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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.
Overall, we continued to provide a stellar environment for our students and faculty to excel in their work, pushing forward the boundaries of knowledge in multiple areas of computing and information technology, and our reputation continues to grow due to the accomplishments of our faculty, students, and alumni.

We had a new group of exceptional Ph.D. students who started at TTIC in Autumn 2022, and they have integrated well into our academic community in their first year, making progress in their coursework and research. Our new Research Assistant Professors (RAPs) have also added greatly to the intellectual atmosphere at TTIC, pushing their research agendas and working with TTIC students and faculty as well as other collaborators.

We were saddened by the passing of former TTIC Trustee and advisor Mark Hogan in April. Mark brought an abundance of experience in the automotive industry, including with General Motors, Magna International, and Toyota, to the TTIC Board of Trustees, and we greatly appreciated his insight and contributions.

TTIC’s partnership with TTI in Nagoya, Japan remains strong. In 2022-2023, we had TTI students with us in Chicago, Prof. David McAllester taught a remote machine learning course for TTI students in the spring, and a group of TTIC faculty and students visited TTI in Nagoya to teach a course. Our interactions with the University of Chicago continued to be important this academic year, including cross course registration, cross advising, and a joint research funding initiative.

Congratulations are in order to Prof. Madhur Tulsiani, who received a promotion to Full Professor this year. Madhur, who received his Ph.D. from UC Berkeley in 2009 and was a postdoctoral researcher at Princeton University and the Institute for Advanced Study before joining TTIC, is one of the top researchers in the world in complexity theory and information and coding theory. In addition to his excellent research and mentoring, Madhur contributes greatly to TTIC as the Director of Graduate Studies.

TTIC continues to be a special place for students, faculty, and staff to learn, collaborate, discover, and work. Our reputation and positive impact on our fields continue to grow. I enjoy learning about the cutting edge in our fields of computing from highly accomplished faculty and students on a daily basis.

As TTIC heads to its 20th anniversary, we can be proud of what we have accomplished and excited about what is to come.

Matthew Turk
President
Message from the Chief Academic Officer

It’s been an exciting year at TTIC. To start with some bragging, Jinbo Xu was named Fellow of the International Society for Computational Biology, Siddharth Bhandari was awarded the ACM India 2022 Doctoral Dissertation Award, Karen Livescu’s paper “Deep Canonical Correlation Analysis” was Runner Up for the ICML 2023 Test-of-Time Award, and student Chung-Ming Chien was awarded a Taiwan Ministry of Education GSSA Award. Congratulations to all! Also, special congratulations to Madhur Tulsiani for his promotion to Full Professor. 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 AAAI, ACL, AISTATS, COLT, CVPR, ECCV, EMNLP, FOCS, FORC, ICASSP, ICLR, ICML, ITCS, NAACL, NeurIPS, RSS, SODA, STOC, and UAI.

TTIC is also proud to be a member of the new IDEAL NSF TRIPODS Phase II institute, bringing together researchers from TTIC, Northwestern, UIC, UChicago, and Illinois Tech, from disciplines including CS, Math, EE, Statistics, Law, and Economics. This is one of only four NSF TRIPODS Phase II institutes nationwide.

TTIC hosted a range of activities and workshops over the course of the past academic year. These include summer workshops on online decision making and representation learning in July and August, the Annual Student Workshop in November, an Industry Open House also in November, the Junior Theorists Workshop in December, and the New Horizons in TCS Summer School in June. Congratulations to Kshitij Patel and Freda Shi for receiving the Best Talk Award and Anmol Kabra for Best Poster Award at the Student Workshop.

We had an especially successful hiring season, hiring one new Assistant Professor, Shiry Ginosar from UC Berkeley, and seven new Research Assistant Professors: Anand Bhattad (Ph.D. University of Illinois), Emily Diana (Ph.D. University of Pennsylvania), Juno Kasai (Ph.D. University of Washington), Theodor Misiakiewicz (Ph.D. Stanford), Liren Shan (Ph.D. Northwestern), Santhoshini Velusamy (Ph.D. Harvard), and Jiwei (Joe) Zhou (Ph.D. Harvard). Their research areas include Computer Vision, NLP, Machine Learning, Theoretical Computer Science, and social issues in computing. Shiry will join us in Fall 2024. We are also very pleased to welcome new Assistant Professor Zhiyuan Li, hired last year, who will join us this Fall 2023.

Congratulations to TTIC’s 2023 Ph.D. graduates Falcon Dai (advised by Matt Walter), Andrea Daniele (advised by Matt Walter), Omar Montasser (advised by Nathan Srebro), Rachit Nimavat (advised by Julia Chuzhoy), Shane Settle (advised by Karen Livescu), Bowen Shi (advised by Karen Livescu), and Qingming Tang (advised by Karen Livescu). This will be TTIC’s largest graduating class to date. Congratulations also to Omar and Bowen for having their theses named as Theses of Distinction.

Next year will be TTIC’s 20th anniversary, and we look forward to an exciting series of academic and social events in celebration. Please join us!

Avrim Blum
Chief Academic Officer
## Institute Overview

### Faculty and Staff

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<th>Position</th>
<th>Count</th>
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<td>Professors</td>
<td>9</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>2</td>
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<tr>
<td>Assistant Professors</td>
<td>1</td>
</tr>
<tr>
<td>Research Assistant Professors</td>
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<tr>
<td>Adjoint Faculty</td>
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<td>Administrative Staff</td>
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<td>Postdocs</td>
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### Ph.D. Program

<table>
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<tr>
<th>Category</th>
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<td>Students enrolled 2022-23</td>
<td>41</td>
</tr>
<tr>
<td>New matriculants for 22-23</td>
<td>6</td>
</tr>
<tr>
<td>Master’s degrees awarded</td>
<td>4</td>
</tr>
<tr>
<td>(in September 2022)</td>
<td></td>
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<tr>
<td>Ph.D. degrees awarded</td>
<td>4</td>
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<tr>
<td>(in September 2022)</td>
<td></td>
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<td>Applicants for 2021-22 Academic Year</td>
<td>205</td>
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<td>Anticipated Enrolling 2023-24</td>
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Awards and Honors

April 2023 - Chung-Ming Chien
Chung-Ming Chien, a Ph.D. student at TTIC, was awarded as a recipient of the 2023 Government Scholarship to Study Abroad (GSSA) from the Taiwan Ministry of Education. According to the Ministry of Education in Taiwan, the GSSA was created “in order to strengthen the strength of the country, strengthen the international experience of outstanding young people in [Taiwan], reward students from disadvantaged groups, and encourage outstanding young people in Taiwan to study for postgraduate degrees in well-known foreign universities.”

January 2023 - Jinbo Xu
Professor Jinbo Xu was selected as an ISCB (International Society for Computational Biology) Fellow in the Class of 2023 for the discovery of computational methods and development of software programs that have revolutionized protein structure prediction.

January 2023 - Siddharth Bhandari
Professor Siddharth Bhandari, TTIC Research Assistant Professor, was announced the recipient of the ACM India 2022 Doctoral Dissertation Award for his dissertation, titled “Exact Sampling and List Decoding.” His dissertation developed new techniques, analyses and tools in two areas of theoretical computer science, including sampling colorings of graphs and list-decoding error-correcting codes. Professor Bhandari’s doctoral dissertation work was done at Tata Institute of Fundamental Research in Mumbai, India.

December 2022 - Jinbo Xu
Professor Jinbo Xu was announced a recipient of a Marshall and Arlene Bennett Family Research Program funding award in partnership with the University of Chicago and the Weizmann Institute of Science (WIS) in Israel to support collaborative research in artificial intelligence.

November 2022 - Freda Shi, Kshitij Patel, and Anmol Kabra
At the sixth Annual Student Workshop at TTIC, the Best Talk Award was awarded to Kshitij Patel for his talk, “Distributed Online and Bandit Convex Optimization,” and to Freda Shi for her talk, “Language Models are Multilingual Chain-of-Thought Reasoners.” The award for Best Poster was given to Anmol Kabra and his poster, “Exponential Family Model-Based Reinforcement Learning via Score Matching.”

September 2022 - Mary Marre
Mary Marre, Administrative Assistant to Faculty, was the recipient of the 2022 Latrice Richards Outstanding Administrative Award, which was announced at TTIC’s 2022 Diploma and Awards Ceremony on Sept. 20, 2022. This award is given each year to recognize an administrative staff member’s hard work and dedication, and the recipient is chosen based on nominations from the TTIC community.

September 2022 - Haochen Wang and Max Ovsiankin
TTIC’s 2022 Outstanding TA Award, which recognizes a student’s dedication and effort as a teaching assistant, was awarded to Max Ovsiankin and Haochen Wang at TTIC’s 2022 Diploma and Awards Ceremony.
August 2022 - Melissa Dutz
Incoming Ph.D. student Melissa Dutz was awarded a National Science Foundation CSGrad4US Ph.D. Fellowship. The CSGrad4US program aims to increase the number of diverse, domestic graduate students pursuing research and innovation careers in the Computer and Information Science and Engineering (CISE) fields.

July 2022 - David McAllester
Open Philanthropy has awarded TTIC’s Prof. David McAllester $700k for two years to research in the area of AI safety. Open Philanthropy identifies outstanding giving opportunities, makes grants, follows the results, and publishes its findings. Its mission is to give as effectively as it can.

