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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 PhDs 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 PhD graduates at high-quality research institutions. TTIC also strives to make its PhD students visible to the academic community before graduation. This can be done most effectively through publications prior to graduation.
2019-2020 was an exciting year for TTIC, and for me as well! I joined the Institute in July 2019, so the start of the academic year was full of change: coming to a new city, getting to know new colleagues, and starting to come up to speed on all things TTIC. It is inspiring to be part of this stellar organization, and I have greatly enjoyed getting to know TTIC’s faculty, staff, and students, as well as our distinguished Board of Trustees, External Advisory Committee members, and our great partners at TTI Japan and the University of Chicago. I deeply appreciate the confidence and trust placed in me by the Board, and my first year has been extremely enjoyable and invigorating.

I would like to acknowledge the many important contributions to TTIC made by Dr. Sadaoki Furui, TTIC’s second President. During his six-plus year tenure, TTIC grew significantly in both size and reputation, and the Institute benefitted immensely from his leadership. It is certainly my pleasure to (try to) follow in his footsteps, and it has been enjoyable to work with him in his new role as Chair of the Board of Trustees.

TTIC is a unique academic institution with a clear mission: to achieve international impact through world-class research and education in fundamental computer science. During the past year I have seen how this mission drives all parts of TTIC, from its academic programs to its operations, finances, and governance. We are well-connected to top researchers and institutions around the globe, and our partnerships with TTI Japan and the University of Chicago are quite synergistic and important.

TTIC’s faculty members are working in important areas and are highly respected leaders in their fields. Our students, from around the world, are superb – they do amazing work, and go on to great positions at top places in academia and industry after finishing their degrees. Our staff do an outstanding job of keeping things running smoothly and professionally, while ensuring that TTIC remains an enjoyable place to work and study.

During the past academic year, TTIC welcomed a new Board member (Dr. Bala Srinivasan) along with several new PhD students and Research Assistant Professors. We graduated one PhD student, Dr. Mohammadreza Mostajabi, with a few more just about to finish. Several honors and awards were bestowed on TTIC faculty and students, including Prof. Julia Chuzhoy, who received the National Academy of Sciences Michael and Sheila Held Prize for advances in discrete optimization and structure of graphs.

TTIC faculty had top leadership positions in some of the best research venues in our fields and gave important invited, keynote, and distinguished lectures at a range of institutions and venues. The faculty also received five new grants from the National Science Foundation totaling over $8 million, in addition to other research funding.

Congratulations are in order to Prof. Greg Shakhnarovich, who was promoted to Full Professor this year. Greg is a leader in the area of computer vision whose research has had a significant impact on the field. He is also an excellent teacher and mentor, and his service to the research community and to TTIC has been excellent. This promotion to the highest level of professorship was well deserved.

In 2020, our accreditation body, the Higher Learning Commission (HLC), conducted their mid-cycle review (part of the standard ten-year review process), including a two-day visit to TTIC in February. This was preceded by much preparation by the TTIC management team, including drafting a Self-Study Report and compiling a large amount of information to share with the HLC team. The visit was a success, resulting in a very positive review and report. This confirmed TTIC’s growth and maturity and the diligent work put in by the whole TTIC community, especially the Board of Trustees and TTIC’s management team in recent years.
The global COVID-19 pandemic has affected everyone in 2020, including TTIC. Early on, we formed a COVID-19 Response Group to consider the growing challenge and the health and safety of the TTIC community. The Response Group has been meeting frequently and guiding TTIC’s responses to the situation, planning our actions, and communicating them to the TTIC community. In March 2020, we went fully remote, and our spring quarter courses were online. While this situation is challenging for everyone, and we miss the personal interaction with one another, TTIC’s activities and operations continue, including remote talks, group meetings, research collaborations, and our tradition of frequent teatimes.

2020 also brought social unrest and a series of protests in Chicago and throughout the country following the horrific killing on May 25 of George Floyd in Minnesota. Discussions in the aftermath of this event, on topics such as racism, challenges to equity in academia and STEM, our part in the local community, and how TTIC can work towards lasting change, helped speed up plans to create TTIC’s first Diversity, Equity, and Inclusion Committee. The DEI committee is intended to engage the TTIC community in considering matters relating to diversity, equity, inclusion, fairness, and racism and promoting actionable changes.

We began a building renovation project in the summer. TTIC is moving into an additional half-floor of our building, giving us additional space (now 2½ floors). We took this opportunity to renovate our whole space, including a redesigned classroom, a larger Robotics Lab, more meeting rooms, and improved social and collaboration areas. We look forward to taking full advantage of this nice, newly upgraded space once we get back to in-person activities!

