wright Hall, Percy Liang, Tengyu Ma. “Sophia: A Scalable Stochastic Second-order Optimizer for Language Model Pre-training.” ICLR 2024.

Zhiyuan Li, Yi Wang, Zhiren Wang. “Fast Equilibrium of SGD in Generic Situations.” ICLR 2024.

Kaiyue Wen, Zhiyuan Li, Tengyu Ma. “Sharpness Minimization Algorithms Do Not Only Minimize Sharpness To Achieve Better Generalization.” NeurIPS 2023 (Oral).

Khashayar Gatmiry, Zhiyuan Li, Ching-Yao Chuang, Sashank Reddi, Tengyu Ma, Stefanie Jegelka. “The Inductive Bias of Flatness Regularization for Deep Matrix Factorization.” NeurIPS 2023.

TALKS

“New Frontiers of Deep Learning Theory in the Era of Transformers.” Research at TTIC, April 5, 2024.

“Sharpness minimization algorithms do not only minimize sharpness to achieve better generalization.” NeurIPS 2023, New Orleans, December 2024

“How Does Sharpness-Aware Minimization Minimize Sharpness?” Informs, Pheonix, October 2024.

“Sophia: A Scalable Stochastic Second-order Optimizer for Language Model Pre-training.” Theory and Practice of Foundation Models Workshop, Yale, October 2023.

“Open Problems about Sharpness, Implicit Bias, and Generalization.” Blessing of dimensionality workshop, Uconn, Stors, Connecticut, July 2024.

“Role of Normalization Layers in Deep Learning.” Guest Lecture Optimization & Machine Learning Course by Jorge Norcedal at Northwestern University.

INVOLVEMENT

Area chair: NeurIPS 2023.
Reviewer: ICLR 2024, JMLR, TPAMI.

RESEARCH FUNDING AWARDS

OpenAI Super-alignment grant: $230K, for 2 years.

CLASSES/SEMINARS

TTIC 31070, “Convex Optimization.”

MISCELLANEOUS

Ph.D. advisor: Amin Mohamadi (TTIC), Shuo Xie (TTIC).
Hosted interns: Xiaoyu Chen.

Ph.D. thesis committee member: Maxim Kodryan (HSE University), Jiaye Teng (Tsinghua University).
Internal service: Hiring Committee member, qualifying exam committee for Chung-Ming Chien (TTIC) and Donya Saless (TTIC).

David McAllester
Professor
ttic.edu/mcallester

TALKS
“The Theory and Practice of Diffusion Models.” Aspen Center for Physics Winter Conference, January 2024.

INVOLVEMENT
Ph.D. advisor: Pedro Savarese (TTIC).

CLASSES/SEMINARS
TTIC31230, “Fundamentals of Deep Learning.”

Hongyuan Mei
Research Assistant Professor
ttic.edu/mei

PUBLISHED/SUBMITTED PAPERS
Shi, Xiaoming, Siqiao Xue, Kangrui Wang, Fan Zhou, James Zhang, Jun Zhou, Chenhao Tan, and Hongyuan Mei. "Language models can improve event prediction by few-shot abductive reasoning." Advances in Neural Information Processing Systems 36 (2024).
Zhao, Hongyu, Kangrui Wang, Mo Yu, and Hongyuan Mei. "Explicit planning helps language models in logical reasoning." arXiv preprint arXiv:2303.15714 (2023).
Xue, Siqiao, Xiaoming Shi, Zhixuan Chu, Yan Wang, Fan Zhou, Hongyan Hao, Caigao Jiang et al. "Easytpp: Towards open benchmarking the temporal point processes." arXiv preprint arXiv:2307.08097 (2023).
Ding, Peng, Jiading Fang, Peng Li, Kangrui Wang, Xiaochen Zhou, Mo Yu, Jing Li, Matthew R. Walter, and Hongyuan Mei. "MANGO: A Benchmark for Evaluating Mapping and Navigation Abilities of Large Language Models." arXiv preprint arXiv:2403.19913 (2024).
Yoneda, Takuma, Jiading Fang, Peng Li, Huanyu Zhang, Tianchong Jiang, Shengjie Lin, Ben Picker, David Yunis, Hongyuan Mei, and Matthew R. Walter. "Statler: State-maintaining language models for embodied reasoning." In 2024 IEEE International Conference on Robotics and Automation (ICRA), pp. 15083-15091. IEEE, 2024.

TALKS
“Language Models as Lego Blocks of Reasoning.” Research@TTIC, January 5, 2024.
“Language Models as Lego Blocks of Reasoning.” Seminar talks at University of Montreal, University of Toronto, University of Alberta, and Stanford University.
“Towards Flexible Reasoning with LLMs as Informal Logic Programs.” Job talks at University of Alberta, Duke University, Emory University, Purdue University.

INVOLVEMENT
Area Chair: NeurIPS 2024.
Reviewer: TMLR, COLM.

OUTREACH/DIVERSITY
Faculty facilitator for Girls Who Code.

MISCELLANEOUS
Research advisor: Yuetong Li (University of Chicago master's candidate), Ningxin Zhang (University of Chicago master's candidate).
Advisor: Sam Huang (University of Chicago undergraduate), Coco Liu (New York University undergraduate).
Worked with Ph.D. students: Takuma Yoneda (TTIC), Jiading Fang (TTIC), Peng Ding (University of Chicago), Rosa Zhou (University of Chicago), Haokun Liu (University of Chicago).

Theodor Misiakiewicz
Research Assistant Professor
ttic.edu/misiakiewicz

PUBLISHED/SUBMITTED PAPERS
T. Misiakiewicz, A. Montanari, "Six Lectures on Linearized Neural Networks," 08/2023. ArXiv preprint arXiv:2308.13431. Will appear in "Les Houches 2022" Special Issue in Journal of Statistical Mechanics (JSTAT).
T. Misiakiewicz, B. Saeed, "A non-asymptotic theory of Kernel Ridge Regression: deterministic equivalents, test error, and GCV estimator," 03/2024. ArXiv preprint arXiv:2403.08938.
H. Hu, Y. M. Lu, T. Misiakiewicz, "Asymptotics of random feature regression beyond the linear scaling regime," 03/2024. ArXiv preprint arXiv:2403.08160.

TALKS
"Kernel ridge regression in high dimension." Statistical Physics and Machine Learning, Institut d'Etude Scientifiques de Cargese., Cargese, France, August 2023.
"Learning sparse functions on the hypercube with neural networks." NSF TRIPODS II Meeting, April 2, 2024.
"Deterministic Equivalents for Kernel Regression." Research at TTIC, April 19, 2024.
"Deterministic Equivalents for Kernel Regression." AMS Special Session on Random Structures, Computation, and Statistical Inference, San Francisco, May 5, 2024.
"Learning juntas with gradient algorithms." IDEAL Workshop on Statistical Inference/Learning Dynamics (Northwestern University). May 21, 2024.
"On the complexity of differentiable learning." MoDL meeting in San Diego. May 17, 2024.
"On the complexity of gradient algorithms." PDE Methods in Machine Learning: from Continuum Dynamics to Algorithms, BIRS-IMAG, Granada, Spain. June 12, 2024.

INVOLVEMENT
Reviewer: JMLR, NeurIPS, Annals of Statistics.

Saeed Sharifi-Malvajerdi
Research Assistant Professor
ttic.edu/sharifi-malvajerdi

PUBLISHED/SUBMITTED PAPERS
Lee Cohen, Saeed Sharifi-Malvajerdi, Kevin Stangl, Ali Vakilian, Juba Ziani. "Sequential Strategic Screening." Appeared at International Conference on Machine Learning (ICML) 2023.
Lee Cohen, Saeed Sharifi-Malvajerdi, Kevin Stangl, Ali Vakilian, Juba Ziani. "Bayesian Strategic Classification." Submitted to Neural Information Processing Systems (NeurIPS) 2024.

TALKS
"Bayesian Strategic Classification." Research at TTIC, April 2024.
"Bayesian Strategic Classification." TRIPODS Meeting, May 2024.

INVOLVEMENT
Program Committee member: ACM Conference on Computer and Communications Security (CCS), Cycles A & B, 2024.
Reviewer: International Conference on Learning Representations (ICLR) 2024, Nature Machine Intelligence Journal 2023.
Organizer: TOC4Fairness Virtual Seminar Series.

MISCELLANEOUS
Hosted summer intern: Roy Long (2023, 2024).

Nathan (Nati) Srebro
Professor
ttic.edu/srebro

PUBLISHED/SUBMITTED PAPERS
M. Aliakbarpour, K Bairaktari, G. Brown, A. Smith, N. Srebro, J. Ullman. "Metalearning with very few samples per task." Proceedings of Thirty Seventh Conference on Learning Theory, 2024.
Kumar Kshitij Patel, Margalit Glasgow, Ali Zindari, Lingxiao Wang, Sebastian U Stich, Ziheng Cheng, Nirmit Joshi, Nati Srebro. "The Limits and Potentials of Local SGD for Distributed Heterogeneous Learning with Intermittent Communication." Proceedings of Thirty Seventh Conference on Learning Theory, 2024.
Gon Buzaglo, Itamar Harel, Mor Shpigel Nacson, Alon Brutzkus, Nati Srebro, Daniel Soudry. "How Uniform Random Weights Induce Non-uniform Bias: Typical Interpolating Neural Networks Generalize with Narrow Teachers." ICML 2024.
L. Zhou, J.B. Simon, G. Vardi, N. Srebro. "An Agnostic View on the Cost of Overfitting in (Kernel) Ridge Regression." The Twelfth International Conference on Learning Representations, ICLR 2024.
N. Joshi, G. Vardi, N. Srebro. "Noisy interpolation learning with shallow univariate ReLU networks." The Twelfth International Conference on Learning Representations, ICLR 2024.
A. Daniely, N. Srebro, G. Vardi. "Computational complexity of learning neural networks: Smoothness and degeneracy." Advances in Neural Information Processing Systems 36.
Z. Jia, G. Li, A. Rakhlin, A. Sekhari, N. Srebro. "When is agnostic reinforcement learning statistically tractable?" Advances in Neural Information Processing Systems 36.

L. Zhou, Z. Dai, F. Koehler, N. Srebro. “Uniform convergence with square-root lipschitz loss.” Advances in Neural Information Processing Systems 36.
A. Daniely, N. Srebro, G. Vardi. “Most neural networks are almost learnable.” Advances in Neural Information Processing Systems 36.
S. Frei, G. Vardi, P. Bartlett, N. Srebro. “The double-edged sword of implicit bias: Generalization vs. robustness in ReLU networks.” Advances in Neural Information Processing Systems 36.
N.S. Manoj, N. Srebro. “Shortest Program Interpolation Learning.” COLT 2023.
S. Frei, G. Vardi, P. Bartlett, N. Srebro. “Benign overfitting in linear classifiers and leaky ReLU networks from KKT conditions for margin maximization.” COLT 2023.
Patel Kshitij, K.; Wang, L.; Saha, A.; and Srebro, N. “Federated Online and Bandit Convex Optimization.” ICML 2023.
Evron, I.; Moroshko, E.; Buzaglo, G.; Khriesh, M.; Marjieh, B.; Srebro, N.; and Soudry, D. “Continual Learning in Linear Classification on Separable Data.” ICML 2023.
Itamar Harel, William M. Hoza, Gal Vardi, Itay Evron, Nati Srebro, Daniel Soudry. “Provable Tempered Overfitting of Minimal Nets and Typical Nets.” High Dimensional Learning Dynamics, ICML 2024.
L. Zhou, F. Koehler, D.J. Sutherland, N. Srebro. “Optimistic rates: A unifying theory for interpolation learning and regularization in linear regression.” ACM/JMS Journal of Data Science 1 (2), 1-51.

TALKS
“Overfitting with Linear Predictors, Short Programs and Neural Networks.” University of Chicago Statistics Colloquium, April 2024.
“Understanding Deep Learning through Optimization Geometry.” Princeton University Operations Research and Financial Engineering Distinguished Lecture Series, February 2024.
“Understanding Deep Learning through Optimization Geometry.” University of Chicago Mathematics Colloquium, November 2023.
“Understanding Deep Learning through Optimization Geometry.” Wisconsin Institute of Discovery, University of Wisconsin Madison, October 2023.
“Statistical Learning Theory view of Benign Overfitting and Interpolation Learning.” ETH, Zurich, Switzerland, September 2023.
"Large Language Models as Lego Blocks of Reasoning." Symbolic-Neural Learning Workshop, Tokyo, Japan, June 2024.
"Overfitting with Linear Predictors, Short Programs and Neural Networks." IDEAL workshop, Chicago, IL, June 2024.
"Understanding Deep Learning through Optimization Geometry." University of California San Diego Data Science Institute, March 2024.
"Understanding Deep Learning through Optimization Geometry." University of California Berkeley Dept of Statistics, February 2024.
"How Uniform Random Weights Induce Non-Uniform Bias: Typical Interpolating Neural Networks Generalize with Narrow Teachers." Information Theory and Applications, San Diego, CA, February 2024.
"Shortest Program Interpolation Learning." University of Chicago Theory of Computation Seminar, January 2024.
"Statistical Learning Theory View of Benign Overfitting and Interpolation Learning." University of Bonn (Remote), November 2023.
"Statistical Learning Theory View of Benign Overfitting and Interpolation Learning." MoDL Annual Meeting, New York, NY, September 2023.
"Interpolation Learning with Neural Nets and Short Programs." Oberwolfach, Germany, September 2023.
"Interpolation Learning with Linear Models, Kernels, Neurals Nets and Short Programs." RIKEN AI Center, Tokyo, Japan, August 2023.
"From Empirics to Theory: Understanding Deep Learning via Optimization Geometry." International Congress on Industrial and Applied Mathematics (ICIAM) Invited Talk, Tokyo, Japan, August 2023.