July 2022 - Avrim Blum, Julia Chuzhoy, Yury Makarychev, Nathan Srebro
The National Science Foundation (NSF) has awarded a TRIPODS Phase II award to TTIC faculty Avrim Blum, Julia Chuzhoy, Yury Makarychev, and Nathan Srebro, along with researchers from UIC, Northwestern, the University of Chicago, and the Illinois Institute of Technology, and in partnership with researchers at Google NYC, together forming the Institute for Data, Econometrics, Algorithms, and Learning (IDEAL).
New Faculty

Siddharth Bhandari | Ph.D., Tata Institute of Fundamental Research
Sam Buchanan | Ph.D., Columbia University
Lee Cohen | Ph.D., Tel Aviv University
Ohad Trabelsi | Ph.D., Weizmann Institute of Science
Saeed Sharifi-Malvajerdi | Ph.D., University of Pennsylvania
Ali Vakilian | Ph.D., Massachusetts Institute of Technology

Faculty Promotion

At the May 2023 meeting of the Board of Trustees, Madhur Tulsiani's promotion to Full Professor was approved.

Professor Tulsiani received a B. Tech. in Computer Science and Engineering from IIT Kanpur in 2005 and a Ph.D. in Computer Science from UC Berkeley in 2009. He spent two years as a postdoc at the Institute for Advanced Study and Princeton University, before joining TTIC in 2011.

Tulsiani's research interests include complexity theory, approximation algorithms, hardness of approximation and pseudorandomness. His dissertation focussed on studying the effectiveness and limitations of various convex relaxations in approximating combinatorial optimization problems.

His work focussed on studying various hierarchies of linear and semidefinite programs, and understanding their usefulness for designing approximation algorithms. He has also worked on understanding the notions of pseudorandomness in computer science and arithmetic combinatorics. He explored connections between different proof techniques used in the two areas.
Faculty by Area

Algorithms and Complexity
Siddharth Bhandari
Avrim Blum
Julia Chuzhoy
Yury Makarychev
Saeed Sharifi-Malvajerdi
Ohad Trabelsi
Madhur Tulsiani
Ali Vakilian

Machine Learning
Sam Buchanan
Lee Cohen
David McAllester
Hongyuan Mei
Nathan Srebro
Lingxiao Wang

Computational Biology
Derek Reiman
Jinbo Xu

Robotics
Matthew Walter

Computer Vision and Computational Photography
Greg Shakhnarovich
Matthew Turk

Speech and Language Technologies
Kevin Gimpel (on leave)
Kartik Goyal
Karen Livescu

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
Marks of Progress

Sponsored Research
In FY 22-23, TTIC faculty were awarded two grants totaling $339,707, and federal grant expenditures were $2.1M. Additionally, one student received a National Science Foundation CSGrad4US Fellowship. The current grants portfolio includes:

- 8 National Science Foundation basic and collaborative research awards
- 3 National Institutes of Health awards
- 2 Department of Defense awards
- 2 Simons Foundation awards
- 2 National Science Foundation Graduate Research Fellowship awards
- 1 National Science Foundation CSGrad4US Fellowship award
- 1 Google Ph.D. Fellowship
- Recent awards from Adobe and AI+Science Collaborative Research Program

A New Strategic Plan
As its 20th anniversary approached, the institute undertook a comprehensive strategic planning process that involved the whole TTIC community, including discussions with faculty, administrative staff, students, and the Board of Trustees, guided and informed by the institute’s academic mission and understanding of its resources, partnerships, and fiducial responsibilities. This process provided an opportunity for TTIC to reflect on its past, consider its present status, and think strategically about priorities for the coming years. Discussions focused on the institute’s core mission, vision, and values, key opportunities and challenges, and strategic priorities and initiatives to help guide and propel the institute forward in the near future.

The resulting Strategic Plan 2022-2027 identified ten areas that represent strategic priorities, grouped into two categories: (1) Priority Aspirations – guiding principles to help guide decisions and direction, and (2) Priority Actions – actions to focus on. These were intended to highlight key motivations and desired outcomes that should inform decisions in the coming years. The plan also identified six strategic initiatives as special projects or areas to focus on in the coming years: (1) Increase Awareness of TTIC, (2) Special Research-Themed Programs of Activity, (3) Develop Strategic Partnerships with Industry and Academia, (4) Strengthen Outreach Activities and Opportunities, (5) Increase the Diversity of Our Academic Staff and Students, and (6) Improve Internal Communication and Processes to Enhance Our Environment and Organizational Effectiveness.

The Board of Trustees approved the strategic plan soon after the May 2023 Board meeting, and planning and actions for the initiatives are underway.
Recognizing Service Milestones

A new recognition was offered at the September 2022 Diploma and Awards Ceremony: service milestones. President Turk recognized the years of service that faculty and administrative staff members have given to TTIC (in 5-year measurements) and the institute’s mission.

5 Years
Avrim Blum
Kevin Gimpel
Matt Walter
Rose Bradford
Erica Cocom
Jessica Jacobson
Mary Marre
Amy Minick

15 Years
Adam Bohlander
Chrissy Coleman

10 Years
Karen Livescu
Yury Makarychev
Greg Shakhnarovich
Madhur Tulsiani

20 Years
David McAllester

20 Years
Julia Chuzhoy
Nathan Srebro
Jinbo Xu
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 and computational photography, speech and language technologies, 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

One of the central tasks in all areas of computer science is the writing of efficient software to perform required computation. In order to write such software, one must first design an efficient algorithm for the computational task at hand. 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 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 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**


**TALKS**
“Recent advances in trifference codes.” IIT Gandhinagar, March 2023.

**HONORS/AWARDS**
ACM India 2022 Doctoral Dissertation Award

**MISCELLANEOUS**
Hosted intern: Peter Manohar (Carnegie Mellon University)

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

**PUBLISHED/SUBMITTED PAPERS**


**TALKS**


“On learning in the presence of biased data and strategic behavior.” Second Smart Information Technology Symposium, Toyota Technological Institute, Nagoya, Japan. December 2022.

“Robustly-reliable learners for unreliable data.” Retirement celebration for Ronald Rivest, MIT. October 2022.

INVOLVEMENT
Editorial board: Journal of the ACM.
Advisory Board: TheoretiCS Journal.
Scientific and Academic Advisory Committee: Subcommittee for Computer Science and Applied Mathematics, Weizmann Institute of Science.
External Advisory Board, TILOS (The Institute for Learning-enabled Optimization at Scale).

RESEARCH FUNDING AWARDS
NSF: Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), $1,664,441, 9/1/2022-8/31/2027.

OUTREACH/DIVERSITY
"Markov Chains: (some of the) math behind Google and ChatGPT." Presentation at the May 2023 IDEAL/Math Circles of Chicago High School Teacher Workshop.

CLASSES/SEMINARS
TTIC 31150/CMSC 31150 - Mathematical Toolkit (Spring 2023).

MISCELLANEOUS
Ph.D. Advisor for: Melissa Dutz, Naren Manoj (co-advised with Yury Makarychev), Keziah Naggita (co-advised with Matt Walter), Kavya Ravichandran, Han Shao, Kevin Stangl.
Ph.D. Thesis Committee: Falcon Dai (TTIC), Gabriele Farina (CMU), Ben Lai (TTIC), Gene Li (TTIC), Omar Montasser (TTIC), Kumar Kshitij Patel (TTIC), Dravyansh Sharma (CMU), Tom Yan (CMU).
Internal service: Chief Academic Officer.
Julia Chuzhoy
Professor
ttic.edu/chuzhoy

PUBLISHED/SUBMITTED PAPERS

TALKS

RESEARCH FUNDING AWARDS
NSF HDR TRIPODS award 2216899 "Institute for Data, Econometrics, Algorithms and Learning (IDEAL)," $1,967,500, September 1, 2022 to August 31, 2027 (split among a number of institutions and PI's).

CLASSES/SEMINARS
TTIC 31010/CMSC 37000: Algorithms.

INvolvement
Steering committee member: SODA, ITCS.

MISCELLANEOUS
Ph.D. advisor: Ron Monzenzon (TTIC), Rachit Nimavat (TTIC).
Hosted summer intern: Rhea Jain (University of Illinois Urbana-Champaign, co-hosted with Ohad Trabelsi).
Internal service: faculty representative at management meetings, member of Outstanding TA Award committee, faculty liaison for curriculum.

Yury Makarychev
Professor
ttic.edu/makarychev

PUBLISHED/SUBMITTED PAPERS
TALKS
“Approximation algorithms for the socially fair clustering problem.” Virtual Theory Seminar, the Max Planck Institute for Informatics, Saarbrucken, Germany, December 2022.

INVOLVEMENT
Executive committee: IDEAL.
Director of the Postdoctoral Program at IDEAL.
Reviewer: STOC, FOCS, SODA, SICOMP, Theoretical Computer Science, and other top-tier journals.

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 31100/CMSC 39010-1: Computational and Metric Geometry.

MISCELLANEOUS
Advisor/co-advisor: Naren Manoj (TTIC, jointly with Avrim Blum), Max Ovsiankin (TTIC).
Mentored postdocs: Suprovat Ghoshal (jointly with K. Makarychev), Jafar Jafarov (University of Chicago).
Co-hosted summer interns: Peter Manohar (Carnegie Mellon University), Madhusudhan Pittu (Carnegie Mellon University).
Internal service: served on faculty hiring committee, in charge of programming requirement.