Our partnership with TTI in Nagoya, Japan continues to strengthen, despite travel limitations due to the global pandemic. TTIC hosted two TTI Japan students at TTIC in the fall quarter and two more in the winter quarter, and we conducted a remote course for TTI students led by Prof. Shakhnarovich. In October 2019, Chief Academic Officer Avrim Blum and I visited TTI for a few days, which was a wonderful opportunity to meet and talk with many of the faculty and students, get an overview of their activities and areas of focus, see several research highlights, and share TTIC updates with them. This was my first time at TTI and my first opportunity to meet with TTI President Kazuo Hotate. We also visited with the Toyota Motor Corporation’s Board Chairman, Mr. Takeshi Uchiyamada, Nagoya University, and the National Institute of Advanced Industrial Science and Technology (AIST).

In 2020, TTIC continued our significant interactions and collaborations with the University of Chicago, with many University students taking TTIC courses, several research collaborations, joint student advising arrangements, involvement in each other’s recruitments, and strengthening our operational partnership. Our strong relationship with the University of Chicago is synergistic, with a range of benefits in both directions.

After my first year of getting to know TTIC, I look forward to continuing to support and empower the community of scholars and staff as we strive for excellence in our research, education, and work. TTIC is an incredible academic institution with great people, important values, and a strong community spirit. We are doing great work and making a real impact with our research and education. We have an excellent Board, great partners, and many great opportunities. The coming year will be exciting!

Matthew Turk
President
Let me begin by expressing how proud I am of the TTIC community in its response to the coronavirus pandemic, the defining challenge of 2019-2020 for any academic institution. TTIC went into a completely virtual mode, and people came together (figuratively, not physically!) to ensure that everyone was accounted for, everyone was taken care of, and that the spirit of TTIC was maintained in the virtual world. Classes, reading groups, seminars, and advisor-advisee meetings moved online, and we even started up a regular online teatime.

Another major activity for TTIC in 2019-2020 has been our renovation planning. In the fall, we received board approval for expanding to half of the 3rd floor, and a renovation of our space that includes improved classroom facilities, larger and more varied meeting and collaboration spaces, a larger robotics lab, and additional student offices. This renovation will provide an improved and more efficient use of space designed to meet our 5-year projected growth in students, faculty, staff, and academic visitors. We are all excited to see the renovation complete and to take full advantage of our renovated space once COVID-19 restrictions allow it.

On the academic front, TTIC continues to excel. To mention a few highlights, Julia Chuzhoy was awarded the 2020 National Academy of Sciences Michael and Sheila Held Prize for advances in discrete optimization, for her “influential work in the fields of graph algorithms, hardness of approximation, and structural graph theory, which have introduced powerful new techniques and resolved deep open questions”.

TTIC also continued its winning streak at COLT with Steve Hanneke receiving the COLT 2020 Best Paper Award for his work “Proper Learning, Helly Number, and an Optimal SVM Bound”. Student Mingda Chen was awarded the 2020 Google Fellowship in Natural Language Processing; the ALBERT system created by Mingda, his advisor Kevin Gimpel, and researchers from Google, received substantial popular press. TTIC alumnus Jian Peng was awarded the 2020 Overton prize from the International Society of Computational Biology. Congratulations to all!
TTIC’s Research Assistant Professor program remains strong. This year we hired four new RAPs: Filip Hanzely (PhD from KAUST), Mina Karzand (PhD from MIT), Audrey Sedal (PhD from U. Michigan), and Bradly Stadie (PhD from UC Berkeley). Together they span areas of Machine Learning, Optimization, Statistics, Computational Mechanics, and Robotics. We were also pleased to welcome Hedyeh Beyhaghi as Institute Postdoctoral Fellow, and Ali Vakilian as IDEAL postdoctoral fellow. We said farewell to three RAPs who moved on to tenure-track positions: Mrinmaya Sachan joined ETH Zurich, DJ Sutherland joined the University of British Columbia, and Thatchaphol Saranurak is joining the University of Michigan in January 2021.

Finally, congratulations to TTIC’s 2020 PhD graduates Takeshi Onishi (advised by David McAllester), Siqi Sun (advised by Jinbo Xu), and Hai Wang (advised by David McAllester)! Takeshi will be our first graduate to have completed degree programs at both TTIJ and TTIC.

Even though we are now in virtual mode, TTIC remains a special place with a friendly and collaborative research atmosphere that can’t be beat. I am proud of how our community has (virtually) come together, and by the time of next year’s annual report, hopefully we’ll be enjoying the use of our beautifully renovated physical space.

Avrim Blum
Chief Academic Officer
In March 2019, Chair of the Board of Trustees, Masatami Takimoto, announced the appointment of Dr. Matthew Turk to become the third President of the Toyota Technological Institute at Chicago. Turk was appointed by TTIC’s Board of Trustees by a unanimous vote and succeeded Dr. Sadaoki Furui on July 1, 2019.