"Interpolation Learning with Short Programs." Statistical Physics and Machine Learning Back Together Again, Cargese, France, August 2023.

INVOLVEMENT
Senior Area Chair: ICML 2024.
Advisory Board: Midwest Machine Learning Symposium.
Scientific Advisory Board: Simons Institute for the Theory of Computation in UC Berkeley.

CLASSES/SEMINARS
TTIC 31020, “Introduction to Machine Learning.”
TTIC 31000, “Research at TTIC.”
Machine Learning and Optimization Reading Group.

OUTREACH/DIVERSITY
Girls Who Code Faculty Advisor.
IDEAL Teacher Workshop.

MISCELLANEOUS
Ph.D. advisor: Donya Saless (TTIC) Marko Medvedev (University of Chicago Mathematics), Anmol Kabra (TTIC), Xiaohan Zhu (University of Chicago Statistics), Nirmit Joshi (TTIC), Gene Li (TTIC), Kshitij Kumar (TTIC), Omar Montasser (TTIC), Lijia Zhou (University of Chicago).
Other students mentored or co-advised: Nikos Tsilivis (NYU, Visiting Ph.D. student), Sue Parkinson (University of Chicago Computational and Applied Mathematics Ph.D.), Gon Buzaglo (Technion Undergraduate).
Ph.D. Thesis Committees: Adel DePavia (University of Chicago), Han Shao (TTIC), Scott Pesme (École Polytechnique Fédérale de Lausanne), Elisabetta Cornacchia (École Polytechnique Fédérale de Lausanne), Leonardo Petrini (École Polytechnique Fédérale de Lausanne).
Post-docs: Gal Vardi.
Internal service: Research@TTIC coordinator, Distinguished Lecture Series coordinator, RAP mentoring coordinator.

Lingxiao Wang
Research Assistant Professor
ttic.edu/wang

PUBLISHED/SUBMITTED PAPERS
Kumar Kshitij Patel, Margalit Glasgow, Ali Zindari, Lingxiao Wang, Sebastian U Stich, Ziheng Cheng, Nirmit Joshi, Nati Srebro, "The limits and potentials of local sgd for distributed heterogeneous learning with intermittent communication." Proceedings of Thirty Seventh Conference on Learning Theory (COLT), 2024.
Lingxiao Wang, Xingyu Zhou, Kumar Kshitij Patel, Lawrence Tang, Aadirupa Saha, "Efficient Private Federated Non-Convex Optimization With Shuffled Model". PrivML workshop at ICLR 2024.
Boxin Zhao, Lingxiao Wang, Mladen Kolar, Ziqi Liu, Zhiqiang Zhang, Jun Zhou, Chaochao Chen. "Adaptive Client Sampling in Federated Learning via Online Learning with Bandit Feedback." To appear in Journal of Machine Learning Research (JMLR) 2024.
Minbiao Han, Kumar Kshitij Patel, Han Shao and Lingxiao Wang, "On the Effect of Defections in Federated Learning and How to Prevent Them." International Workshop on Federated Learning in the Age of Foundation Models at IJCAI 2024.

Velma K. Lopez,...,Lingxiao Wang,...,Nicholas G. Reich, Michael A. Johansson, "Challenges of COVID-19 Case Forecasting in the US, 2020–2021." PLOS Computational Biology, 2024.

TALKS
"Advances in Privacy-Preserving Machine Learning." Research at TTIC Seminar, 2024.

INVOLVEMENT
Area Chair: NeurIPS 2024.
Conference reviewer: AISTATS 2024, ICML 2024.
Funding Panel reviewer: ADVANCED SCIENTIFIC COMPUTING RESEARCH.

MISCELLANEOUS
Mentored students: Kumar Kshitij Patel (TTIC), Lawrence Tang (University of Chicago).

Robotics

Robotics can generally be defined as a field concerned with the development and realization of intelligent, physical agents that are able to perceive, plan, and act intentionally in an uncertain world. Robotics is a broad field that includes mechanical design, planning and control, perception, estimation, and human-robot interaction among others. At TTIC, robotics research currently focuses on developing advanced perception algorithms that endow robots with a rich awareness of, and the ability to act deliberately, within their surroundings. Researchers are particularly interested in algorithms that take multi-modal observations of a robot's surroundings as input, notably image streams and natural language speech, and infer rich properties of the people, places, objects, and actions that comprise a robot's environment. Integral to these technologies is their reliance on techniques from machine learning in developing probabilistic and statistical methods that are able to overcome the challenge of mitigating the uncertainty inherent in performing tasks effectively in real-world environments. These tasks include assistive technology for people living with physical and cognitive impairments, healthcare, logistics, manufacturing, and exploration. Below is a list of the work done at TTIC this year in the area of Robotics.

Matthew Walter
Professor
ttic.edu/walter

PUBLISHED/SUBMITTED PAPERS
X. Liu, T. Yoneda, R. L. Stevens, M. R. Walter, and Y. Chen, "Blending imitation and reinforcement learning for robust policy improvement," in Proceedings of the International Conference on Learning Representations (ICLR), April 2024.
X. Liu, T. Yoneda, C. Wang, M. R. Walter, and Y. Chen, "Active policy improvement from multiple black-box oracles," in Proceedings of the International Conference on Machine Learning (ICML), Jul. 2023.
H. Shao, L. Cohen, A. Blum, Y. Mansour, A. Saha, and M. R. Walter, "Eliciting user preferences for personalized multi-objective decision making through comparative feedback," in Advances in Neural Information Processing Systems (NeurIPS), December 2023.

Z. Wang, T. Oba, T. Yoneda, R. Shen, M. R. Walter, and B. Stadie, “Cold diffusion on the replay buffer: Learning to plan from known good states,” in Proceedings of the Conference on Robot Learning (CoRL), November 2023.
T. Yoneda, J. Fang, P. Li, H. Zhang, T. Jiang, S. Lin, B. Picker, D. Yunis, H. Mei, and M. R. Walter, “Statler: State maintaining language models for embodied reasoning,” in Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), May 2024.
T. Yoneda, L. Sun, G. Yang, B. Stadie, and M. Walter, “To the noise and back: Diffusion for shared autonomy,” in Proceedings of Robotics: Science and Systems (RSS), Jul. 2023.
J. Fang, S. Lin, I. Vasiljevic, V. Guizilini, R. Ambrus, A. Gaidon, G. Shakhnarovich, and M. R. Walter, “NeR Fuser: Large-scale scene representation by NeRF fusion,” in Proceedings of the Bay Area Machine Learning Symposium (BayLearn), October 2023.
J. Fang, X. Tan, S. Lin, I. Vasiljevic, V. Guizilini, H. Mei, R. Ambrus, G. Shakhnarovich, and M. R. Walter, “Transcribe3D: Grounding llms using transcribed information for 3d referential reasoning with self-corrected finetuning,” in Proceedings of the CoRL Workshop on Language and Robot Learning: Language as Grounding, November 2023.
D. Yunis, J. Jung, F. Dai, and M. R. Walter, “Subwords as skills: Tokenization for sparse-reward reinforcement learning,” in Proceedings of the NeurIPS Workshop on Generalization in Planning, December 2023.
A. Phung, G. Billings, A. F. Daniele, M. R. Walter, and R. Camilli, “Enhancing scientific exploration of the deep sea through shared autonomy in remote manipulation,” Science Robotics, vol. 8, no. 81, 2023.
C. Schaff, A. Sedal, S. Ni, and M. R. Walter, “Sim-to-real transfer of co-optimized soft robot crawlers,” Autonomous Robots, vol. 47, pp. 1195–1211, December 2023.

TALKS
“Collaborating Trust and Expectations in Shared Autonomy: Reinforcement Learning for Autonomous Vehicles.” Auto.AI Conference, June 2023 .
“Learning Better Ways to Measure and Move: Joint Optimization of an Agent’s Physical Design and Computational Reasoning.” International Workshop on Symbolic-Neural Learning (SNL), July 2023.
“Robots that Understand Language: A Whirlwind Tour from Rule-based Parsers to Generative Models.” Toyota Technological Institute at Japan (TTIJ), October 2023.
“Robots that Understand Language: A Whirlwind Tour from Rule-based Parsers to Generative Models.” TTIC 20th Anniversary Workshop, November 2023.
“Diffusion Models for Shared Autonomy.” NSF TRIPODS Workshop, University of California, San Diego (UCSD), February 2024.

INVOLVEMENT
Co-organizer, 2024 Midwest Robotics Workshop.
Associate Editor: IEEE Transactions on Robotics (T-RO), ACM Transactions on Human-Robot Interaction (THRI) , Transactions on Machine Learning Research
Area Chair: ICLR, NeurIPS, ICML.
Board Member: Duckietown Foundation.
Panelist: NSF Graduate Research Fellowship Program, NSF Safe Learning-Enabled Systems Panel (July 2023), NSF Robotics SCH (January 2024), NSF Safe Learning-Enabled Systems Panel (April 2024).
Co-organizer: ICCV Workshop on the Frontiers of Monocular 3D Perception: Geometric Foundation Models, 2023.
Steering Committee: Northeast Robotics Colloquium (NeRC).
Reviewer: CoRL, RSS, WACV, ECCV, ICRA, COLM, HRI, RA-L.
Senior member: IEEE.

RESEARCH FUNDING AWARDS
Toyota Research Institute, “Scalable Self-Supervised Learning for 3D Scene Understanding,” $351,086 (shared with Greg Shakhnarovich).
National Science Foundation, Research Experience for Teachers (RET) Supplement to Institute for Data, Econometrics, Algorithms and Learning (IDEAL), $15,000.

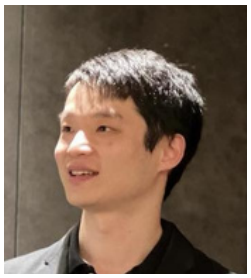
CLASSES/SEMINARS
TTIC 31180: “Probabilistic Graphical Models.” TTIC/University of Chicago.
“Self-Driving Cars with Duckietown,” edX MOOC (with Andrea Censi, Liam Paull, and Jacopo Tani) involving approximately >11,200 students from across the world in our first two editions.
Robotics Reading Group.

OUTREACH/DIVERSITY
Developed and led a six-week summer course on robot manipulation for high school students from the South Side of Chicago.
Co-chair: TTIC Diversity, Equity, and Inclusion (DEI) Committee.
Speaker and Host, University of Chicago Collegiate Scholars Program, July 2023.
Speaker and Host for numerous visits by several Chicago Public School (CPS) schools.
Exhibitor: University of Chicago South Side Science Festival (September 2023), National Robotics Week Robot Block Party at Museum of Science and Industry (April 2024). Developed and led a six-week summer course on robot manipulation for high school students from the South Side of Chicago, Summer 2024.
Co-organizer: Robot Summer Camp, Chicago Park District.

MISCELLANEOUS
Ph.D. advisor: Tewodros “Teddy” Ayalew (University of Chicago), Zhongtian “Falcon” Dai (TTIC), Andrea Daniele (TTIC), Jiading Fang (TTIC), Shengjie Lin (TTIC), Keziah Naggita (Co-advised by Avrim Blum, TTIC), Luzhe Sun (TTIC), Takuma Yoneda (TTIC), David Yunis (TTIC).
M.S. advisor: Huanyu Zhang (University of Chicago).
Mentor: Hongyuan Mei (TTIC Research Assistant Professor.)
Chair, Thesis Committee: Zhongtian “Falcon” Dai (TTIC), Andrea Daniele (TTIC), Jiading Fang (TTIC), Takuma Yoneda (TTIC).
Visiting Student advisor: Tomoharu Aizu (TTIJ) Julian Coward (University of Illinois at Chicago), Davide Iafrate (Polytecnico di Milano), Tianchong Jiang (University of Chicago) Geno Lewis (University of Chicago), Peng Li (Fudan University, co-advised by Hongyuan Mei), Alea Ritchie (Illinois Math and Science Academy), Takeru Oba (TTIJ), Katsuki Shimbo (TTIJ), Hiromu Taketsugu (TTIJ), Xiangshan “Vincent” Tan (Zhejiang University), Sam Wheeler (University of Chicago), Kevin Wu (University of Chicago), Yang Xu (University of Chicago).
Qualifying Exam Committee Chair: Marcelo Sandoval-Castañeda (TTIC), Melissa Dutz (TTIC).
Internal service: TTIC Hiring Committee member, TTIC Visiting Student Program chair, DEI Committee co-chair, TTIC Industrial Affiliates Program chair.