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

PUBLISHED/SUBMITTED PAPERS

INVOLVEMENT
Organizer: TOC4Fairness Virtual Seminar Series.

MISCELLANEOUS
Mentor: Roy Long (University of Chicago, intern), Kevin Strangl (TTIC).
Madhur Tulsiani
Professor and Director of Graduate Studies
ttic.edu/tulsiani

PUBLISHED/SUBMITTED PAPERS

TALKS
"Hypergraph Expansion, CSPs, and Codes.” IIT Bombay theory seminar, January 2023.

INVolVEMENT
Managing Editor: Theory of Computing journal.
Program committee member: STOC 2023, RANDOM 2023.
Reviewer: FOCS, ICALP, CCC, APPROX, RANDOM, JACM.

Research Funding Awards

Classes/Seminars
TTIC 31200/CMSC 37220, Information and Coding Theory, Autumn 2022.

Outreach/Diversity
Co-organizer of “New Horizons in Theoretical Computer Science” summer school aimed at increasing participation from under-represented groups.

Miscellaneous
Advisor: Shashank Srivastava (TTIC), Tushant Mittal (University of Chicago), June Wu (University of Chicago).
Internal service: Director of Graduate Studies.
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**

**TALKS**


**CLASSES/SEMINARS**
Co-instructor for MSPH 44000: Computational Systems Biology, Spring 2023.

**MISCELLANEOUS**
Hosted intern: Tina Khajeh (Summer 2023 Intern).
Jinbo Xu
Professor (on sabbatical)
ttic.edu/xu

PUBLISHED/SUBMITTED PAPERS

IN VolvEMENT
Associate editor: Journal of Bioinformatics.

MISCELLANEOUS
Ph.D. advisor: Ben Lai (TTIC), Xiao Luo (TTIC), Ziwei Xie (TTIC), Matthew McPartlon (UChicago)
Computer Vision involves getting computers to extract useful information from pictures and videos. It has applications in robotics, surveillance, autonomous vehicles, and automobile collision avoidance.

Historically, this is a central research area of computer science. Below is a list of the work done at TTIC this year in the area of Computer Vision and Computational Photography.

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

PUBLISHED/SUBMITTED PAPERS
Vitor Guizilini, Igor Vasiljevic, Jiading Fang, Rare Ambru, Greg Shakharovich, Matthew R. Walter, and Adrien Gaidon. "Depth Field Networks For Generalizable Multi-view Scene Representation." ECCV, 2022 (poster).

INVOLVEMENT
Associate Editor: IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE TPAMI).

RESEARCH FUNDING AWARDS
IC Postdoctoral Research Fellowship (to Jim Franke), Advisor component $17,000 x 2 years.
OUTREACH/DIVERSITY
Co-chair: Diversity, Equity, and Inclusion (DEI) committee, TTIC.
Coordinator of TTIC involvement in the Leadership Alliance Program.
Involved in coordinating TTIC’s collaboration with Chicago Public Schools (CPS).

CLASSES/SEMINARS
TTIC 31020, Introduction to Machine Learning, Autumn 2022.
TTIC 55000, Independent Research.
Faculty mentor for student-organized Computer Vision reading group at TTIC and the University of Chicago.

MISCELLANEOUS
Ph.D. advisor: Marcelo Sandoval-Castañeda (TTIC), Haochen Wang (TTIC), Xiaodan Du (TTIC), Jiahao Li (TTIC).
Undergraduate advisees: Josh Ahn (University of Chicago), Kevin Suk (University of Chicago), Nam Anh Dinh (University of Chicago).
Internal service: Director of Admissions; Faculty Liaison to Director of IT, co-chair of Diversity, Equity, and Inclusion (DEI) committee.
Mentored: Sudarshan Babu (TTIC).

Matthew Turk
President
ttic.edu/turk

PUBLISHED/SUBMITTED PAPERS

TALKS

IN VolvEMENT
CRA Computing Community Consortium Council (CCC) member.
FG 2023 Panel, Privacy and Ethics of FG Research.
FG 2023 Best Paper Selection Committee.
International Advisory Board member for IDIAP (Switzerland), 2021-2025.

MISCELLANEOUS
Ph.D. advisor for: Pushkar Shukla (TTIC).
Committee member: Brandon Huynh (University of California, Santa Barbara), Yi Ding (University of California, Santa Barbara).
TTIJ Board of Councilors member.
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. Especially in recent years, as training data is becoming plentiful, and massive computational and storage resources needed for handling the data are also becoming available, Machine Learning is playing a key role in many application areas. This includes classic artificial intelligence problems, such as computer vision, robotics, machine translation, question answering and dialogue systems. There are also a variety of “non-human” problems such as information retrieval, search, bioinformatics, and stock market prediction to be considered. 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
Sam Buchanan, Jingkai Yan, Ellie Haber, John Wright. Resource-Efficient Invariant Networks: Exponential Gains by Unrolled Optimization. SLowDNN 2023 workshop.

TALKS
“Deep Networks and the Multiple Manifold Problem.” Dec. 8, 2022, University of Michigan CSP Seminar.

INvolvement
Journal reviewer: TPAMI
Workshop organizing: MoDL meeting 2023 at TTIC.

CLASSES/SEMINARS
“Learning Nonlinear and Deep Low-Dimensional Representations from High-Dimensional Data: From Theory to Practice.” ICASSP 2023 short course.
“Deep Representation Learning from the Ground Up.” (Tutorial).

MISCELLANEOUS
Mentor: Brent Yi (University of California Berkeley), Druv Pai (University of California Berkeley).
Lee Cohen
Research Assistant Professor
ttic.edu/cohen

PUBLISHED/SUBMITTED PAPERS

TALKS

INVolVEMENT
Program Committee member: ALT 2023.

MISCELLANEOUS
Internal service: Award Committee member for 2023 TTIC Student Workshop.

David McAllester
Professor
ttic.edu/mcallester

TALKS
“Interpretability, Control and Retrieval Models.” Human Level AI workshop, Boston Ma., June 20-22.

CLASSES/SEMINARS

MISCELLANEOUS
Advisor: Pedro Savarese (TTIC).
Supervisor: David Yunis (TTIC) on retrieval models.
Internal service: Website Committee member.

Nathan Srebro
Professor
ttic.edu/srebro

PUBLISHED/SUBMITTED PAPERS


TALKS

“Interpolation Learning with Linear Predictors and Short Programs.” Yale University Statistics and Data Science Colloquium, March 2023.
“Interpolation Learning with Minimum Description Length.” Tel Aviv University, March 2023.

“Interpolation Learning with Linear Models, Kernels, Neural Nets and Short Programs.” RIKEN AI, Tokyo, August 2023.

ININVOLVEMENT
Steering committee: FAacT, Midwest Machine Learning Symposium.
Senior area chair: NeurIPS 2022, ICL 2023.
Co-organizer: Simons Workshop on Federated Learning.

CLASSES/SEMINARS
Machine Learning and Optimization Reading Group.

OUTREACH/DIVERSITY
Bessie Coleman Library Computer Science Club mentor.

MISCELLANEOUS
Advisor: Omar Montasser (TTIC), Anmol Kabra (TTIC), Kavya Ravichandran (TTIC), Donya Saless (TTIC), Marko Medvedev (University of Chicago), Xiaohan Zhu (University of Chicago), Lijia Zhou (University of Chicago).
Mentored RAPs: Lingxiao Wang, Saeed Sharifi-Malvajerdi, Sam Buchanan, Theo Misiakiewicz.
Hosted postdoc: Gal Vardi.
Lingxiao Wang
Research Assistant Professor
ttic.edu/wang

PUBLISHED/SUBMITTED PAPERS
Lingxiao Wang, Boxin Zhao, Mladen Kolar, "Differentially Private Matrix Completion through Low-rank Matrix Factorization", in Proc. of the 25th International Conference on Artificial Intelligence and Statistics (AISTATS), 2023.
Lingxiao Wang, Bargav Jayaraman, David Evans, Quanquan Gu, "Efficient Privacy-Preserving Stochastic Nonconvex Optimization". in Proc. of the 39th International Conference on Uncertainty in Artificial Intelligence (UAI), 2023.

TALKS

INVOLVEMENT
Area Chair: NeurIPS 2023.

MISCELLANEOUS
Mentor: 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

TALKS
“Recent Robotics Research at TTI-Chicago,” Toyota Technological Institute at Japan, November 2022.

INVolvEMENt
Board member: Duckietown Foundation.
Senior member: IEEE.
Steering committee: Northeast Robotics Colloquium.
Program committee: Artificial Intelligence and Statistics (AISTATS).

CLASSES/SEminARS
TTIC 31170: Robot Learning and Estimation, TTIC/University of Chicago.
“Self-Driving Cars with Duckietown,” edX MOOC (with Andrea Censi, Liam Paull, and Jacopo Tani) involving approximately 7000 students from across the world.
Robotics reading group.

OUTreach/DIVERSITY
Diversity, Equity, and Inclusion (DEI) Committee member.
IDEAL High School Teacher Workshop speaker, May 2023.
University of Chicago Collegiate Scholars Program speaker and host, July 2023.
TTIC + ChiS&E Robotics and Autonomy Course organizer for high-school students from underrepresented groups.
Co-organizer, Robot Summer Camp, Chicago Park District.

MiSCELLANEous
Internal service: TTIC Diversity, Equity and Inclusion (DEI) committee member, TTIC Hiring Committee member, TTIC Industrial Affiliates Program czar.
Qualifying exam committee member: Ju-Chieh Chou (TTIC).
Speech and Language Technologies

This area is concerned with getting computers to analyze and extract information from spoken language, as well as to generate spoken audio. At TTIC, current speech research focuses mainly on the analysis side. For example, speech recognition is the problem of transcribing the words being spoken in an audio signal, such as that recorded from a microphone. Speech 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 computational biology. This area has applications such as automated telephone information centers, dictation systems, machine translation, archiving and search of spoken documents, assistance for the visually or hearing-impaired, and other human-computer interface systems. Below is a list of the work done at TTIC this year in the area of Speech and Language Technologies.

Kartik Goyal
Assistant Professor
ttic.edu/goyal

PUBLISHED/SUBMITTED PAPERS


TALKS
“Controllable generative models for natural language and related phenomena.” Faculty job talk, Georgia Institute of Technology, March 2023.
"Beyond the autoregressive paradigm for probabilistic text generation." Research at TTIC, January 2023.
"Natural language processing and controllability.” TTIC Industry Open House, December 2022.

INVOLEMENT

CLASSES/SEMINARS
Co-organizer: Weekly reading group on Speech and Natural Language processing with participants from TTIC and the University of Chicago.

MISCELLANEOUS
Mentor: Joe Chaplowski (University of Chicago), Henry Herzog (University of Chicago), Marziyeh Mohavedi (University of Chicago), Nolan Pozzobon (University of Chicago), Gerald White (University of Chicago), Jiamin Yang (University of Chicago), Davis Yoshida (TTIC), David Yunis (TTIC).

Karen Livescu
Professor
ttic.edu/livescu

PUBLISHED/SUBMITTED PAPERS

TALKS
"Spoken language understanding, with and without pre-training." FAIR seminar, Meta, July 2022.

ININVOLVEMENT
Associate Editor: TPAMI.
Action Editor: TACL.
Technical Program Co-Chair: Interspeech 2022.

CLASSES/SEMINARS
TTIC 31220: Unsupervised Learning and Data Analysis.

MISCELLANEOUS
Thesis committee member: Robin Algayres (École Normale Supérieure/INRIA), Lingyu Gao (TTIC), Davis Yoshida (TTIC).
Ph.D. advisor: Qingming Tang (TTIC), Bowen Shi (TTIC), Shane Settle (TTIC), Freda Shi (TTIC), Ankita Pasad (TTIC), Ju-Chieh Chou (TTIC), Chung-Ming Chien (TTIC).
Internal service: Colloquium Coordinator, Student Support Coordinator, Student Workshop faculty advisor, faculty hiring committee chair.
Visiting and Adjoint Faculty

Visiting Professors

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

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

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

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

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

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

Yutaka Sasaki  
Professor, TTI-Japan  
Ph.D. - University of Tsukuba

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

Norimichi Ukita  
Professor, TTI-Japan  
Ph.D. - Kyoto University

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

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

Alexander Razborov  
Professor, University of Chicago  
Ph.D. - Steklov Mathematical Institute
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
Professor Avrim Blum, Professor Julia Chuzhoy, Professor Yury Makarychev, and Professor Nathan Srebro are collaborating with researchers from University of Illinois at Chicago, Northwestern University, the University of Chicago, and the Illinois Institute of Technology, and in partnership with researchers at Google NYC, together forming the Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), which was awarded a TRIPODS Phase II award by the National Science Foundation. IDEAL involves more than 50 researchers working on key aspects of the foundations of data science across multiple disciplines. The research centers around the foundations of machine learning, high-dimensional data analysis and inference, and data science and society.

Professors Avrim Blum, Lee Cohen, and Matt Walter and student Han Shao are collaborating with Professor Yishay Mansour at Tel-Aviv University on algorithms for eliciting user preferences in order to quickly develop optimal personalized policies in multi-objective decision-making scenarios.

Professor Jinbo Xu is collaborating with Professor Tali Dekel (WIS) and Professor Sarel Fleishman (WIS). Professor Fleishman (WIS) has developed cutting-edge atomistic methods PROSS and FuncLib for optimizing protein stability and activity, Professor Xu developed the first deep-learning method for protein structure prediction, revolutionizing the field and inspiring DeepMind's AlphaFold, and Professor Dekel (WIS) developed cutting-edge deep-learning methods for image and video analysis. The completion of their project, “Deep learning for protein optimization and design,” will furnish innovative, experimentally validated deep-learning approaches for protein design and broaden participation among students from under-represented groups in both Chicago and Israel.

Professor Karen Livescu is collaborating with researchers at Carnegie Mellon University, National Taiwan University, and ASAPP Inc. to develop a broad benchmark to measure performance of artificial intelligence systems on spoken language understanding.

Professor Greg Shakhnarovich, together with Professor Karen Livescu, continued long-standing collaboration with Professor Diane Brentari at the University of Chicago on automated recognition of sign languages. Work done as part of this effort won the sign language translation challenge at WMT-2023.

Joint work between Professor Shakhnarovich’s group and Nick Kolkin (Adobe Research) explored properties of modern generative models for images. Another effort, joint with colleagues at Toyota Research Institute, introduced novel methods for composing and understanding 3D scenes.
Talks and Seminars