Speech and Language

This area is concerned with utilizing computers to analyze and extract information from language, as well as to generate language. Speech and language processing heavily relies on techniques from machine learning and statistics, as well as ideas from linguistics and speech science, and shares algorithms with computer vision and other artificial intelligence areas. In the sub-area of speech processing, example applications include automatic speech recognition and synthesis, speech summarization and translation, and conversational systems. Current speech research at TTIC includes developing and analyzing foundation models that can be used for a large number of applications, developing speech capabilities for low-resource languages and settings, and advancing spoken language tasks that require semantic understanding. Current natural language processing (text) research at TTIC includes problems such as understanding and improving the capabilities of large language models, automatic analysis of dialectal and regional language varieties, and combining linguistic representation with knowledge outside of language. Speech and language research at TTIC also includes work that combines multiple modalities of language, such as spoken, written, and signed language, along with other modalities that provide useful context for understanding language, such as images and video. Below is a list of the work done at TTIC this year in the area of Speech and Language.



Jungo Kasai
Research Assistant Professor
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PUBLISHED/SUBMITTED PAPERS

Jungo Kasai, Keisuke Sakaguchi, Yoichi Takahashi, Ronan Le Bras, Akari Asai, Xinyan Yu, Dragomir Radev, Noah A. Smith, Yejin Choi, Kentaro Inui. “RealTime QA: What's the Answer Right Now?” NeurIPS.

Yushi Hu, Benlin Liu, Jungo Kasai, Yizhong Wang, Mari Ostendorf, Ranjay Krishna, Noah A Smith. “TIFA: Accurate and Interpretable Text-to-Image Faithfulness Evaluation with Question Answering.” ICCV.

Zhoujun Cheng, Jungo Kasai, Tao Yu. “TIFA: Accurate and Interpretable Text-to-Image Faithfulness Evaluation with Question Answering.” EMNLP.

Jungo Kasai, Keisuke Sakaguchi, Ronan Le Bras, Dragomir Radev, Yejin Choi, Noah A Smith. “A Call for Clarity in Beam Search: How It Works and When It Stops.” LREC-COLING.

Yutaro Yamada, Yihan Bao, Andrew K. Lampinen, Jungo Kasai, Ilker Yildirim. “Evaluating Spatial Understanding of Large Language Models.” TMLR.

John J Nay, David Karamardian, Sarah B Lawsky, Wenting Tao, Meghana Bhat, Raghav Jain, Aaron Travis Lee, Jonathan H Choi, Jungo Kasai. “Large language models as tax attorneys: a case study in legal capabilities emergence.” Philosophical Transactions of the Royal Society.

TALKS

“Dramatic Five Years of AI and NLP: The Present and Future of Large Language Models.” Keynote at the First Workshop on the Evaluation of Generative Foundation Models @CVPR, June 2024.

“Dramatic Five Years of AI and NLP: The Present and Future of Large Language Models.” Tohoku University (Oct. 2023, Sendai Japan), Nara Institute of Science and Technology (Oct. 2023, Nara, Japan), University of Tokyo (Oct. 2023, Tokyo, Japan), Keio University (Oct. 2023, Tokyo, Japan), Hokkaido University. (Oct., 2023, Sapporo, Japan), Hitotsubashi University. (Sept. 2023, Tokyo, Japan), Waseda University (Sept. 2023, Tokyo, Japan).

INVOLVEMENT

Reviewer: ARR.

Karen Livescu
Professor
ttic.edu/livescu

PUBLISHED/SUBMITTED PAPERS
S. Arora, H. Futami, J.-w. Jung, Y. Peng, R. Sharma, Y. Kashiwagi, E. Tsunoo, K. Livescu, S. Watanabe. "UniverSLU: Universal Spoken Language Understanding for Diverse Tasks with Natural Language Instructions." NAACL 2024.
J.-C. Chou, C.-M. Chien, and K. Livescu, "AV2Wav: Diffusion-Based Re-Synthesis from Continuous Self-Supervised Features for Audio-Visual Speech Enhancement." ICASSP 2024.
J.-C. Chou, C.-M. Chien, W.-N. Hsu, K. Livescu, A. Babu, A. Conneau, A. Baevski, and M. Auli. "Toward Joint Language Modeling for Speech Units and Text." Findings of EMNLP 2023.
C.-M. Chien, M. Zhang, J.-C. Chou, and K. Livescu. "Few-shot spoken language understanding via joint speech-text models." ASRU 2023.
C.-I. J. Lai, F. Shi, P. Peng, Y. Kim, K. Gimpel, S. Chang, Y.-S. Chuang, S. Bhati, D. Cox, D. Harwath, Y. Zhang, K. Livescu, and J. Glass. "Audio-visual neural syntax acquisition." ASRU 2023.
S. Shon, S. Arora, C.-J. Lin, A. Pasad, F. Wu, R. Sharman, W.-L. Wu, H.-Y. Lee, K. Livescu, and S. Watanabe. "SLUE Phase-2: A Benchmark Suite of Diverse Spoken Language Understanding Tasks." ACL 2023.
M. Sandoval-Castañeda, Y. Li, B. Shi, D. Brentari, K. Livescu, and G. Shakhnarovich.
"TTIC's Submission to WMT-SLT 23." 8th Conference on Machine Translation 2023 (Top system).
A. Pasad, C.-M. Chien, S. Settle, and K. Livescu. “What do self-supervised speech models know about words?” TACL 2024.

TALKS
“What Do Pre-Trained Speech Representation Models Know? Layer-Wise Analysis and Benchmarking.” CLSP Seminar at Johns Hopkins University, December 1, 2023.
"What Do Pre-Trained Speech Representation Models Know?” Linguistics Colloquium, Stanford University, January 19, 2024.
"What Do Speech Foundation Models Know?" UT Austin CS, April 9, 2024. USC SAIL Group, May 28, 2024. UCLA EE, May 29, 2024. Allen Institute for Artificial Intelligence, July 9, 2024.

INVOLVEMENT
Associate Editor: IEEE T-PAMI, Trans. ACL.
Co-organizer: ASRU 2023 SPARKS Workshop on Speech Foundation Models and their Performance Benchmarks.
Reviewer: ICASSP, COLM.
External reviewer: NSF IIS panel.

HONORS/AWARDS
Galen Andrew, Raman Arora, Jeff Bilmes, Karen Livescu. “Deep Canonical Correlation Analysis.” Proceedings of the 30th International Conference on Machine Learning, PMLR 28(3):1247-1255, 2013. ICML 2023 Test-of-Time Runner.
Best Student Paper (with C.-M. Chien, M. Zhang, J.-C. Chou), ASRU 2023.

MISCELLANEOUS
Ph.D. advisor: Freda Shi (TTIC), Ankita Pasad (TTIC), Ju-Chieh Chou (TTIC), Chung-Ming Chien (TTIC).
Visiting students (including University of Chicago collaborators): Shester Gueuwou (co-advised with Greg), Yanhong Li.
Thesis committees: Lingyu Gao (TTIC), Nay San (Stanford), Yifan Peng (CMU), Salah Zaiem (Institut Polytechnique de Paris), Robin Algayres (Ecole Normale Superieure/INRIA).

Jiawei Zhou
Research Assistant Professor
ttic.edu/zhou

PUBLISHED/SUBMITTED PAPERS

Gupta, Devaansh, Siddhant Kharbanda, Jiawei Zhou, Wanhua Li, Hanspeter Pfister, and Donglai Wei. "CLIPTrans: transferring visual knowledge with pre-trained models for multimodal machine translation." In Proceedings of the IEEE/CVF international conference on computer vision, pp. 2875-2886. 2023. (ICCV 2023, poster).

Brimacombe, Benjamin, and Jiawei Zhou. "Quick Back-Translation for Unsupervised Machine Translation." In Findings of the Association for Computational Linguistics: EMNLP 2023, pp. 8521-8534. 2023 (poster).

Chen, Zhaorun, Zhuokai Zhao, Hongyin Luo, Huaxiu Yao, Bo Li, and Jiawei Zhou. "HALC: Object Hallucination Reduction via Adaptive Focal-Contrast Decoding." In Forty-first International Conference on Machine Learning (ICML 2024, poster).

Wanhua Li, Zibin Meng, Jiawei Zhou, Donglai Wei, Chuang Gan, and Hanspeter Pfister. “Prompting LLMs for Social Relation Reasoning via Greedy Segment Optimization.” In submission.

Yanhong Li, Karen Livescu, Jiawei Zhou, “Beyond Token Generation: Adaptive Chunk-Distilled Language Modeling.” In submission.

Chen, Zhaorun, Zhuokai Zhao, Hongyin Luo, Huaxiu Yao, Bo Li, and Jiawei Zhou. "HALC: Object Hallucination Reduction via Adaptive Focal-Contrast Decoding." In ICLR 2024 Workshop on Reliable and Responsible Foundation Models, May 2024. (Poster).

Chen, Zhaorun, Yichao Du, Zichen Wen, Yiyang Zhou, Chenhang Cui, Zhenzhen Weng, Haoqin Tu et al. "MJ-Bench: Is Your Multimodal Reward Model Really a Good Judge for Text-to-Image Generation?" ICML 2024 Workshop on Foundation Models in the Wild (ICML 2024 FM-Wild Workshop), July 2024. (Poster).

TALKS

“Deep Natural Language Understanding with Structured Semantics.” Research at TTIC seminar, October 13, 2023.

“Learning Graph Structures and Dynamics on Networking Data.” Invited talk at the IDEAL Graph Representation Learning Workshop, UIC, 05/31/2024.

INVOLVEMENT

Conference reviewer: ACL Rolling Review (ARR), NAACL 2024, ACL 2024, EMNLP 2024, COLM 2024.

Workshop reviewer: NLRSE 2024 Workshop (Second Workshop on Natural Language Reasoning and Structured Explanations) at ACL 2024, WiNLP 2024 (The Eighth Widening NLP Workshop) at EMNLP 2024.

Workshop organizer: “Summer Workshop on Multimodal AI,” August 7-8, 2024, hosted at TTIC.

RESEARCH FUNDING AWARDS

Google Gemma Academic Program GCP Credit Award, $5,000, 1 year extensible support.

CLASSES/SEMINARS

TTIC 31190: Natural Language Processing (Autumn 2023).

Co-organized weekly TTIC/University of Chicago NLP Seminar 2023-2024.

Visiting and Adjoint Faculty

Visiting Professors

Aditya Bhaskara
Associate Professor, University of Utah
Ph.D. - Princeton University

Eden Chlamtac
Assistant Professor, Ben Gurion University
Ph.D. - Princeton University

Graciela Perera
Associate Professor, Northeastern Illinois University
Ph.D. - University of South Florida

Aadirupa Saha
Research Scientist at Apple
Ph.D. - Indian Institute of Science

Adjoint Professors

David Forsyth
Professor, University of Illinois at Urbana-Champaign
Ph.D. - Balliol College, Oxford

Sanjeev Khanna
Professor, University of Pennsylvania
Ph.D. - Stanford University

Svetlana Lazebnik
Professor, University of Illinois at Urbana-Champaign
Ph.D. - University of Illinois at Urbana-Champaign

Robert Nowak
Professor, University of Wisconsin-Madison
Ph.D. - University of Wisconsin-Madison

Alexander Razborov
Professor, University of Chicago
Ph.D. - Steklov Mathematical Institute

Alexander Razborov
Professor, University of Chicago
Ph.D. - Steklov Mathematical Institute

Yutaka Sasaki
Professor, TTIJ
Ph.D. - University of Tsukuba

Norimichi Ukita
Professor, TTIJ
Ph.D. - Kyoto University

Stephen Wright
Professor, University of Wisconsin-Madison
Ph.D. - University of Queensland

Courtesy Faculty

László Babai
George and Elizabeth Yovovich Professor, University of Chicago
Ph.D. - Hungarian Academy of Sciences, Budapest

Allyson Ettinger
Assistant Professor, University of Chicago
Ph.D. - University of Maryland, College Park

Michael Franklin
Liew Family Chair of Computer Science, University of Chicago
Ph.D. - University of Wisconsin

Rana Hanocka
Assistant Professor, University of Chicago
Ph.D. - Tel Aviv University

Mladen Kolar
Associate Professor of Econometrics and Statistics, University of Chicago
Ph.D. - Carnegie Mellon University

Risi Kondor
Assistant Professor, University of Chicago
Ph.D. - Columbia University

Michael Maire
Assistant Professor, University of Chicago
Ph.D. - University of California, Berkeley

Rad Niazadeh
Assistant Professor of Operations Management, University of Chicago
Ph.D. - Cornell University

Aaron Potechin
Assistant Professor, University of Chicago
Ph.D. - Massachusetts Institute of Technology

Janos Simon
Professor and Director of Graduate Studies, University of Chicago
Ph.D. - Cornell University

Chenhao Tan
Assistant Professor, University of Chicago
Ph.D. - Cornell University

Rebecca Willett
Professor, University of Chicago
Ph.D. - Rice University

Collaboration and Cooperation

Professor Julia Chuzhoy (TTIC) and Professor Sanjeev Khanna (University of Pennsylvania, Adjoint Faculty at TTIC) are collaborating on an NSF CCF grant awarded project, “Fast Combinational Algorithms for (Dynamic) Matchings and Shortest Paths.” Their research focuses on obtaining very efficient combinatorial algorithms for central graph problems, such as Maximum Matching, Maximum Flow, and Shortest Paths, in both the standard static and the dynamic settings.

Professor Zhiyuan Li (TTIC) is collaborating with Professor Sanjeev Arora (Princeton University) for a Superalignment Fast Grant from Open AI to investigate the “weak-to-strong generalization” problem.