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
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<thead>
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<th>Speaker</th>
<th>Institute</th>
<th>Title</th>
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<td>Mingda Chen</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Leveraging Natural Supervision for Language Representation Learning and Generation</td>
<td>7/8/22</td>
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<tr>
<td>Ravi Kannan</td>
<td>Microsoft Research India</td>
<td>Random Separating Hyperplanes and Applications</td>
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<td>Itai Lang</td>
<td>Tel Aviv University</td>
<td>Learning-Based Manipulation of 3D Point Clouds</td>
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<tr>
<td>Siddharth Bhandari</td>
<td>University of California, Berkeley</td>
<td>Vanishing Spaces of Random Sets and Applications</td>
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<tr>
<td>Hung-yi Lee</td>
<td>National Taiwan University</td>
<td>Recent Progress of Self-supervised Learning for Speech Processing</td>
<td>8/12/22</td>
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<tr>
<td>Chip Schaff</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Thesis Defense: Neural Approaches to Co-Optimization in Robotics</td>
<td>8/17/22</td>
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<tr>
<td>Aadirupa Saha</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Learning to Make Context-Dependent Predictions Through Preference Elicitation</td>
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<tr>
<td>Shubham Tosnhiwal</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Thesis Defense: Efficient and Interpretable Neural Models for Entity Tracking</td>
<td>8/24/22</td>
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<tr>
<td>Falcon Dai</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Thesis Defense: On Reward Structures of Markov Decision Processes</td>
<td>9/7/22</td>
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<tr>
<td>Kshitij Patel</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Towards Optimal Communication Complexity in Distributed Non-Convex Optimization</td>
<td>9/14/22</td>
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<tr>
<td>Davoud Ataee</td>
<td>University of Michigan</td>
<td>Federated Bilevel Optimization and its Applications in Machine Learning</td>
<td>9/16/22</td>
</tr>
<tr>
<td>Pragya Sur</td>
<td>Harvard University</td>
<td>A New Perspective on High-Dimensional Causal Inference</td>
<td>9/19/22</td>
</tr>
<tr>
<td>Svetlana Lazebnik</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Playing with GANs for Virtual Try-On and Face Stylization</td>
<td>9/30/22</td>
</tr>
<tr>
<td>John C. Duchi</td>
<td>Stanford University</td>
<td>How many labelers do you have? Some perspectives on &quot;gold standard&quot; labels</td>
<td>10/3/22</td>
</tr>
<tr>
<td>David McAllester</td>
<td>Toyota Technological Institute at Chicago</td>
<td>The Neurosymbolic conundrum</td>
<td>10/7/22</td>
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<tr>
<td>Divyarthi Mohan</td>
<td>Tel Aviv University</td>
<td>Simplicity and Optimality in Multi-Dimensional Mechanism Design</td>
<td>10/13/22</td>
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<tr>
<td>Baba C. Vemuri</td>
<td>University of Florida</td>
<td>ManifoldNet: A Deep Neural Network for Manifold-valued Data with Applications</td>
<td>10/14/22</td>
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<tr>
<td>Bowen Shi</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Toward American Sign Language Processing in the Real World: Data, Tasks, and Methods</td>
<td>10/17/22</td>
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<tr>
<td>Aadirupa Saha</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Dueling-Opt: Convex Optimization with Relative Feedback</td>
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<tr>
<td>Yoav Artzi</td>
<td>Cornell University</td>
<td>Interaction and Natural Language Learning</td>
<td>10/24/22</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
<td>Title</td>
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<tr>
<td>Sam Buchanan</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Deep Networks and the Multiple Manifold Problem</td>
<td>10/28/22</td>
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<tr>
<td>Avrim Blum</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Robustly-reliable learners for unreliable data</td>
<td>11/4/22</td>
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<tr>
<td>June Vuong</td>
<td>Stanford University</td>
<td>Optimal Sublinear Sampling of Spanning Trees and Determinantal Point Processes via Average-Case Entropic Independence</td>
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<tr>
<td>Elisa Celis</td>
<td>Yale University</td>
<td>Mitigating Bias in Data Science</td>
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<tr>
<td>Lingxiao Wang</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Private Matrix Completion through Low-rank Matrix Factorization</td>
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<tr>
<td>Paul Valiant</td>
<td>Purdue University</td>
<td>Mean Estimation in Low and High Dimensions</td>
<td>11/14/22</td>
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<tr>
<td>Mari Ostendorf</td>
<td>University of Washington</td>
<td>A Discussion with Toyota Technological Institute at Chicago Trustee Mari Ostendorf: Get to Know your Board</td>
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<tr>
<td>Lisa Li</td>
<td>Stanford University</td>
<td>Diffusion-LM Improves Controllable Text Generation</td>
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<tr>
<td>Jacob Andreas</td>
<td>Massachusetts Institute of Technology</td>
<td>Toward Natural Language Supervision</td>
<td>11/17/22</td>
</tr>
<tr>
<td>Qingming Tang</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Representation Learning for Speech Data</td>
<td>12/7/22</td>
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<tr>
<td>Noam Aigerman</td>
<td>Adobe Research</td>
<td>Neural shape mapping: modifying, manipulating, and synthesizing geometry through deep learning</td>
<td>1/4/23</td>
</tr>
<tr>
<td>Allyson Ettinger</td>
<td>University of Chicago</td>
<td>Understanding* and prediction: Disentangling meaning extraction and predictive processes in NLP models and in humans</td>
<td>1/6/23</td>
</tr>
<tr>
<td>David Held</td>
<td>Carnegie Mellon</td>
<td>Relational Affordance Learning for Robot Manipulation</td>
<td>1/9/23</td>
</tr>
<tr>
<td>Leon Bottou</td>
<td>Facebook</td>
<td>Out-of-distribution generalization, causation, and features</td>
<td>1/9/23</td>
</tr>
<tr>
<td>Elena Voita</td>
<td>FAIR</td>
<td>A Journey on Interpretability Methods in NLP: Inside-Out and Back</td>
<td>1/11/23</td>
</tr>
<tr>
<td>Andrea Daniele</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Accessible Interfaces for the Development and Deployment of Robotic Platforms</td>
<td>1/13/23</td>
</tr>
<tr>
<td>Greg Shakhnarovich</td>
<td>Toyota Technological Institute at Chicago</td>
<td>What can natural language do for computer vision?</td>
<td>1/13/23</td>
</tr>
<tr>
<td>Kartik Goyal</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Beyond the autoregressive paradigm for text generation</td>
<td>1/20/23</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
<td>Title</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------</td>
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</tr>
<tr>
<td>Victor Zhong</td>
<td>University of Washington</td>
<td>Reading to Learn: Improving Generalization by Learning From Language</td>
<td>1/23/23</td>
</tr>
<tr>
<td>Enric Boix</td>
<td>MIT</td>
<td>The staircase property and the leap complexity</td>
<td>1/25/23</td>
</tr>
<tr>
<td>Theodor Misiakiewicz</td>
<td>Stanford University</td>
<td>New statistical and computational phenomena from Deep Learning</td>
<td>1/27/23</td>
</tr>
<tr>
<td>Hongyuan Mei</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Logical Reasoning with Language Models</td>
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<tr>
<td>Benjamin Eysenbach</td>
<td>Carnegie Mellon University</td>
<td>Self-Supervised Reinforcement Learning</td>
<td>1/30/23</td>
</tr>
<tr>
<td>Matt Walter</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Robots Play Video Games and with Blocks</td>
<td>2/3/23</td>
</tr>
<tr>
<td>Elijah Cole</td>
<td>California Institute of Technology</td>
<td>Learning from Real-World Data</td>
<td>2/6/23</td>
</tr>
<tr>
<td>Lydia T. Liu</td>
<td>Cornell University</td>
<td>Towards Responsible Machine Learning in Societal Systems</td>
<td>2/8/23</td>
</tr>
<tr>
<td>Tanya Goyal</td>
<td>University of Texas at Austin</td>
<td>Building Reliable Text Generation Capabilities for Large Language Models</td>
<td>2/10/23</td>
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<tr>
<td>Alexander Razborov</td>
<td>University of Chicago</td>
<td>Convergence of Shallow Neural Networks in the NTK Regime</td>
<td>2/10/23</td>
</tr>
<tr>
<td>Ariel Holtzman</td>
<td>University of Washington</td>
<td>Controlling Large Language Models: Generating (Useful) Text from Models We Don't Fully Understand</td>
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<tr>
<td>Jungo Kasai</td>
<td>University of Washington</td>
<td>Democratized Natural Language Processing: Efficiency, Evaluation, and Beyond</td>
<td>2/15/23</td>
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<tr>
<td>Ohad Trabelsi</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Bridge Girth: A Unifying Notion in Network Design</td>
<td>2/17/23</td>
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<tr>
<td>Yuntian Deng</td>
<td>Harvard University</td>
<td>Structural Coherence in Text Generation</td>
<td>2/20/23</td>
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<tr>
<td>Ali Vakilian</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Individual Preference Stability for Clustering</td>
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<tr>
<td>Jamie Simon</td>
<td>University of California at Berkeley</td>
<td>The Eigenlearning Framework: A Conservation Law Perspective on Kernel Regression and Wide Neural Networks</td>
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<tr>
<td>Naomi Saphra</td>
<td>New York University</td>
<td>Interpreting Training</td>
<td>2/27/23</td>
</tr>
<tr>
<td>Ofir Press</td>
<td>University of Washington</td>
<td>Guidance Helps Where Scale Doesn't in Language Modeling</td>
<td>3/1/23</td>
</tr>
<tr>
<td>Adam Kalai</td>
<td>Microsoft Research</td>
<td>The Power of Intelligent Language Models</td>
<td>3/8/23</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
<td>Topic</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>Lianhui Qin</td>
<td>University of Washington</td>
<td>Constrained, Casual, and Logical Reasoning for Neural Language Generation</td>
<td>3/20/23</td>
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<tr>
<td>Shiry Ginosar</td>
<td>University of California at Berkeley</td>
<td>Toward Artificial Social Intelligence</td>
<td>3/22/23</td>
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<tr>
<td>Aaron Potechin</td>
<td>University of Chicago</td>
<td>Graph Matrices and the Ellipsoid Fitting Conjecture</td>
<td>3/24/23</td>
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<tr>
<td>Kuan Fang</td>
<td>University of California at Berkeley</td>
<td>Scalable Robot Intelligence: Self-Supervised Learning through Generation</td>
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<tr>
<td>Ohad Shamir</td>
<td>Weizmann Institute</td>
<td>Implicit bias in machine learning</td>
<td>3/24/23</td>
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<tr>
<td>Gal Vardi</td>
<td>Toyota Technological Institute at Chicago</td>
<td>On Implicit Bias and Provable Generalization in Overparameterized Neural Networks</td>
<td>3/31/23</td>
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<tr>
<td>Derek Reiman</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Methods for modeling the complex immune system</td>
<td>3/31/23</td>
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<tr>
<td>Matthew Turk</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Multimodal Classification for Context-Aware Mixed Reality</td>
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<tr>
<td>Moïse Blanchard</td>
<td>MIT</td>
<td>Convex optimization with constrained memory: Is cutting planes optimal?</td>
<td>4/12/23</td>
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<tr>
<td>Lee Cohen</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Finding Safe Zones of Policies Markov Decision Processes</td>
<td>4/14/23</td>
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<tr>
<td>Nathan Srebro</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Interpolation learning with linear predictors and short programs: How I learned to stop worrying and love the overfitting.</td>
<td>4/21/23</td>
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<tr>
<td>Fred Zhang</td>
<td>University of California at Berkeley</td>
<td>Online Prediction in Sub-linear Space</td>
<td>4/21/23</td>
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<tr>
<td>Rebecca Willett</td>
<td>University of Chicago</td>
<td>Machine Learning in Science and Engineering</td>
<td>4/28/23</td>
</tr>
<tr>
<td>David Forsyth</td>
<td>University of Illinois Urbana-Champaign</td>
<td>Intrinsic images, lighting, and relighting without any labelling</td>
<td>5/3/23</td>
</tr>
<tr>
<td>Shane Settle</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Neural Approaches to Spoken Content Embedding</td>
<td>5/4/23</td>
</tr>
<tr>
<td>Omar Montasser</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Theoretical Foundations of Adversarially Robust Learning</td>
<td>5/4/23</td>
</tr>
<tr>
<td>Julia Chuzhoy</td>
<td>Toyota Technological Institute at Chicago</td>
<td>On Fixing Some Issues with Expanders</td>
<td>5/5/23</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
<td>Title</td>
<td>Date</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Johannes Schmidt-Hieber</td>
<td>University of Twente</td>
<td>A statistical analysis of an image classification problem</td>
<td>5/5/23</td>
</tr>
<tr>
<td>Jason Eisner</td>
<td>John Hopkins University</td>
<td>Putting Planning and Reasoning Inside Language Models</td>
<td>5/10/23</td>
</tr>
<tr>
<td>Yury Makarychev</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Higher-Order Cheeger Inequality for Partitioning with Buffers</td>
<td>5/12/23</td>
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<tr>
<td>Ankita Sarkar</td>
<td>Dartmouth University</td>
<td>Approximation Algorithms for Continuous Clustering and Facility Location Problems</td>
<td>5/12/23</td>
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<tr>
<td>Pedro Lopes</td>
<td>University of Chicago</td>
<td>Integrating interactive devices with the User’s Body</td>
<td>5/15/23</td>
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<tr>
<td>Madhur Tulsiani</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Decoding Codes via Proofs</td>
<td>5/19/23</td>
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<tr>
<td>Francesca Mignacco</td>
<td>Princeton University</td>
<td>Statistical physics insights into the dynamics of learning algorithms</td>
<td>5/24/23</td>
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<tr>
<td>Rachit Nimavat</td>
<td>Toyota Technological Institute at Chicago</td>
<td>Graph Theory and Its Uses in Graph Algorithms and Beyond</td>
<td>6/1/23</td>
</tr>
<tr>
<td>Haifeng Xu</td>
<td>University of Chicago</td>
<td>The Economics of Machine Learning</td>
<td>6/2/23</td>
</tr>
</tbody>
</table>
New Models in Online Decision Making for Real-World Applications