Kumar Kshitij Patel (TTIC) collaborated with Negin Golrezaei (MIT), Rad Niazadeh (University of Chicago), and Fransisca Susan (MIT) for their paper, “Online Combinatorial Optimization with Group Fairness Constraints,” which won a Distinguished Paper Award at the International Joint Conference on Artificial Intelligence (IJCAI 2024).

Professor Matthew Turk, Ph.D. student **Pushkar Shukla**, and Research Assistant Professors **Lee Cohen** and **Emily Diana** are collaborating with colleagues at the University of British Columbia, and the University of Pennsylvania on topics relating to understanding and mitigating biases in computer vision.

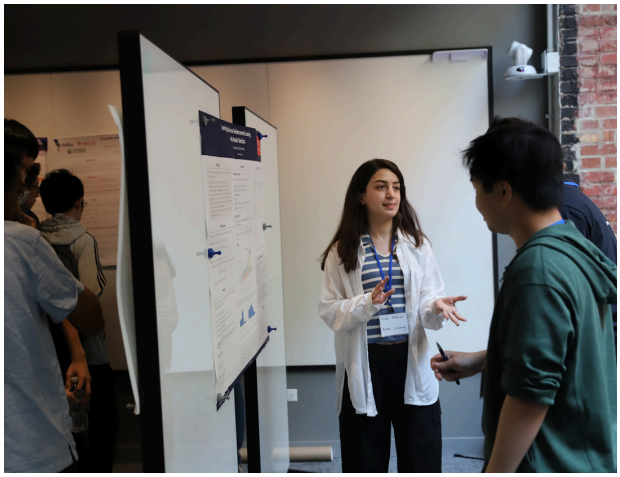
Professor Matthew Walter is collaborating with the Duckietown Foundation and researchers members Andrea Censi, Liam Paull, and Jacopo Tani to create the free online course, “Self-Driving Cars with Duckietown.”

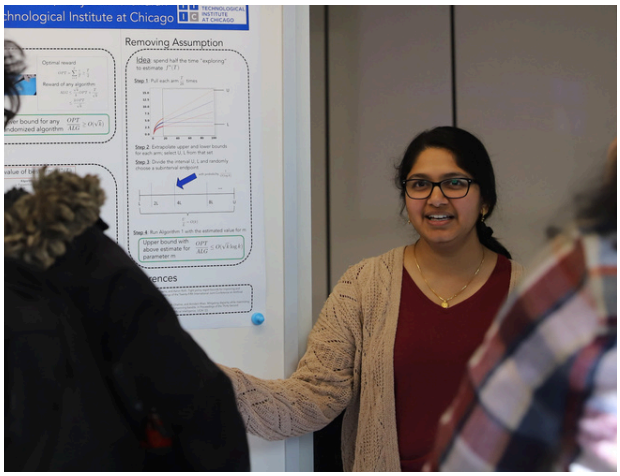
Talks, Seminars and Workshops

Talks and seminars are an important part of any academic institution. They are both a way for researchers to promote their research, and to keep abreast of recent developments. They allow students to be exposed to ideas and researchers that may play a role in shaping their academic views, research direction, or even career. Talks and seminars play an important role in establishing the level of intellectual activity and influx of innovative ideas at an institution: research is more likely to be productive in an active environment with significant interaction between researchers.

The table below lists seminars given at TTIC, many of which are given by speakers from other universities and research institutions, as part of the **TTIC Colloquium**: a forum for talks by invited speakers on work of current relevance and broad interest to the computer science community. Other talks may be a part of the **Research at TTIC** series: a weekly seminar series presenting research currently underway at the Institute. Every week a different TTIC faculty member will present their research. The lectures are intended both for students seeking research topics and advisers, and for the general TTIC and University of Chicago communities interested in hearing what their colleagues are currently involved in. The **Young Researcher Seminar Series** features talks by Ph.D. students and postdocs whose research is of broad interest to the computer science community. The series provides an opportunity for early-career researchers to present recent and promising work and to meet with students and faculty at TTIC and nearby universities. Some speakers may be part of research **Reading Groups**: people presenting papers that are of interest to a particular group, such as the theory group or the programming languages group. Most seminars are advertised outside of TTIC and are intended to be for a broad audience in computer science. In the spring quarter there are a large number of recruiting seminars which are talks given by candidates for faculty positions.

The TTIC Event Calendar can be accessed from the main website: **www.ttic.edu**





Seminars and Talks at TTIC:

- TTIC Colloquium
- Research at TTIC
- Young Researcher Seminar Series
- Talks at TTIC
- Reading Groups

Speaker	Institute	Title	Date
Jonathan Ullman	Northeastern University	Auditing Differentially Private Machine Learning	7/17/23
Davis Yoshida	TTIC	Thesis Defense: Making the Most of your Model: Methods for Finetuning and Applying Pretrained Transformers	8/23/23
Kanishka Misra	Purdue University	Analyzing Robust Conceptual Knowledge and Property Inheritance in Language Models	9/18/23
Shanthi Gudavalli	JP Morgan and Chase	AI-ML Design Patterns Applied @ Scale	9/25/23
Avrim Blum	TTIC	Learning, Game Theory, and Adversaries	9/29/23
David Iseri Inouye	Purdue University	Towards Trustworthy ML via Distribution Alignment	9/29/23
Boaz Barak	Harvard University	On Provable Copyright Protection for Generative Model	10/2/23
Jinbo Xu	TTIC	Recent Progress on AI for Protein Study	10/6/23
Jiawei Zhou	TTIC	Deep Natural Language Understanding with Structured Semantics	10/13/23
Anand Bhattad	TTIC	What Do Generative Image Models Know?	10/20/23
Noah Golowich	MIT	Exploring and Learning in Sparse Linear MDPs without Computationally Intractable Oracles	10/25/23
Lee Cohen	TTIC	Incentivized Learning in the Presence of Strategic Agents	10/27/23
Tselil Schramm	Stanford University	Spectral Clustering in High-Dimensional Gaussian Mixture Block Models	10/27/23
Liren Shan	TTIC	Explainable k-medians and k-means Clustering.	11/3/23
David McAllester	TTIC	MathZero, Common Sense, and AI alignment.	11/10/23
Emily Diana	TTIC	Balanced Filtering via Disclosure-Controlled Proxies	11/17/23
Jeremias Sulam	Johns Hopkins University	Understanding deep nets: on local Lipschitz functions and learned proximal networks	11/27/23
Chong Liu	University of Chicago	Global Optimization with Parametric Function Approximation: Realizability and Misspecification	11/29/23
Santhoshini Velusamy	TTIC	Streaming Algorithms for Constraint Satisfaction Problems	12/1/23
Dingli Yu	Princeton University	Feature Learning in Infinite-Depth Neural Networks	12/6/23
Matthew Walter	TTIC	Robot Learning from Demonstrations and Language	12/8/23
Hongyuan Mei	TTIC	Language Models as Lego Blocks of Reasoning	1/5/24
Nati Srebro	TTIC	Infinite size magnitude controlled networks and other thoughts	1/12/24

Speaker	Institute	Title	Date
Ali Vakilian	TTIC	Algorithm Design in the AI Age: Fairness & Learning-Augmented	1/19/24
Yuqing Kong	Peking University	Eliciting Information without Verification from Humans and Machines	1/25/24
Dravyansh Sharma	Carnegie Mellon University	Data-driven Algorithm Design and Principled Hyperparameter Tuning in Machine Learning	1/26/24
Lingxiao Wang	TTIC	Advances in Privacy-Preserving Machine Learning: Overparameterization and Federated Learning	1/26/24
Jessica Hullman	Northwestern University	Hypothesizing about effects in experiment design and interpretation	1/29/24
Chandra Chekuri	University of Illinois, Urbana-Champaign	Algorithms, (Combinatorial) Optimization and Applications	1/30/24
Venkat Chandrasekaran	California Institute of Technology	On False Positive Error	1/31/24
Alexander Razborov	University of Chicago	Propositional Proof Complexity (a survey)	2/2/24
Sara Fridovich-Keil	Stanford University	White-Box Computational Imaging: Measurements to Images to Insights	2/9/24
Yury Makarychev	TTIC	Shortest Path, Asymmetric TSP, and Group Steiner Tree with Vector Costs	2/9/24
Jeremy Cohen	Carnegie Mellon	The Dynamics of Gradient Descent in Deep Learning	2/13/24
Hadar Averbuch-Elor	Tel Aviv University	Leveraging Multimodal Foundation Models for Exploring the 3D World	2/15/24
Robert Nowak	University of Wisconsin-Madison	What Kinds of Functions do Neural Networks Learn? Theory and Practical Applications	2/16/24
Kumar Kshitij Patel	TTIC	On the Search for the Min-max Optimal Algorithms for Distributed Optimization with Intermittent Communication	2/16/24
Gengshan Yang	Meta Reality Labs	Towards 4D Reconstruction in the Wild	2/19/24
Ayush Tewari	MIT CSAIL	Learning to See the World in 3D	2/21/24
Aleksander Hołyński	University of California Berkeley	How I Learned to Stop Worrying and Love the Data Monster	2/22/24
Ohad Trabelsi	TTIC	(Almost) Ruling Out SETH Lower Bounds for All-Pairs Max-Flow	2/23/24
Rediet Abebe	Harvard University	When Does Allocation Require Prediction?	2/27/24
Zhuang Liu	Meta AI Research	Scaling Deep Learning Up and Down	2/29/24
Zhijing Jin	Max Planck Institute and ETH	Causal Inference for Robust, Reliable, and Responsible NLP	3/1/24
Yury Makarychev	TTIC	Shortest Path, Asymmetric TSP, and Group Steiner Tree with Vector Costs	3/1/24
Gon Buzaglo	Technion	How Uniform Random Weights Induce Non-uniform Bias: Typical Interpolating Neural Networks Generalize with Narrow Teachers	3/4/24

Speaker	Institute	Title	Date
Shuyan Zhou	Carnegie Mellon University	Solving Real-World Tasks with AI Agents	3/14/24
Bruno Loureiro	École Normale Supérieure	Learning features with two-layer neural networks, one step at a time	3/18/24
Peter West	University of Washington	Hidden Capabilities and Counterintuitive Limits in Large Language Models	3/19/24
Unnat Jain	Carnegie Mellon University and Meta	Jump-starting Embodied Intelligence	3/20/24
Sam Buchanan	TTIC	Pose-Appearance Disentanglement in Hybrid Neural Fields	3/22/24
Zhewei Sun	University of Toronto	Contextualizing Natural Language Agents: The Case of Slang	3/22/24
Eva Tardos	Cornell University	Stability and Learning in Strategic Games	3/22/24
Jungo Kasai	TTIC	Towards Speech Foundation Models	3/29/24
Zhiyuan Li	TTIC	New frontiers of deep learning theory in the era of transformers	4/5/24
Terry Fong	NASA	The NASA Volatiles Inspecting Polar Exploration Rover (VIPER) Mission	4/8/24
Saeed Sharifi-Malvajerdi	TTIC	Bayesian Strategic Classification	4/12/24
Peter Manohar	Carnegie Mellon University	An Exponential Lower Bound for Linear 3-Query Locally Correctable Codes	4/12/24
Hao Peng	University of Illinois Urbana-Champaign	Pushing the Boundaries of Length Generalization and Reasoning Capabilities of Open LLMs	4/12/24
Liren Shan	TTIC	Error-Tolerant E-Discovery Protocols	4/12/24
Andrew Ilyas	MIT	Making Machine Learning Predictably Reliable	4/15/24
Theodor Misiakiewicz	TTIC	Deterministic equivalents for kernel regression	4/19/24
Janani Sundaresan	University of Waterloo	O(log log n) Passes is Optimal for Semi-Streaming Maximal Independent Set	4/19/24
Siddharth Bhandari	TTIC	Median of differences is not difference of medians	4/26/24
Huan Sun	Ohio State University	Powers and Peculiarities of “Reasoning” in Large Language Models and Agents	4/26/24
Mitali Bafna	Massachusetts Institute of Technology	Constant Degree Direct Product Testers with Small Soundness	4/26/24
Alexander Tolbert	Emory University	Causal Agnosticism About Race: Variable Selection Problems in Causal Inference	4/29/24
Julia Chuzhoy	TTIC	Faster Combinatorial Algorithms for Bipartite Matching	5/3/24
Peter Kiss	University of Warwick	Dynamic $(1+\epsilon)$-Approximate Matching Size in Truly Sublinear Update Time	5/3/24

Speaker	Institute	Title	Date
Freda Shi	TTIC	Thesis Defense: Learning Language Structures Through Grounding	5/7/24
Matthew Turk	TTIC	Who Cares about AI Regulation?	5/10/24
Amy Greenwald	Brown University	Solving Games Forwards and Backwards	5/13/24
Louie Putterman	Harvard University	Sparsifying CSPs Through the Lens of Code Sparsification	5/17/24
Madhur Tulsiani	TTIC	List-Decodable Quantum LDPC Codes	5/17/24
Tim Roughgarden	Columbia University	The Computer in the Sky	5/20/24
Jungo Kasai	TTIC	Towards Speech Foundation Models	5/24/24
Lingyu Gao	TTIC	Thesis Defense: Harnessing the Intrinsic Knowledge of Pretrained Language Models for Challenging Text Classification Settings	6/10/24

Workshops

Annual Student Workshop

[February 23, 2024] The 7th Annual Student Workshop took place on February 23, 2024 at TTIC. It included student talks, a poster session, an invited talk, and a panel discussion on “From Research to Job Search” for Ph.D. students. This year’s invited speaker was Behnam Neyshabur, a TTIC alum and senior staff research scientist at Google DeepMind.