[July 13-15, 2022] As the first workshop of TTIC’s 2022 Summer Workshop Program, this workshop presented a broad overview of the contemporary decision-making models that are being actively researched, and provide a networking forum for researchers and practitioners. This year’s theme, New Models in Online Decision Making for Real-World Applications, pervades machine learning at large, and with our aim of bridging practice and theory this workshop will find general appeal.

Representation Learning Theory Workshop

[August 4-5, 2022] As the second part of TTIC’s 2022 Summer Workshop Program, this workshop was organized and hosted at TTIC and served as a platform to foster discussion and collaboration for understanding the theoretical foundations of representation learning in modern machine learning.

Sixth Annual Student Workshop

[November 18, 2022] The sixth Annual Student Workshop was held in person on Friday, November 18, 2022, at TTIC. The agenda included student talks, a poster session, and an invited talk from the University of Chicago Assistant Professor Aly Azeem Khan. Talk/Award Committee, Professors Ali Vakilian, Lee Cohen, and Hongyuan Mei. Organizing Committee: Ph.D. candidates Ben Lai and Max Ovsiankin, Professors Karen Livescu and Madhur Tulsiani, and Student Services and Admissions Administrator Erica Cocom. The Best Talk Award was a tie between Kshitij Patel for his talk, “Distributed Online and Bandit Convex Optimization,” and Freda Shi for her talk, “Language Models are Multilingual Chain-of-Thought Reasoners.” The award for Best Poster was given to Anmol Kabra and his poster, “Exponential Family Model-Based Reinforcement Learning via Score Matching.”

Junior Theorists Workshop

[January 5-6, 2023] The Junior Theorists Workshop was jointly hosted by TTIC and Northwestern University to focus on and highlight junior researchers in all areas of theoretical computer science. This workshop was organized by Professor Ali Vakilian and postdoctoral researcher Suprovat Ghoshal.
IDEAL Workshop on Machine Learning, Interpretability, and Logic

[April 10-14, 2023] This workshop was co-sponsored and co-hosted by TTIC, Northwestern University, and the University of Chicago with The Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), an NSF-supported collaborative institute featuring speakers from TTIC’s faculty and students. This workshop explored connections between this topic and the program’s theme of machine learning and logic.

Midwest Machine Learning Symposium

[May 16-17, 2023] TTIC co-sponsored the Midwest ML Symposium, which aims to convene regional machine learning researchers for stimulating discussions and debates, to foster cross-institutional collaboration, and to showcase the collective talent of ML researchers at all career stages.

New Horizons in Theoretical Computer Science

[June 12-16, 2023] Professor Madhur Tulsiani was an organizer for the workshop, “New Horizons in Theoretical Computer Science,” which is an annual, week-long online summer school which aimed to expose under-represented undergraduates in theoretical computer science to exciting research areas in the area of theoretical computer science and its applications. The school contained several mini-courses from top researchers in the field. The courses were free of charge, held remotely, and applications from undergraduates majoring in computer science or related fields who are currently under-represented were encouraged to apply.
Distinguished Lecture Series 2023

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."
The TTIC 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 the University of Chicago, 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 library system, athletic facilities, the student health center, 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 still maintain the traditional shared experiences that come with a large university.

Graduates, Diplomas and Awards

TTIC held the 2022 Diploma and Graduation Ceremony at a new campus hotel, The Study, conveniently located about one block west of the institute. This new venue allowed for increased capacity for attendees to celebrate diploma and award recipients, and share a lunch reception directly following the ceremony.

4 doctoral diplomas were awarded at the September 2022 ceremony to:

- **Mingda Chen**, who studied under Professor Kevin Gimpel, with research interests in Machine Learning and Natural Language Processing. Mingda is currently a Research Scientist at Meta AI.

- **Chip Schaff**, who studied under Professor Matt Walter, with research interests in Machine Learning and its applications, especially in Robotics. Chip is currently an Autopilot Engineer at Tesla. Chip’s thesis was awarded the honor: thesis of distinction.

- **Shubham Toshniwal**, who studied under Professors Kevin Gimpel and Karen Livescu, with research interests in machine learning and its applications to natural language processing. Shubham is currently employed by Meta AI.

- **Igor Vasiljevic**, who studied under Professor Greg Shakhnarovich, with research interests in Computer Vision. Igor is currently a Machine Learning Research Scientist at Toyota Research Institute.
TTIC expects seven Ph.D. Candidates to be eligible for doctoral degrees in the September 2023 diploma ceremony.

Students Xiaodan Du, Jiahao Li, Max Ovsiankin, and Kavya Ravichandran fulfilled all requirements to complete the Master’s portion of the Ph.D. Program, and received Master’s diplomas at the September 2022 diploma ceremony at the start of the academic year.
Quality Curriculum

TTIC instructors serve the TTIC 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. TTIC 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.
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.

TTIJ Exchange Students

This year TTIC welcomed two exchange students from the Toyota Technological Institute located in Nagoya, Japan (TTIJ). The students enrolled in courses during their one-quarter stays and became full participating members of institute life, both academic and social.

Kohei Makino and Yuta Yanai arrived in September 2022 and returned to TTIJ in late December.

TTIC remains pleased with the exchange program with TTIJ, as the experience continues to be a success for all involved. New exchange student plans are underway at the institute for 2023-24.
Student Publications, Posters, and Abstracts


**Student Admissions and Student Body Growth**

In the fall of 2004, TTIC matriculated its first three students. The 2022-23 academic year saw 42 students enrolled in the Ph.D. program, 6 who enrolled as first time new students this year.

<table>
<thead>
<tr>
<th>Admissions Year (Fall)</th>
<th>Total Applicants</th>
<th>Applicants Admitted</th>
<th>Enrolled next Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>187</td>
<td>20</td>
<td>3 planned</td>
</tr>
<tr>
<td>2022</td>
<td>205</td>
<td>17</td>
<td>5+1*</td>
</tr>
<tr>
<td>2021</td>
<td>227</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>2020</td>
<td>229</td>
<td>26</td>
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<tr>
<td>2019</td>
<td>225</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>2018</td>
<td>207</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>2017</td>
<td>135</td>
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<td>2016</td>
<td>123</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td>90</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>2014</td>
<td>83</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

*Indicates a non-fall program start
Investment Pool Performance

TTIC’s diversified yet conservative investment pool is designed to weather challenging economic events. In November 2022, the Board of Trustees approved further diversification of the investment portfolio with changes expected to increase 10-year real return from 3.8% to 4.29%. This reallocation, beginning in December 2022, was planned to occur over 12-monthly tranches to capture the benefits of dollar cost averaging in a volatile market environment. The reallocation increases the allocations to Public Equity, Private Debt, and Infrastructure by reducing the Core Fixed Income and Return Seeking Fixed Income allocations. The reallocation was on-target as of the month ending June 30, 2023.

The investment pool returned 2.5% for the year ended June 30, 2023, and 1.4% since inception, which is March 2021.

Operating Results

In fiscal year ending June 30, 2023, 24% of TTIC’s operating revenue was derived from external grants, which was less than anticipated by approximately $900,000. Except for tuition paid by the University of Chicago, the remainder of TTIC’s operating revenue is the board-approved distribution of investment return, which was $9.5M. Overall, operating revenue of $11.8M fell short of the budgeted $12.7M due to the grant revenue.

Expenses were also lower than budget due to less hiring and less grant spending than anticipated. Overall, TTIC ended the fiscal year operations at approximately budgeted level of slight surplus.

TTIC is fortunate to be in a strong financial position with approximately $67M in unrestricted financial assets, $57M of which represents assets with liquidity available within one year.