Organizing Committee: Han Shao, Chung-Ming Chien, Ron Mosenzon, Madhur Tulsiani, and Erica Cocom; and the Talk/Award Committee: Anand Bhattad, Liren Shan, Lingxiao Wang, Jiawei Zhou, and Sam Buchanan.

New Frontiers in Algorithmic Robust Statistics

[June 12-14, 2024] The field of robust statistics addresses the challenge of devising estimators that demonstrate reliable performance in situations where the data deviates substantially from the assumed idealized models. Over the past decade, a line of work in computer science has led to significant advances in the algorithmic aspects of this field. This workshop will concentrate on exploring the upcoming research directions in algorithmic robust statistics, emphasizing connections with different privacy and associated concepts of algorithmic stability.

Organizers: Ilias Diakonikolas (UW Madison), Gautam Kamath (U Waterloo), and Daniel M. Kane (UC San Diego).

Midwest Robotics Workshop

[April 18-19, 2024] The Midwest Robotics Workshop is intended to bring together roboticists from academia and industry in and around the Midwestern United States. The program will include invited talks, poster sessions, and will feature keynote speakers Nancy Amato (University of Illinois at Urbana-Champaign), Marcia O’Malley (Rice University), and Robert Wood (Harvard University).

Organizers: Timothy Bretl (University of Illinois at Urbana-Champaign), Daniel Bruder (University of Michigan), Girish Krishnan (University of Illinois at Urbana-Champaign), Ram Vasudevan (University of Michigan), and Matthew Walter (TTIC).

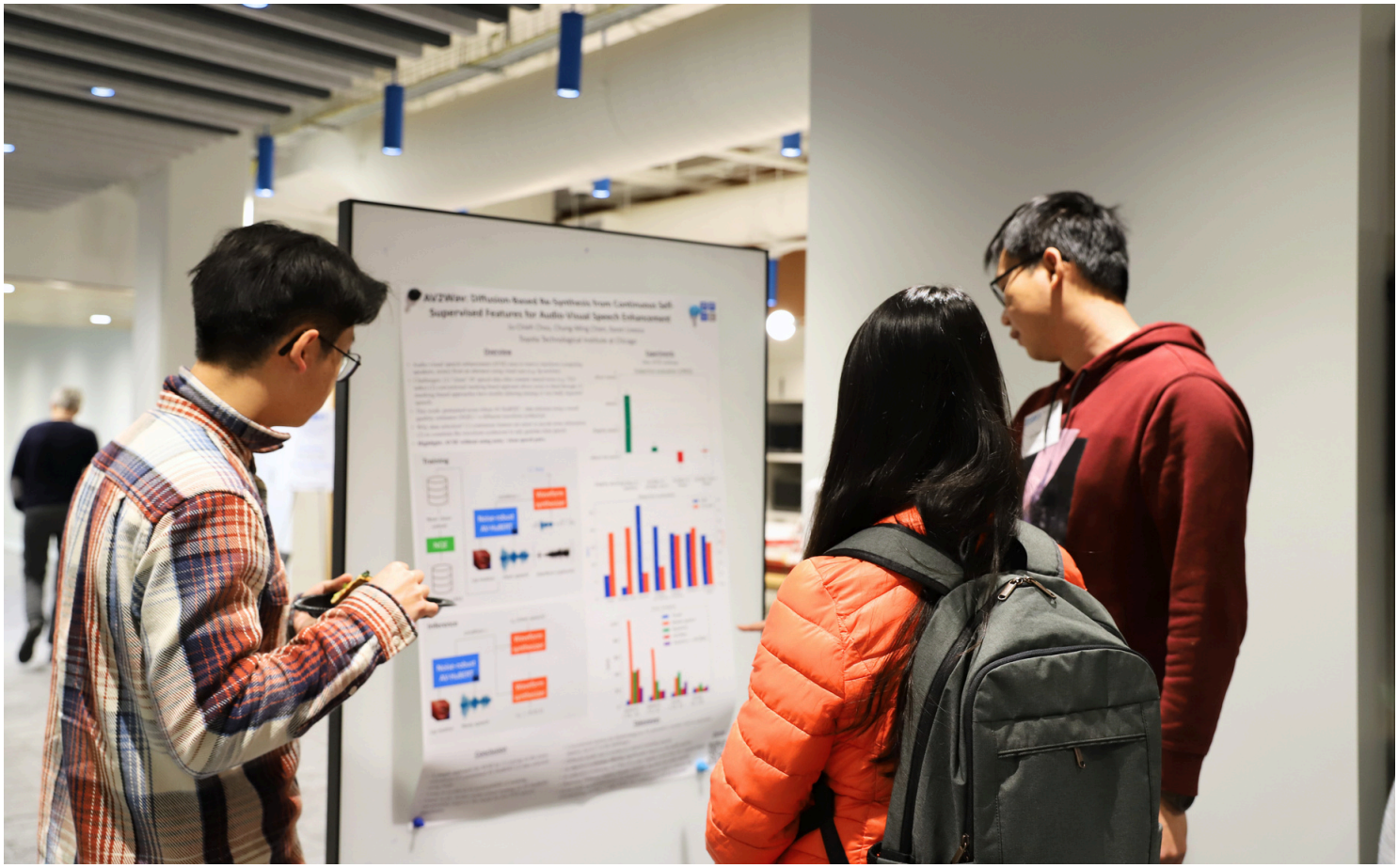
Junior Theorists Workshop

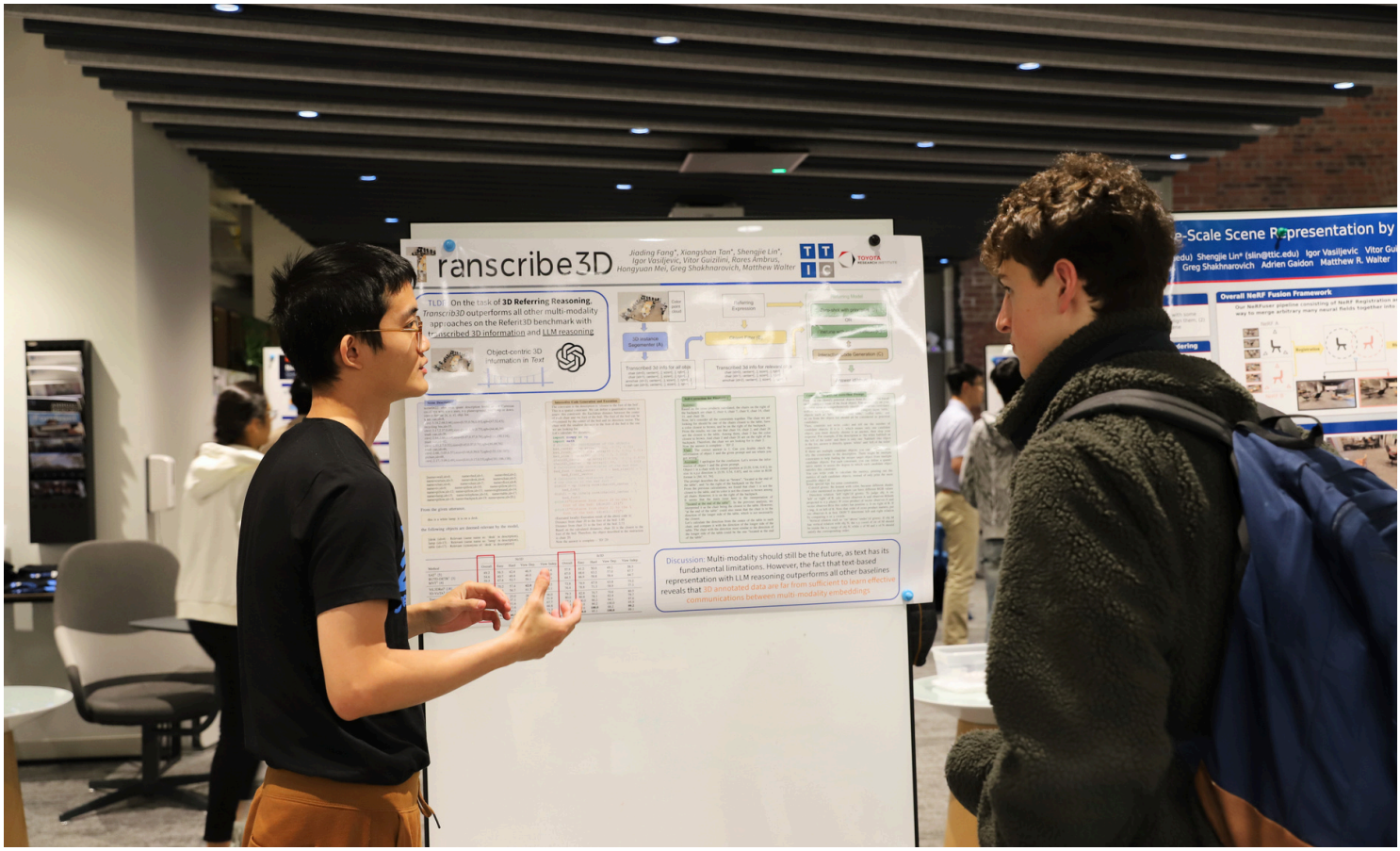
[November 30-December 1, 2023] The 2023 Fall Junior Theorists Workshop was held jointly by Northwestern University and Toyota Technological Institute at Chicago on November 30th – December 1st, 2023. This workshop focused on junior researchers in all areas of theoretical computer science.

Organizers: Dmitrii Avdiukhin (Northwestern University) and Santhoshini Velusamy (TTIC).

20th Anniversary Workshop

[November 9-10, 2023] TTIC held a 20th Anniversary Workshop celebrating 20 years of excellence in research, education, and early-career training on November 9-10, 2023. About 100 people attended the workshop, which featured student alumni, faculty alumni, current faculty, panel discussions, and a poster session, as well as a history and timeline of TTIC. Speakers presented cutting-edge research on topics ranging from large language models to computational immunology to robotics to graph algorithms to computer vision, and more.




ranscribe3D
Jiading Fang*, Xiangshan Tan*, Shengjie Lin*,
Igor Vasiljevic, Vitor Guizilini, Rares Ambrus,
Hongyuan Mei, Greg Shakhnarovich, Matthew Walter
TOYOTA
Object-centric 3D Information in Text
Discussion: Multi-modality should still be the future, as text has its fundamental limitations. However, the fact that text-based representation with LLM reasoning outperforms all other baselines reveals that 3D annotated data are far from sufficient to learn effective communications between multi-modality embeddings
e-Scale Scene Representation by
Greg Shakhnarovich Adrien Gaidon Matthew R. Walter
Overall NeRF Fusion Framework

Fifth Annual Summer Workshop Program

The TTIC Summer Workshop Program hosts a series of specialized workshops from June to September, covering diverse areas like algorithmic robust statistics, adaptive learning, multimodal AI, learning-augmented algorithms, data-driven decision processes, and computational biology. Each workshop is led by prominent organizers and features experts discussing recent advancements and applications in these fields, fostering collaboration among academia and industry.

TTIC invites researchers to submit proposals for the 6th Annual Summer Workshop Program, set for June–September 2025. Proposals should outline workshop topics, preferred dates, and organizer details. Accepted workshops receive a budget for logistics, catering, and selected attendee travel, fostering collaboration in fields such as machine learning, robotics, and computational biology. This program offers a unique platform for thought leaders to drive impactful research discussions in an engaging academic community.

For submission details, visit: **ttic.edu/summer-workshop-2025-call-for-proposals**

Midwest Computational Biology Workshop

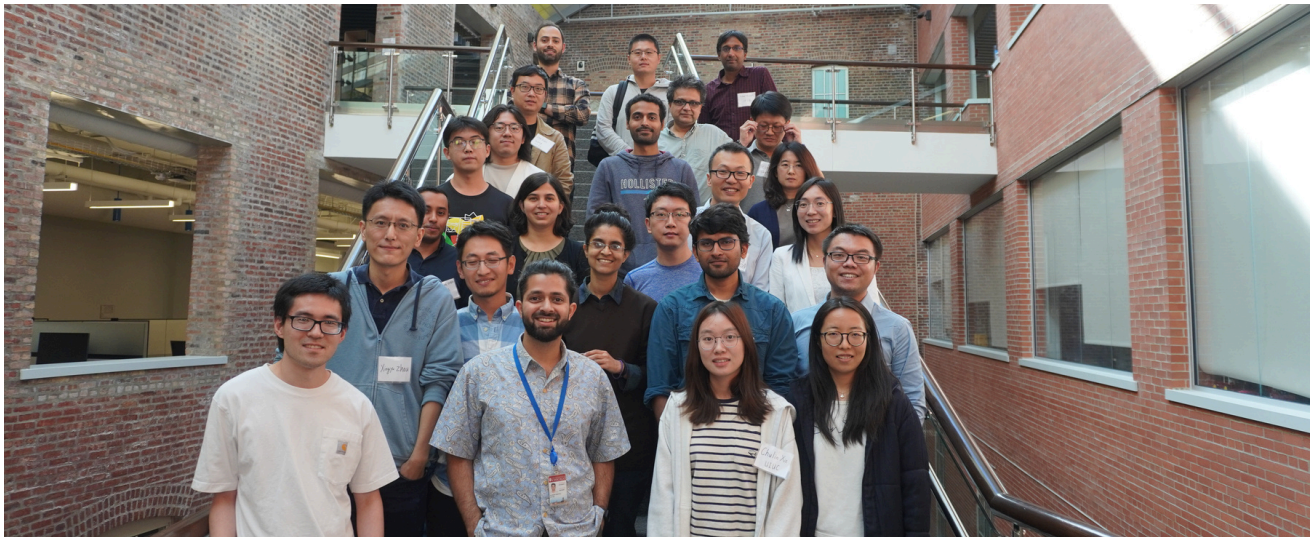
[Sept. 12-13, 2023] The 2023 Midwest Computational Biology Workshop, hosted at TTIC on September 12-13, will explore emerging topics in the field of computational biology, covering a spectrum of algorithmic and machine learning challenges to address biological questions. The workshop will bring together a wide range of participants from different backgrounds (computer science, biology, medicine) and positions (undergrads, grad students, faculty, and industry professionals). The workshop aims to initiate new interdisciplinary interactions and collaborations by connecting these researchers. The workshop will be organized around three sessions: genomics, immunology, and protein structure. Each session will include invited talks about current research and open problems and a discussion period to brainstorm collaborative solutions.

Organizers: Aly Azeem Khan (University of Chicago), Derek Reiman (TTC), and Jinbo Xu (TTIC).

New Frontiers in Federated Learning

[Sept. 8-9, 2023] The primary aim of this workshop is to connect the theoretical underpinnings and practical applications in research on Federated Learning: We will cover multiple areas related to Federated Learning, including Distributed optimization, Privacy, Mechanism Design, and also some topics related to fairness. We also plan to hold brainstorming and mentoring sessions to catalyze new ideas and discuss new starting points, ideas, questions, or applications.

Organizers: Kumar Kshitij Patel (TTIC), Aadirupa Saha (Apple, ML Research), Nati Srebro (TTIC), Lingxiao Wang (TTIC), Zheng Xu (Google).



NSF-TRIPODS Postdoc Workshop

[August 21-23, 2023] This workshop's mission was to gather postdocs from all the different NSF-TRIPODS institutes. Our plan is to have research talks by postdocs, and panel discussions by faculty and industry researchers on career and other issues. We hope this will be a fun and intellectually-stimulating event as well as a chance to build a TRIPODS postdoc community. Panelists include Pranjal Awasthi (Google NYC), Maryam Fazel (U Washington), Abolfazl Hashemi (Purdue), Piotr Indyk (MIT), Ermin Wei (Northwestern), Becca Willett (University of Chicago), and Steve Wright (UW-Madison).

Organizers: The Institute for Data, Econometrics, Algorithms, and Learning (IDEAL).

DavidFest and YishayFest

[August 17-18, 2023] These celebratory/milestone birthday workshops are in honor of TTIC's David McAllester, and friend-of-TTIC Yishay Mansour. YishayFest will be on August 17 and DavidFest will be on August 18. The workshops will feature talks by Nina Balcan, Nicolò Cesa-Bianchi, Pedro Felzenszwalb, Shafi Goldwasser, Sham Kakade, Adam Kalai, Haim Kaplan, Michael Kearns, Michael Littman, Mehryar Mohri, Fernando Pereira, Deva Ramanan, Rob Schapire, and Shai Vardi.

Organizers: Avrim Blum (TTIC), Lee Cohen (TTIC).

Distinguished Lecture Series 2023-2024

The Distinguished Lecture Series (DLS) at TTIC invites prominent computer scientists from around the world to share breakthroughs, innovations, and insights with our academic community. These lectures bridge foundational theory with pioneering applications, fostering a rich exchange of ideas and sparking new research initiatives. In the 2023–2024 series, TTIC welcomed experts whose contributions span machine learning, robotics, and beyond, offering students and faculty unique exposure to evolving trends and cutting-edge methodologies in computer science.

ttic.edu/dls

David Forsyth

Wednesday, May 3, 2023
Fulton-Watson-Copp Chair and Professor, Computer Science Dept., University of Illinois Urbana-Champaign
Talk Title: “Intrinsic images, lighting and relighting without any labeling.”

Jason Eisner

Wednesday, May 10, 2023
Professor, John Hopkins University, ACL Fellow
Talk Title: “Putting Planning and Reasoning inside Language Models.”

Yejin Choi

Monday, October 16, 2023
Professor, University of Washington, MacArthur Fellow, ACL Fellow, Distinguished Research Fellow at Institute for Ethics in AI at Oxford
Talk Title: "Possible Impossibilities and Impossible Possibilities."

Lenore Blum and Manuel Blum

Wednesday, April 24, 2024
Lenore Blum: Distinguished Career Professor Emerita of Computer Science at Carnegie Mellon University, and Visiting Chair Professor at Peking University
Manuel Blum: Bruce Nelson Professor Emeritus of Computer Science at Carnegie Mellon University, Professor Emeritus of EECS at UC Berkeley, and Visiting Chair Professor at Peking University
Talk title: “A Theoretical Computer Science Perspective on Consciousness and Artificial General Intelligence.”

Tim Roughgarden

Monday, May 20, 2024
Professor of Computer Science and member of the Data Science Institute at Columbia University
Talk title: “The Computer in the Sky.”

Education

The Ph.D. Program

The TTIC Ph.D. Program is designed to prepare students for modern academic or research careers in computer science. To complete the program, a student must make an original and significant contribution to the field of computer science, conducting high-level, responsible, and original research that culminates in a doctoral thesis which can be successfully defended in a public forum and published. In addition to the thesis, there are course, experiential, and examination requirements to complete the program. The main component of the program is the process by which the student learns to do quality research and becomes a part of the academic community.

As part of the associated partnership between TTIC and University students of TTIC can take and receive credit for courses through the University, and University of Chicago students can take advantage of classes that TTIC offers as well. Students of both institutions have taken full advantage of this opportunity. TTIC students also have full access to the University of Chicago campus services, including the library system, athletic facilities, the student wellness services, student organizations, and transportation on campus. TTIC students enjoy the benefits and great rewards of an intimate learning, study, and research setting, exposure to state-of-the-art research, opportunities in the greater computer science community, and can enjoy the traditional experiences that come with a large university.

Graduates, Diplomas and Awards

TTIC held the 2023 Diploma and Awards Ceremony at The Study, conveniently located about one block west of the Institute. Attendees celebrated diploma and award recipients, and shared a lunch reception directly following the ceremony.

7 doctoral diplomas were awarded at the September 2023 ceremony to:

Falcon Dai, who studied under Professor Matthew Walter, on reinforcement learning and machine learning. He is currently a Machine Learning Researcher at Symbolica AI.

Andrea Daniele, who studied under Professor Matthew Walter, with research interest in robotics. Andrea is currently the Chief Technology Officer of Duckietown.

Omar Montasser, who studied under Professor Nati Srebro, on machine learning. Omar is currently an Assistant Professor at Yale University in the Department of Statistics and Data Science.

Rachit Nimavat, who studied under Professor Julia Chuzhoy, on theoretical computer science.

Shane Settle, who studied under Professor Karen Livescu, on speech and language.

Bowen Shi, who studied under Professor Karen Livescu, on applications of machine learning to speech recognition and computer vision. He is currently a research scientist at Meta AI.

Qingming Tang, who studied under Professor Karen Livescu, on machine learning and speech recognition. He is currently a Senior Applied Scientist in Alexa Perceptual Technologies (APT) of Alexa AI.

Master's within the Ph.D. program diploma recipients included Ju-Chieh Chou, Anmol Kabra, Marziyeh Movahedi, and Haochen Wang.

Xiaodan Du was awarded the 2023 Outstanding Teaching Assistant Award at the ceremony for his exceptional dedication as a TA. The annual award was created in 2019 to recognize outstanding performance of teaching assistants (TAs) of courses at the Toyota Technological Institute at Chicago. Students enrolled in TTIC courses may nominate the course TA(s) for the award throughout the academic year. An award committee reviews nominations and selects a winner. An Outstanding TA Award plaque displays the names of annual award recipients.

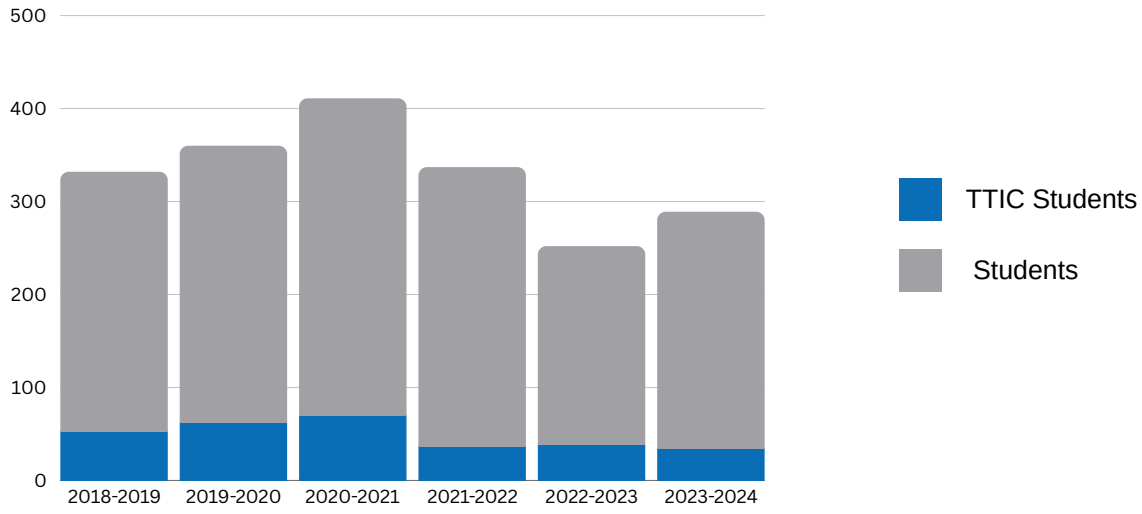
Quality Curriculum

TTIC instructors serve the student population in their courses, and under the TTIC-University of Chicago Agreement, University students may enroll in TTIC's courses and receive credit through the University, and vice-versa. The Institute views this as part of serving the Education Mission of the Institute. The amount of University students who register for TTIC courses remains high.

TTIC instructors are proud to offer a quality, modern curriculum and rigorous courses to institute Ph.D. students and the students from the University who take part.

Course enrollment numbers for TTIC courses:

Enrollment Numbers for TTIC Courses



Financial Support for Students

Full financial support is offered to all enrolled students in good academic standing, in residence, and making progress in the program, guaranteed for up to five years.

The tuition for an academic year is $30,000. TTIC provides support funding that covers tuition, health services, health insurance and campus student services fees, a new student equipment allowance, and a stipend for research assistance. There is additional funding support for English as a second language study, women's conferences, and emergency aid.

Student Admissions and Student Body Growth

In the fall of 2004, TTIC matriculated its first three students. The 2023-24 academic year saw 39 enrolled in the Ph.D. program, 3 who enrolled as first time new students this year.

Admissions Year (Fall)	Applicants Admitted	Enrolled next Fall
2024	25	*10 planned*
2023	20	3
2022	17	5+1*
2021	17	5
2020	26	4
2019	27	9
2018	26	8
2017	23	8
2016	23	4
2015	22	9
2014	6	2

*Indicates a non-fall program start

Student Publications, Posters, Abstracts 2023-24

Pasad, Ankita, Chung-Ming Chien, Shane Settle, and Karen Livescu. “What do self-supervised speech models know about words?” Transactions of the Association for Computational Linguistics no.12 (2024). 372–391.

Chou, Ju-Chieh, Chung-Ming Chien, Wei-Ning Hsu, Karen Livescu, Arun Babu, Alexis Conneau, Alexei Baevski, and Michael Auli. “Toward Joint Language Modeling for Speech Units and Text Findings.” Paper presented at the Conference on Empirical Methods in Natural Language Processing (EMNLP), Singapore, December 2023.

Chien, Chung-Ming, Mingjiamei Zhang, **Ju-Chieh Chou**, and Karen Livescu. “Few-Shot Spoken Language Understanding via Joint Speech-Text Models” Paper presented at the IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU), Taipei, Taiwan, December 2023.

Chou, Ju-Chieh, **Chung-Ming Chien**, and Karen Livescu. “AV2Wav: Diffusion-Based Re-synthesis from Continuous Self-supervised Features for Audio-Visual Speech Enhancement.” Paper presented at the International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Seoul, South Korea, April 2024.

Chien, Chung-Ming, Mingjiamei Zhang, **Ju-Chieh Chou**, and Karen Livescu. “Few-Shot Spoken Language Understanding via Joint Speech-Text Models.“ Paper presented at the IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU), Taipei, Taiwan, December 2023.