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
# Financial Reports

## Statement of Financial Position

June 30, 2022 and 2023

### ASSETS

<table>
<thead>
<tr>
<th>Current assets:</th>
<th>2023</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash and cash equivalents</td>
<td>$2,890,200</td>
<td>$1,855,617</td>
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<tr>
<td>Receivables:</td>
<td></td>
<td></td>
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<tr>
<td>Miscellaneous receivable</td>
<td>116,035</td>
<td>377,276</td>
</tr>
<tr>
<td>Grants receivable</td>
<td>557,462</td>
<td>804,604</td>
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<td>Due from TTI (Note 9)</td>
<td>1,255</td>
<td>1,332</td>
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<tr>
<td>Interest receivable</td>
<td>245,154</td>
<td>43,843</td>
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<tr>
<td>Investment distribution receivable</td>
<td>-</td>
<td>6,026,762</td>
</tr>
<tr>
<td>Prepaid expenses and other current assets</td>
<td>75,380</td>
<td>86,243</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td>$3,885,486</td>
<td>$9,194,477</td>
</tr>
</tbody>
</table>

| Investments                          | $264,339,349  | $260,590,725  |
| Operating lease right-of-use asset (Note 7) | 10,176,366  | -             |
| Furniture and equipment, net (Note 4) | 5,045,085     | 5,623,151     |

**Total assets**                      | $283,446,286  | $275,408,353  |

### LIABILITIES AND NET ASSETS

<table>
<thead>
<tr>
<th>Current liabilities:</th>
<th>2023</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts payable</td>
<td>$357,129</td>
<td>$100,474</td>
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<tr>
<td>Accrued expenses</td>
<td>743,772</td>
<td>743,081</td>
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<tr>
<td>Operating lease liability, current (Note 7)</td>
<td>909,917</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total current liabilities</strong></td>
<td>2,010,818</td>
<td>843,555</td>
</tr>
</tbody>
</table>

| Operating lease liability, non-current (Note 7) | 9,518,693 | - |
| Other long-term liabilities           | -            | 265,415       |
| **Total non-current liabilities**     | 9,518,693    | 265,415       |

| **Total liabilities**                | $11,529,511   | $1,108,970    |

| Net assets:                          |               |               |
| Without donor restrictions           | 66,926,774    | 67,256,617    |
| With donor restrictions              | 264,990,001   | 207,042,766   |
| **Total net assets**                 | 271,916,775   | 274,299,383   |

**Total liabilities and net assets**  | $283,446,286  | $275,408,353  |
## Statement of Activities and Changes in Net Assets

June 30, 2022 and 2023

<table>
<thead>
<tr>
<th></th>
<th>Without Donor Restrictions</th>
<th>With Donor Restrictions</th>
<th>Total</th>
<th>Without Donor Restrictions</th>
<th>With Donor Restrictions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues, gains and other support</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student tuition and fees, less Scholarships of $1,145,000 and $1,207,000, in 2023 and 2022, respectively</td>
<td>$3,863</td>
<td>$3,863</td>
<td>$7,726</td>
<td>$3,863</td>
<td>$3,863</td>
<td>$7,726</td>
</tr>
<tr>
<td>Other income</td>
<td>4,260</td>
<td>4,260</td>
<td>8,520</td>
<td>4,260</td>
<td>4,260</td>
<td>8,520</td>
</tr>
<tr>
<td>Net realized and unrealized gains (losses) on investments</td>
<td>1,275,582</td>
<td>1,275,582</td>
<td>4,222,064</td>
<td>1,275,582</td>
<td>1,275,582</td>
<td>4,222,064</td>
</tr>
<tr>
<td>Investment income (loss) – net of investment fees</td>
<td>196,742</td>
<td>196,742</td>
<td>393,484</td>
<td>196,742</td>
<td>196,742</td>
<td>393,484</td>
</tr>
<tr>
<td>Net assets released from restrictions</td>
<td>7,097,828</td>
<td>7,097,828</td>
<td>14,195,656</td>
<td>7,097,828</td>
<td>7,097,828</td>
<td>14,195,656</td>
</tr>
<tr>
<td>Total revenue, gains (losses), and other support</td>
<td>12,104,250</td>
<td>(2,052,765)</td>
<td>10,051,485</td>
<td>4,126,913</td>
<td>(18,975,034)</td>
<td>(14,848,121)</td>
</tr>
<tr>
<td><strong>Expenses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education and research expenses – instruction</td>
<td>9,423,480</td>
<td>9,423,480</td>
<td>9,423,480</td>
<td>8,843,646</td>
<td>8,843,646</td>
<td></td>
</tr>
<tr>
<td>Management and general expenses – institutional support</td>
<td>3,010,613</td>
<td>3,010,613</td>
<td>3,010,613</td>
<td>2,744,534</td>
<td>2,744,534</td>
<td></td>
</tr>
<tr>
<td>Total expenses</td>
<td>12,434,093</td>
<td>12,434,093</td>
<td>12,434,093</td>
<td>11,588,186</td>
<td>11,588,186</td>
<td></td>
</tr>
<tr>
<td><strong>Changes in net assets</strong></td>
<td>(329,843)</td>
<td>(2,052,765)</td>
<td>(2,382,608)</td>
<td>(7,461,267)</td>
<td>(18,975,034)</td>
<td>(26,436,301)</td>
</tr>
<tr>
<td>Net assets at beginning of year</td>
<td>67,256,817</td>
<td>207,042,766</td>
<td>274,299,383</td>
<td>74,717,864</td>
<td>220,017,800</td>
<td>300,735,684</td>
</tr>
<tr>
<td>Net assets at end of year</td>
<td>$66,926,774</td>
<td>$204,990,001</td>
<td>$271,916,775</td>
<td>$67,256,817</td>
<td>$207,042,766</td>
<td>$274,299,383</td>
</tr>
</tbody>
</table>
Interns and Visiting Scholars

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):

- **Songcheng Cai** (Karen Livescu, Hongyuan Mei)
- **Betsy Gonzalez**, ChiS&E (Matt Walter)
- **Asher Grossman**, Computer Science Summerlink Program (Matt Walter)
- **Davide Iafrate** (Matt Walter)
- **Rhea Jain** (Julia Chuzhoy, Ohad Trabelsi)
- **Justin Jung**, University of Chicago (Matt Walter)
- **Tina Khajeh**, University of Illinois Chicago (Derek Reiman)
- **Peng Li**, Fudan University (Hongyuan Mei, Matt Walter)
- **Yanhong Li**, University of Chicago (David McAllester)
- **Roy Long**, University of Chicago (Avrim Blum, Saeed Sharifi-Malvajerdi)
- **Peter Manohar**, Carnegie Mellon University (Madhur Tulsiani, Yury Makarychev, Siddharth Bhandari)
- **Tushant Mittal**, University of Chicago (Madhur Tulsiani)
- **Takeru Oba**, Toyota Technological Institute, Japan (Matt Walter)
- **Madhusudhan Pittu**, Carnegie Mellon University (Ali Vakilian, Julia Chuzhoy, Yury Makarychev)
- **Emma Quansah**, ChiS&E (Matt Walter)
- **Alea Ritchie** (Matt Walter)
- **Benjamin Stoddart**, University of Michigan (Matt Walter)
- **Dylan Sumaya Lobo**, ChiS&E (Matt Walter)
- **Luzhe Sun**, University of Chicago (Matt Walter)
- **Xiangshan Tan** (Matt Walter)
- **Daksh Vermareddy**, ChiS&E (Matt Walter)
- **Jiamin Yang**, University of Chicago (Kartik Goyal)
- **Hongyu Zhao**, University of Chicago (Hongyuan Mei)
- **Shester Gueuwou**, (Karen Livescu, Greg Shakhnarovich)
- **Vaidehi Srinivas**, Northwestern University (Avrim Blum)
- **Kirij Salij**, Carleton College (Matthew Turk)
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 Committee has been discussing and actively exploring new avenues for outreach and for support for groups underrepresented in computing. TTIC is partnered with Duckietown and the Chicago Pre-College Science and Engineering Program (ChiS&E). Student volunteers facilitate general computer science and Girls Who Code sessions at various sites, and TTIC supports two successful computer science clubs meeting weekly with regular attendance at Kenwood Academy and the Bessie Coleman branch of the Chicago Public Library.

The Committee is also committed to more transparency in its communications to the TTIC community and has established a goal of more regular internal communications as well as updating the institute website and external communications to reflect our commitment to our values in diversity, equity and inclusion in our recruiting, hiring, and admissions practices. These pages are currently under revision.

The DEI Committee has been contending with questions of further actions we can take to bolster our commitment to DEI values within the TTIC community. To this end, we have been learning from courses, surveys, and discussions, and we are currently drafting a common purpose statement that will help us and the community establish an ongoing list of top priorities to focus on, and attend to recommendations and actions that will have significant impact.

In April 2023, the DEI Committee sent a document outlining the list of recommendations to President Matthew Turk, which was discussed at the November 2023 meeting of the Board of Trustees.

Committee Members:
- Rose Bradford, Administrator (co-chair)
- Greg Shakhnarovich, Faculty (co-chair)
- Matthew Walter, Faculty
- Celeste Ki, Administrator
- Deree Kobets, Administrator
- Kavya Ravichandran, Student
Women at TTIC Group

TTIC supports a Women at TTIC group, which is a group of women faculty, research assistant professors, courtesy faculty, and Ph.D. students at TTIC, to provide opportunities for increased interaction and support among women faculty and students. Quarterly meet-ups have been a tradition where the group members have hearty conversations over lunch. This tradition has continued in remote settings during the past year with fun meet-ups including virtual games of Balderdash and Escape-Room. Beyond the usual tradition, the group also occasionally holds joint student events with University of Chicago Grad Women in Computer Science (GWiCS) which enables more interdepartmental interaction.

TTIC Internship Program

TTIC runs a robust intern/visiting scholar program, with typically 10-25 students from universities around the world spending an academic quarter or more working with faculty and students. This program creates new research and collaboration opportunities and provides valuable research experience for the participating undergraduate and graduate students.