Chou, Ju-Chieh, **Chung-Ming Chien**, Wei-Ning Hsu, Karen Livescu, Arun Babu, Alexis Conneau, Alexei Baevski, and Michael Auli. “Toward Joint Language Modeling for Speech Units and Text.” Paper presented at the Conference on Empirical Methods in Natural Language Processing (EMNLP), Singapore, December 2023.
Du, Xiaodan, Nicholas Kolkin, Greg Shakhnarovich, and Anand Bhattad. “Intrinsic LoRA: A Generalist Approach for Discovering Knowledge in Generative Models.” Preprint submitted on November 28, 2023. arXiv:2311.17137v2.

Blum, Avrim, and **Melissa Dutz**. “Winning without Observing Payoffs: Exploiting Behavioral Biases to Win Nearly Every Round.” Paper presented at the Innovations in Theoretical Computer Science (ITCS), Berkeley, CA, January 2024.

Fang, Jiading, Xiangshan Tan, **Shengjie Lin**, Hongyuan Mei, and Matthew R. Walter. “Transcribe3D: Grounding LLMs Using Transcribed Information for 3D Referential Reasoning with Self-Corrected Fine Tuning.” Poster presented at the Conference on Robot Learning (CORL), Atlanta, GA, October 2023.

Yoneda, Takuma, **Jiading Fang**, Peng Li, Huanyu Zhang, Tianchong Jiang, **Shengjie Lin**, Ben Picker, **David Yunis**, Hongyuan Mei, and Matthew R. Walter. “Statler: State-Maintaining Language Models for Embodied Reasoning.” Paper presented at the International Conference on Robotics and Automation (ICRA), Yokohama, Japan, May 2024.

Gaudio, Julia, and **Nirmit Joshi**. “Community Detection the Hypergraph SBM: Exact Recovery Given the Similarity Matrix.” Paper presented at the Annual Conference on Learning Theory (COLT), Banglore, India, July 2023.

Joshi, Nirmit, Gal Vardi, and Nati Srebro. “Noisy Interpolation Leaning with Shallow Univariate ReLU Networks.” Paper presented at the International Conference on Learning Representations (ICLR), Vienna, Austria, May 2024.

Jia, Zeyu, **Gene Li**, Alexander Rakhlin, Ayush Sekhari, and Nati Srebro. “When is Agnostic Reinforcement Learning Statistically Tractable?” Paper presented at the Annual Conference on Neural Information Processing Systems (NeurIPS), New Orleans, December 2023.

Blum, Avrim, Meghal Gupta, **Gene Li**, **Naren Sarayu Manoj**, Aadirupa Saha, and Yuanyuan Yang. “Dueling Optimization with a Monotone Adversary.” Paper presented at the International Conference on Algorithmic Learning Theory (ALT), La Jolla, CA, February 2024.

Li, Jiahao, Hao Tan, Kai Zhang, Zexiang Xu, Fujun Luan, Yinghao Xu, Yicong Hong, Kalyan Sunkavalli, Greg Shakhnarovich, and Sai Bi. “Instant3D: Fast Text-to-3D with Sparse-View Generation and Large Reconstruction Model.” Paper presented at the International Conference on Learning Representations (ICLR), Vienna, Austria, May 2024.

Xu, Yinghao, Hao Tan, Fujun Luan, Sai Bi, Peng Wang, **Jiahao Li**, Zifan Shi, Kalyan Sunkavalli, Gordon Wetzstein, Zexiang Xu, and Kai Zhang. “DMV3D: Denoising Multi-View Diffusion using 3D Large Reconstruction Model.” Paper presented at the International Conference on Learning Representations (ICLR), Vienna, Austria, May 2024.

Xie, Desai, **Jiahao Li**, Hao Tan, Xin Sun, Zhixin Shu, Yi Zhou, Sai Bi, Sören Pirk, and Arie E Kaufman. “Carve3D: Improving Multi-view Reconstruction Consistency for Diffusion Models with RL Finetuning.” Paper presented at the IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR), Seattle, WA, June 2024.

Wu, Fandi, Xiaoyang Jing, **Xiao Luo**, and Jinbo Xu. “Improving protein structure prediction using templates and sequence embedding.” Bioinformatics 39, no. 1 (2023). doi: 10.1093/bioinformatics/btac723.

Jing, Xiaoyang, Fandi Wu, **Xiao Luo**, and Jinbo Xu. “Single-sequence protein structure prediction by integrating protein language models.” Proceedings of the National Academy of Sciences no. 121 (March 2024). doi:10.1073/pnas.2308788121.

Makarychev, Yury, **Naren Sarayu Manoj**, and **Max Ovsiankin**. “Near-Optimal Streaming Ellipsoidal Rounding for General Convex Polytopes.” Paper presented at the ACM Symposium on Theory of Computing (STOC), Vancouver, CA, June 2024.

Shon, Suwon, Siddhant Arora, Chyi-Jiunn Lin, **Ankita Pasad**, Felix Wu, Roshan Sharma, Wei-Lun Wu, Hung-Yi Lee, Karen Livescu, and Shinji Watanabe. "SLUE Phase-2: A Benchmark Suite of Diverse Spoken Language Understanding Tasks." Poster presented at the Annual Meeting of the Association for Computational Linguistics (ACL), Toronto, Canada, July 2023.

Golrezaei, Negin, Rad Niazadeh, **Kumar Kshitij Patel**, and Fransisca Susan. “Online Combinatorial Optimization with Group Fairness Constraints.” Poster presented at the INFORMS Annual Meeting, Phoenix, AZ, October 2023.

Dandi, Yatin, Stefani Karp, Francesca Mignacco, and **Kavya Ravichandran**. “Learning from setbacks: the impact of adversarial initialization on generalization performance.” Poster presented at Mathematics of Modern Machine Learning Workshop at the Annual Conference on Neural Information Processing Systems (NeurIPS), New Orleans, December 2023.

Blum, Avrim, and **Kavya Ravichandran**. “Nearly-tight Approximation Guarantees for the Improving Multi-Armed Bandits Problem.” Preprint submitted on April 1, 2024. arXiv:2404.01198v1.

Sandoval-Castañeda, Marcelo, Yanhong Li, Bowen Shi, Diante Brentari, Karen Livescu, and Gregory Shakhnarovich. “TTIC's Submission to WMT-SLT 23.” Paper presented at the Conference on Machine Translation (WMT), Singapore, December 2023.

Shao, Han, Avrim Blum, and Omar Montasser. “Strategic Classification under Unknown Personalized Manipulation.” Paper presented at the Annual Conference on Neural Information Processing Systems (NeurIPS), New Orleans, December 2023.

Lai, Cheng-I Jeff, **Freda Shi**, Puyuan Peng, Yoon Kim, Kevin Gimpel, Shiyu Chang, Yung-Sung Chuang, Saurabhchand Bhati, David Cox, David Harwath, Yang Zhang, Karen Livescu, and James Glass. “Audio-Visual Neural Syntax Acquisition.” Paper presented at the IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU), Taipei, Taiwan, December 2023.

Jeronimo, Fernando Granha, **Shashank Srivastava**, and Madhur Tulsiani. “List Decoding of Tanner and Expander Amplified Codes from Distance Certificates.” Paper presented atSymposium on Foundations of Computer Science (FOCS), Santa Cruz, CA, November 2023.

Xie, Shuo, and Zhiyuan Li. “Implicit Bias of AdamW: ℓ_∞-Norm Constrained Optimization.” Poster presented at the International Conference on Learning Representations (ICLR), Vienna, Austria, May 2024.

Wang, Zidan, Takeru Oba, **Takuma Yoneda**, Rui Shen, Matthew Walter, and Bradly C Stadie. “Cold Diffusion on the Replay Buffer: Learning to Plan from Known Good States.” Paper presented at the Conference on Robot Learning (CORL), Atlanta, GA, October 2023.

Liu, Xuefeng, **Takuma Yoneda**, Rick L. Stevens, Matthew Walter and Yuxin Chen. “Blending Imitation and Reinforcement Learning for Robust Policy Improvement.” Preprint submitted on October 3, 2023. arXiv:2310.01737v2.

Zhang, Xiao, **David Yunis**, and Michael Maire. “Deciphering 'What' and 'Where' Visual Pathways from Spectral Clustering of Layer-Distributed Neural Representations.” Poster presented at the IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR), Seattle, WA, June 2024.


Learning Fine-Grained Controllability on Speech Generation via Efficient Fine-Tuning
Chung-Ming Chien[1], Andros Tjandra[2], Apoorv Vyas[2], Matt Le[2], Bowen Shi[2], Wei-Ning Hsu[2]
TTI-Chicago[1], FAIR at Meta[2]
Overview
Fine-grained controllable speech generation
Punctuation, pauses, laughter, etc.
Previous work: task-specific design & training.
Efficient fine-tuning on fine-grained conditions
Speech generation models pre-trained on large corpora already learn fine-grained vocalizations.
We teach pre-trained models to follow user-specified fine-grained conditions via efficient fine-tuning methods.
Pre-Training
Global conditions (speaker, style)
Masked Mel-spectrogram
Data
Telephone conversation + audiobook + podcast
61.8k hrs, 20k speakers
Diverse styles, expressiveness, quality, etc.
Model Architecture
Denoise objective
Fine-Tuning
Fine-grained conditional speech generation tasks
Punctuation (550 hrs)
(20 hrs), laughter
Efficient fine-tuning
Adapters
LoRA
Bias-tuning
Emphasis Annotator
Generated Speech
Baseline
3.5
3.82

Notes from the CFO

Investment Pool Performance

Approximately 75% of TTIC's operating revenue is provided by investment return. Therefore, the primary objective of the Investment Pool is to generate a real rate of return, above inflation, that is sufficient to support, in perpetuity, the mission of TTIC and its operating needs. The Investment Pool must meet this objective while assuming acceptable risk levels, and this is achieved through asset allocation.

The investment pool ended fiscal year 2024 at $275.0 mil with a 7.6% return on investments for the year and a 3.2% return since inception, which is March 2021. The investment pool represents 94% of TTIC's total assets.

Operating Results

TTIC ended the fiscal year 2024 with an operating surplus of approximately $525,000, which is the net of $13.0 mil in operating revenue and $12.5 mil in operating expense.

Expenses were lower than budget due to less hiring of tenure track faculty than anticipated. However, this was slightly offset by an all-time high spending of TTIC research funds this fiscal year. This is in part due to also having a historically high number of Research Assistant Professors. The TTIC research funds were used to support students, visiting interns, and travel for conferences.

TTIC is fortunate to be in a strong financial position with approximately $69.0 mil in unrestricted financial assets, $66.0 mil of which represents assets with liquidity available within one year and no debt.

In conclusion, I would like to thank the TTIC administrative staff for their hard work and commitment to TTIC's continued success.

Jessica Jacobson,
Chief Financial Officer
Director of Operations

Financial Reports

Statement of Financial Position

June 30, 2023 and 2024

	2024	2023
ASSETS		
Current assets:		
Cash and cash equivalents	$ 3,123,444	$ 2,890,200
Receivables:		
Miscellaneous receivable	103,160	116,035
Grants receivable	648,031	557,462
Due from TTI (Note 9)	1,130	1,255
Interest receivable	226,116	245,154
Prepaid expenses and other current assets	78,909	75,380
Total current assets	4,180,790	3,885,486
Investments	274,806,758	264,339,349
Operating lease right-of-use asset (Note 7)	9,481,178	10,176,366
Furniture and equipment, net (Note 4)	4,445,967	5,045,085
Total assets	$ 292,914,693	$ 283,446,286
LIABILITIES AND NET ASSETS		
Current liabilities:		
Accounts payable	$ 316,904	$ 357,129
Accrued expenses	825,043	743,772
Operating lease liability, current (Note 7)	928,116	909,917
Total current liabilities	2,070,063	2,010,818
Operating lease liability, non-current (Note 7)	8,895,219	9,518,693
Total non-current liabilities	8,895,219	9,518,693
Total liabilities	10,965,282	11,529,511
Net assets:		
Without donor restrictions	69,353,760	66,926,774
With donor restrictions	212,595,651	204,990,001
Total net assets	281,949,411	271,916,775
Total liabilities and net assets	$ 292,914,693	$ 283,446,286

Statement of Activities and Changes in Net Assets

June 30, 2023 and 2024

	2024			2023		
	Without Donor Restrictions	With Donor Restrictions	Total	Without Donor Restrictions	With Donor Restrictions	Total
Revenues, gains and other support						
Student tuition and fees, less Scholarships of $1,077,500 and $1,145,000, in 2024 and 2023, respectively	$ 50,116	$ -	$ 50,116	$ 37,666	$ -	$ 37,666
Federal grants and contracts	3,015,640	-	3,015,640	3,580,172	-	3,580,172
Contributions	5,000	506,564	511,564	-	-	-
Other income	515,652	-	515,652	4,260	-	4,260
Net realized and unrealized gains on investments	4,167,039	12,358,361	16,525,400	1,275,582	3,146,461	4,422,043
Investment income – net of investment fees	201,081	2,660,306	2,861,387	108,742	1,898,602	2,007,344
Net assets released from restrictions	7,919,581	(7,919,581)	-	7,097,828	(7,097,828)	-
Total revenue, gains, and other support	15,874,109	7,605,650	23,479,759	12,104,250	(2,052,765)	10,051,485
Expenses						
Education and research expenses – instruction	10,287,080	-	10,287,080	9,423,480	-	9,423,480
Management and general expenses – institutional support	3,160,043	-	3,160,043	3,010,613	-	3,010,613
Total expenses	13,447,123	-	13,447,123	12,434,093	-	12,434,093
Changes in net assets	2,426,986	7,605,650	10,032,636	(329,843)	(2,052,765)	(2,382,608)
Net assets at beginning of year	66,926,774	204,990,001	271,916,775	67,256,617	207,042,766	274,299,383
Net assets at end of year	$ 69,353,760	$ 212,595,651	$ 281,949,411	$ 66,926,774	$ 204,990,001	$ 271,916,775

Independent auditing agency:
Crowe LLP | crowe.com

Interns and Visiting Scholars

TTIC's intern and visiting scholar program fosters a diverse and inclusive research environment by welcoming 10-30 students each academic quarter from universities across the globe. With a focus on outreach, this program provides meaningful research and collaboration opportunities, prioritizing access for underrepresented groups in computer science. Participating high school, undergraduate and graduate students gain hands-on experience working alongside faculty and peers, strengthening the field by bringing together a wide range of perspectives and fostering a community committed to innovation and equity.

TTIC maintains a steady number of interns and visiting scholars who engage in study and research on the premises. Summer 2023 had 27 visiting scholars from the U.S. and abroad who came to the Institute to work on research projects in collaboration with TTIC faculty and students.

Short-term visiting scholars bring interest, energy, and enthusiasm to our academic community, and allow TTIC students access to a broad range of specialties that outside researchers bring with them, along with ideas and culture brought from the visitors' home institutions.

Visiting scholars are listed below (faculty hosts in parentheses):

Aditya Anand, University of Michigan (Yury Makarychev, Liren Shan, Santhoshini Velusamy)

Xinyuan Cao, Georgia Tech (Yury Makarychev, Liren Shan)

Xiaoyu Chen, Peking University (Zhiyuan Li)

Shester Gueuwou, Kwame Nkrumah University of Science and Technology, Graduated (Greg Shakhnarovich, Karen Livescu)

Gary Hoppenwoth, University of Michigan (Julia Chuzhoy, Ohad Trabelsi)

Tianchong Jiang, University of Chicago, Graduated (Matthew Walter)

Teppei Kawashima, University of Chicago (Siddharth Bhandari)

Yanhong Li, University of Chicago (Karen Livescu, David McAllester, Greg Shakhnarovich)

Roy Long, University of Chicago (Saeed Sharifi-Malvajerdi)

Tushant Mittal, University of Chicago (Madhur Tulsiani)

Chirag Pabbaraju, Stanford (Avrim Blum)

Bilin Sun, University of Chicago (David McAllester)

Youth interns and high school interns are listed below (faculty hosts in parentheses):

Justin Chan, Youth Internship Program (Matthew Walter)

Justin Coward, Youth Internship Program (Matthew Walter)

Nina Lewis, Youth Internship Program (Matthew Walter)

Jae'Lyn Prewitt, Youth Internship Program (Matthew Walter)


TOYOTA TECHNOLOGICAL INSTITUTE AT CHICAGO
Marlins


EXIT

Constituent & Community Outreach

Promoting Diversity, Equity, and Inclusion

The Diversity, Equity, and Inclusion (DEI) Committee at TTIC was first created in August 2020 to seek out new opportunities to educate students, faculty, and staff and make TTIC a more inclusive and welcoming place. The Committee is composed of students, faculty, and staff members, and welcomes feedback and participation from all members of the TTIC community.

The 2023-2024 DEI Committee was created through nominations from President Matthew Turk, who sent out a President's Charge to focus on key points:

- Organizing activities and events for TTIC that promote thinking and discussion about diversity, equity, and inclusion.
- Suggesting effective ways to assess our progress and status with respect to DEI at the institute.
- Evaluating our public messaging, including website, social media, and communications to potential students, faculty, employers, and colleagues, with respect to our commitment to, and aspirations for, diversity, equity, and inclusion at TTIC.
- Recommending training on DEI-related matters to the TTIC community.
- Reviewing institute policies that address or overlap with matters relating to DEI.

The DEI Committee welcomes suggestions from other members of the TTIC community for opportunities to improve awareness of DEI-related issues, such as cultural events. The committee has a budget to support and organize such events. The Committee also encourages and welcomes all feedback and participation, including at future DEI Committee meetings, from all TTIC community members.

Committee Members for 2023-2024:

- Matthew Walter, Associate Professor (co-chair)
- Deree Kobets, Controller (co-chair)
- Han Shao, Student
- Marcelo Sandoval-Castañeda, Student
- Sam Buchanan, Research Assistant Professor
- Celeste Ki, Communications Coordinator

Engaging with Youth In Partnerships

TTIC has worked with various Chicago Public Schools (CPS) including Kenwood Academy, Carnegie Elementary, Morgan Park High School, and Hyde Park Academy and is continuing in its role as Community Partner through after-school programs, youth internship programs, and hosting lab visits and demonstrations to the youth groups such as at the Jackson Park Campers and the Griffin Museum of Science and Industry.

Girls Who Code

Girls Who Code is an after-school coding program for elementary school girls. TTIC has worked with various area CPS schools and is continuing in its role as Community Partner, initiated by Rose Bradford (TTIC Manager of Research Administration). Volunteer facilitators commit 1-2 hours per week to help teach sessions for a ten-week quarter.

Bessie Coleman Library Partnership

TTIC has partnered with the Bessie Coleman Library to teach curriculum for elementary students in computer science and Girls Who Code programs.

Summer Youth Internship Program

Beginning in June 2024, TTIC launched a robotics internship program for high school students, led by faculty member Matthew Walter, Rose Bradford (Manager of Research Administration), and Randy Landsberg (Director of Outreach), in collaboration with the University of Chicago's Youth Internship Program. The six-week summer program included curriculum for Python programming and robotics, and finished with a showcase at Argonne South Side STEM Showcase at the Pullman National Historic Park on August 2, 2024.

Leadership Alliance

Leadership Alliance is a national summer research internship placement program for underrepresented undergraduates in STEM fields. TTIC is currently a member institution and is accepting applications through the program.

Broadening Participation in Computing Plan

TTIC has developed a plan for the Institute's effort towards making TTIC an ever more inclusive, diverse and equitable environment, and towards expanding participation in education, research, and practice of computing at large by groups currently under-represented in the field.

Griffin Museum of Science and Industry

TTIC's Robot Intelligence through Perception Lab (RIPL) group, led by Professor Matthew Walter, attends the Griffin Museum of Science and Industry Robot Block Party each year as part of National Robotics Week. This year's Robot Block Party took place on April 12-13, 2024, and the RIPL group presented their robot demonstrations to museum visitors. Their robot, "Baxter," was featured on WGN News on April 12, 2024.


WESTON GAME LAB

Governance

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Advisor, Toyota Central R&D Labs, Inc. and Toyota Motor
Chairman of Toyota Central R&D Labs, Inc., 2014-2017
Member of Representatives, Society of Automotive Engineers of Japan, Inc., 2009-2011
Member of Councils, Toyota School Foundation, 2011- current
Member of Japan Techno-Economics Society Board of Trustees, 2017- current
Recipient of Society of Automotive Engineers (SAE) Fuel and Lubricant Paper Award (1997) and JSAE Technological Contribution Award (2017)
Trustee since October 2017

Ka Yee C. Lee
Interim Dean of the Physical Sciences Division and David Lee Shillinglaw Distinguished Service Professor of Chemistry, University of Chicago
Trustee since July 2024

Angela Olinto
Albert A. Michelson Distinguished Service Professor and Dean of the Physical Sciences Division, University of Chicago
Principal Investigator of the POEMMA (Probe of Extreme Multi-Messenger Astrophysics) space mission
Member of the Pierre Auger Observatory
Fellow, American Physical Society and the American Association for the Advancement of Science
Trustee since October 2018 - April 2024

Nuria Oliver
Director of Research in Data Science, Vodafone
Chief Data Scientist, Data-Pop Alliance
Commissioner for AI and COVID-19, Presidency of Valencia
Founder, ELLIS Alicante Foundation
Trustee since November 2020

Mari Ostendorf
Endowed Professor of System Design Methodologies and Associate Vice Provost for Research, University of Washington
Australia Fulbright Scholar at Macquarie University
2010 IEEE HP Harriett B. Rigas Award, and the 2018 IEEE James L. Flanagan Speech and Audio Processing Award
Fellow of IEEE and ISCA and a 2013-2014 IEEE Signal Processing Society Distinguished Lecturer
Trustee since October 2017

Hiroyuki Sakaki
Former President, Toyota Technological Institute
Fellow, Toyota School Foundation
Chairman, Nara National Institute of Higher Education and Research
Professor Emeritus, University of Tokyo
Appointed as Vice President of Toyota Technological Institute (Nagoya, Japan) in 2007 and promoted to President in 2010
Awarded the National Recognition as a Person of Cultural Merit, Japan Academy Award, Leo Esaki Award, Heinrich Welker Award, Medal of Purple Ribbon from the Emperor of Japan, IEEE David Sarnoff Award, Fujiwara Prize, Japan IBM Science Award, and the Hattori-Hoko Award
Trustee since October 2010

Ivan Samstein
Executive Vice President and Chief Financial Officer, University of Chicago Medical Center
Former Director of public finance department, Bank of America Merrill Lynch, 2004-2011;
Assistant Vice President of public finance, Moody's Investors Service, 1999-2004
Former Chief Financial Officer for Cook County, 2012-2016
Trustee since April 2018

Matthew Turk
President, Toyota Technological Institute at Chicago
Professor Emeritus, University of California, Santa Barbara
Former professor and dept. Chair, Department of Computer Science and Media Arts and Technology, UC Santa Barbara
Fellow of the ACM, the IEEE, the IAPR, and the AAIA
Former Fulbright-Nokia Distinguished Chair in Information and Communications Technologies
Trustee since July 2019

Trustee Departures:
Angelina Olinto (October 2018 - April 2024)

Trustee Appointments:
Dr. Ka Yee Lee (Appointed May 1, 2024)

Leadership

Matthew Turk, President
Avrim Blum, Chief Academic Officer
Chrissy Coleman, Secretary of the Institute
Jessica Jacobson, Chief Financial Officer

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Rose Bradford, Manager of Research Administration
Erica Cocom, Student Services and Admissions Administrator
Chrissy Coleman, Administrative Director of Graduate Studies, Accreditation Liaison Officer, Deputy Title IX Coordinator
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Amy Minick, Director of Human Resources and International Affairs, Title IX Coordinator
Mick Washington, Operations Coordinator

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In keeping with its long-standing traditions and policies, Toyota Technological Institute at Chicago (TTIC) considers students, employees, applicants for admission or employment, and those seeking access to TTIC programs on the basis of individual merit.

In accordance with federal, state, and local law, TTIC does not discriminate on the basis of sex, race, color, religion, national origin, citizenship, ancestry, age, marital status, physical or mental disability, medical condition, genetic information, pregnancy or perceived pregnancy, gender, gender identity, gender expression, sexual orientation, protected military or veteran status, or any other protected status under the law, including Title IX of the Education Amendments of 1972. TTIC prohibits discrimination based on legally protected status with respect to all employment-related decisions, educational and admissions policies, personnel actions, and academic actions.

If you have questions about this Notice of Non-Discrimination, Title IX, Title VI of the Civil Rights Act of 1964 (“Title VI”), Title VII of the Civil Rights Act of 1964 (“Title VII”), the Americans with Disabilities Act of 1990 (“ADA”), or Section 504 of the Rehabilitation Act of 1973 (“Section 504”), or if you believe you have been discriminated against based on your membership in a protected class, please contact Amy Minick, TTIC’s Title IX Coordinator and Section 504/ADA Coordinator. You may contact Ms. Minick by emailing aminick@ttic.edu, by calling 773.702.5033, or by writing to Amy Minick,Toyota Technological Institute at Chicago, 6045 S. Kenwood Ave. Chicago, IL 60637. Online submissions, with anonymous reporting options, are also available.

For more information and to view policies, please visit **www.ttic.edu/notice-of-non-discrimination.**

Special Thanks

External Advisory Committee
William T. Freeman, Thomas and Gerd Perkins Professor of Electrical Engineering and Computer Science, Massachusetts Institute of Technology
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Takeo Kanade, UA and Helen Whitaker University Professor, Robotics Institute, Carnegie Mellon University
Éva Tardos, Jacob Gould Schurman Professor of Computer Science, Cornell University

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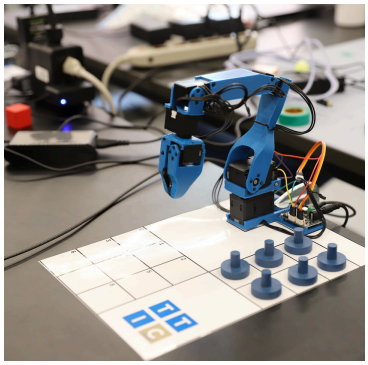

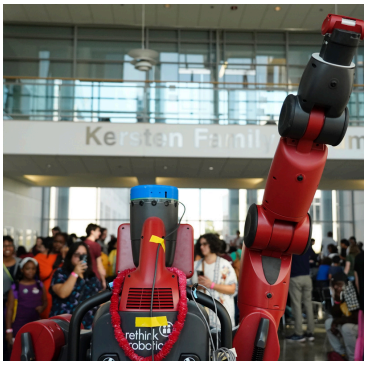

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