TTIC provides matching funds for faculty to employ summer interns from underrepresented minority populations, which was new to the program starting this year.

Institute Donation to Turkey

On February 6, 2023, a 7.8 earthquake struck southern and central Turkey and northern and western Syria. It was one of the strongest earthquakes ever recorded in the Levant and of the past century, with an estimated 14 million people affected.


TTIC employees donated $1,060 and TTIC donated an additional $860 for a total gift to UNICEF of $1,920.
TTIC Youth and Community Partnerships

TTIC Manager of Research Administration, Ms. Rose Bradford, has initiated and supports new programs of Girls Who Code, which is an after-school coding program for elementary school girls, by providing or arranging facilitation, lessons, and presentations. TTIC has worked with various area Chicago Public Schools (CPS) including Kenwood Academy, Carnegie Elementary, and Hyde Park Academy and is continuing in its role as Community Partner.

TTIC became community partners with the Bessie Coleman Library to sponsor a 3rd-8th grade Coding Club for boys and girls including a showcase at the University of Chicago Weston Game Lab.

Chicago Pre-College Science and Engineering Program (ChiS&E) is a weekend program for Chicago Public School students underrepresented in STEM fields. Professor Matt Walter and TTIC worked with ChiS&E to develop a Duckiebot-based high school robotics course for Chicago-area students for fall of 2022. Many of the students from this group are traditionally underrepresented in robotics and STEM.

Professor Madhur Tulsiani co-organized the “New Horizons in Theoretical Computer Science” workshop, which took place on June 12-16, 2023, and is an annual week-long online summer school aiming to expose under-represented undergraduates in theoretical computer science to exciting research areas in the area of theoretical computer science and its applications. The workshop contained several mini-courses from top researchers in the field, was free of charge, held remotely, and applications from undergraduates majoring in computer science or related fields who are considered under-represented in the field were encouraged to attend.
Governance

Board of Trustees

Kavita Bala
Dean, Ann S. Bowers College of Computing and Information Science, Cornell University
Professor, Cornell University
Co-Founder, GrokStyle
Faculty Fellow, Atkinson Center for a Sustainable Future
Trustee since May 2021

Robert Barnett
Partner, Williams & Connolly LLP
Ranked Number One, Washingtonian Magazine’s list of “Washington’s Best Lawyers.”
Executive Committee Member, Williams & Connelly LLP
Senior Counsel, Board of Trustees of the John F. Kennedy Center for the Performing Arts.
(President-appointed member.)
Trustee since April 2006

Juan de Pablo
Vice President for National Laboratories, Science Strategy, Innovation, and Global Initiatives, University of Chicago
Liew Family Professor in Molecular Engineering, University of Chicago
Senior Scientist, Argonne National Laboratory
Member, National Academy of Engineering (NAE)
Trustee since May 2021

Eric Grimson
Chancellor for Academic Advancement, Massachusetts Institute of Technology
Bernard Gordon Chair of Medical Engineering at MIT
Lecturer on Radiology at Harvard Medical School and at Brigham and Women's Hospital
Former Education Officer for the Dept. of Electrical Engineering and Computer Science at MIT; Associate Department Head; Head of the Depart. of Electrical Engineering and Computer Science
Trustee since July 2015; Chair from May 2021
Charles Isbell, Jr.
Executive Director, Constellations Center for Equity in Computing, Georgia Institute of Technology
Dean of Computing/The John P. Imlay Jr. Chair
College of Computing, Georgia Institute of Technology
Oversaw Georgia Tech’s rollout of online Computer Science Master’s degree, studied by Harvard economists and published in the New York Times, as a whole new way of thinking about the cost of higher education
Work has been featured in the New York Times and the Washington Post
Trustee since April 2018

Kazuo Hotate
President, Toyota Technological Institute (Nagoya, Japan)
Member, Science Council of Japan (SCJ)
Member, Institute of Electrical and Electronics Engineers (IEEE)
Member, Japan Society of Applied Physics (JSAP)
Trustee since May 2021

Yoshihiko Masuda
Chairman of the Board of Trustees, Toyota School Foundation
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

Alexis Herman
Chair and Chief Executive Officer, New Ventures, LLC
Appointed by President Jimmy Carter, became the youngest director of the Women's Bureau in the history of the Labor Department
US 23rd Secretary of Labor and first African American to lead the US Department of Labor
Former member of the National Economic Council
Serves on the boards of: Cummins Inc., Entergy Inc., MGM Mirage, Coca-Cola Company
Former chairwoman of the Coca-Cola Company’s Human Resources Task Force
Board member of the Clinton Bush Haiti Fund
Trustee since October 2012

Noboru Kikuchi
Representative Director, Genesis Research Institute, Inc.
Roger L. McCarthy Professor Emeritus of Mechanical Engineering, University of Michigan
A Member of National Academy of Engineering, USA
Design and System Engineering Achievement Award, The Japan Society of Mechanical Engineers
Computational Mechanics Achievements Award, The Japan Society of Mechanical Engineers
Excellence in Research Award, Dept of Mechanical Engineering and Applied Mechanics, The University of Michigan
Distinguished Research Award, College of Engineering, University of Michigan
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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
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
Received the Chaire d’Excellence Award of the French Agence Nationale de Recherche, 2006
Received the Llewellyn John and Harriet Manchester Quantrell Award for Excellence in Undergrad Teaching, 2001
Received the Faculty Award for Excellence in Graduate Teaching, University of Chicago, 2015
Trustee since October 2018

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
Has worked for AT&T Bell Laboratories, BBN Laboratories and Boston University
Adjunct Professor in Linguistics and Computer Science and Engineering and served as Associate Dean for Research and Graduate Studies in the College of Engineering, 2009-2012
Scottish Informatics and Computer Science Alliance Distinguished Visiting Fellow
Australia Fulbright Scholar at Macquarie University
Has had 260 publications and recipient of two paper awards, the 2010 IEEE HP Harriett B. Rigas Award, and the 2018 IEEE James L. Flanagan Speech and Audio Processing Award
Served as Editor of IEEE Transactions on Audio, Speech and Language Processing and Computer Speech and Language, as VP Publications on IEEE Signal Processing Society, and served as a member of the IEEE Periodicals Review and Advisory Committee 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
Appointed as an associate professor in 1973 at the Institute of Industrial Science, University of Tokyo, promoted to full professor in 1987, and engaged in R&D and education in the area of semiconductor electronics.
Professor Emeritus in 2007
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
Had primary responsibility for budget, capital and debt structure for second-largest county
government and associated health system in the country
Designed and led several transformative projects in financial operations, technology, program-
based budgeting and performance metric-driven management
Leads integrated strategic financial planning and oversight for the execution of the University’s
work in financial analysis and functions, information technology and human resources
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

Tatsuro Toyoda
Chair Emeritus

Mitsuru Nagasawa
President Emeritus

Trustee Departures:
Mark Hogan (Service from 2013-2023)

In Memoriam of Mark Hogan
TTIC is deeply saddened to share the news that Mr. Mark Hogan, former Trustee (2013-
2015) and Advisor to the Board (2015-2023), passed away on April 16, 2023, at 71 years
old. Mr. Hogan was born on May 15, 1951.

Mr. Hogan received a BA from the University of Illinois at Urbana-Champaign in Business
Administration/Management, served as the university’s football manager, and then earned
his MBA from Harvard University.

A former General Motors executive, Mr. Hogan served as a Toyota Motor Corporation Board Member and as
President of Dewey Investments LLC prior to his passing. Mr. Hogan also held a variety of management and
executive positions, including serving as the President and CEO of Vehicle Production Group LLC, and as
President of Magna International.

We are grateful to Mr. Hogan for his professional leadership, partnership, wisdom, and friendship.
Leadership

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

Administration

Adam Bohlander, Director of Information Technology
Rose Bradford, Manager of Research Administration
Erica Cocom, Student Services and Admissions Administrator
Chrissy Coleman, Administrative Director of Graduate Studies and Publications, Accreditation Liaison Officer, Deputy Title IX Coordinator
Jessica Jacobson, Chief Financial Officer and Director of Operations
Michelle Jardine, Office Manager
Brandie Jones, Administrative Assistant to Faculty
Celeste Ki, Communications Coordinator
Deree Kobets, Controller
Mary Marre, Administrative Assistant to Faculty
Amy Minick, Director of Human Resources and International Affairs, Title IX Coordinator

Non-Discrimination Statement

TTIC is committed to providing a respectful and positive environment for all members of its community, free from all forms of discrimination and harassment.
Special Thanks

External Advisory Committee
William T. Freeman, Thomas and Gerd Perkins Professor of Electrical Engineering and Computer Science, Massachusetts Institute of Technology
Richard Karp, Founding Director, Simons Institute for the Theory of Computing, University of California Berkeley
Takeo Kanade, UA and Helen Whitaker University Professor, Robotics Institute, Carnegie Mellon University
Éva Tardos, Jacob Gould Schurman Professor of Computer Science, Cornell University

The professionals at the Higher Learning Commission

Toyota Motor Corporation

Toyota Technological Institute (Nagoya, Japan)

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Department of Mathematics
Department of Statistics
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Student Wellness Services
Facilities Services
University Research Administration
University IT Services
The professionals at the 6045 S. Kenwood Avenue building