Furui called Turk the ideal person to lead TTIC into the next exciting stage of growth for the institute. Furui expects the institute to continue its trajectory for great levels of accomplishment and innovation, and he hopes that accelerates with the appointment of the new president.

Formal investiture events were held October 3 and 4, 2019. President Turk attended his first Board of Trustees meeting on October 3 held at the Waldorf Hotel in Chicago, followed by a welcome dinner reception. Reception welcome speeches were made by Avrim Blum (Chief Academic Officer), Chrissy Coleman (Secretary of the Institute) and Jessica Jacobson (Chief Financial Officer).

An Investiture Ceremony was held on October 4 at the Chicago Theological Seminary, and was open to the public. Speakers included:

- **Dr. Robert Zimmer**, President, University of Chicago
- **Prof. Irfan Essa**, Distinguished Professor and Senior Associate Dean, College of Computing, Georgia Tech
- **Dr. Matthew Turk**
- **Mr. Masatami Takimoto**, TTIC Board Chair
- **Dr. Hiroyuki Sakaki**, TTIJ President and TTIC Trustee

President Turk was given the TTIC President’s medallion, and the ceremony was attended by Trustees, computer science colleagues, faculty, students, administrators, family, and friends of the institute.

After the ceremony, there was a lunch and academic symposium held at TTIC. Speakers included: Greg Shakhnarovich (Professor), Karen Livescu (Associate Professor), Matthew Walter (Assistant Professor), Sepideh Mahabadi (Research Assistant Professor), Jinbo Xu (Professor), Nati Srebro (Professor) and Bill Freeman (MIT Thomas and Gerd Perkins Professor of Electrical Engineering and Computer Science).
On March 5, 2020, President Turk assembled an institute COVID-19 Response Group to help ensure the health of the TTIC community, and plan for institute continuity due to news that a novel coronavirus originating in Asia was spreading around the globe. The team included:

Avrim Blum, Chief Academic Officer
Adam Bohlander, Director of IT
Chrissy Coleman, Administrative Director of Graduate Studies
Jessica Jacobson, Chief Financial Officer
Matthew Turk, President

March 6 - President Turk notified the TTIC community of the new COVID-19 Response Group and the committee’s goals, that TTIC and the University of Chicago would be following identical protocols and procedures unless otherwise specified, that there were new travel warnings and quarantine guidelines for travelers from certain countries, and asked the TTIC community to follow public health guidance: washing hands and covering coughs.

Within several days, the U.S. Centers For Disease Control, Illinois Department of Public Health, and the Governor of Illinois announced that the public health situation had become more of an emergency, and Illinois would be implementing statewide quarantine regulations to keep infections and hospital conditions manageable.

March 12 - President Turk notified the TTIC community that beginning March 20, TTIC facilities would be closed to academic programs and courses, meetings, activities, and support services. Courses, services, and meetings would be conducted remotely, for everyone’s safety and health. This will be the case for the duration of spring quarter. He shared a TTIC COVID-19 Resources website, confirmed pay would not be interrupted, and that the committee would be in regular communication with ongoing details.
For a period, the group held meetings several times a week to keep up with changing circumstances. The public health situation and changing state and local guidelines continued through spring 2020. The team addressed institute issues and communicated with the TTIC community. Work of the committee included:

- Creating COVID Resources website with updated CDC guidance, restrictions, travel advisories, academic and health resources, mental health support, academic calendar changes, etc.
- Sharing institute communication updates via email and various anonymous check-ins inquiring community well-being
- Securing remote work resources for instructors, students, advisors, administrators, and visiting scholars with the remaining faculty and student recruitment season conducted online
- Coordinating with the University of Chicago regarding changing campus restrictions, testing capabilities, and facility cleaning protocols
- Arranging and documenting long-term plans for returning to campus and/or prolonged remote work
- Notifying the Higher Learning Commission of the institute’s short-term altered academic format
- Arranging for altered student visa processes regarding newly admitted foreign national students
- Creating an allowance for remote-work accommodations for the TTIC community (including $100/month to cover internet and phone, and remote work equipment and furniture if needed)
- Ensuring facility cleaning protocols, personal protective equipment, hygiene supplies, and safety signage
- Attending virtual seminars and workshops aimed at higher education planning in the pandemic
- Implementing a training and attestation for community members
- Adding a question about remote learning effectiveness to spring course evaluations
- Planning for the May 2020 Board of Trustees meeting to be held over Zoom video conferencing platforms
- Coordinating safe facility renovations that were planned to be underway prior to pandemic conditions

On May 15, the institute was notified that Summer Quarter 2020 would also be conducted remotely. The COVID-19 Response Team continues to meet weekly and be in touch with the TTIC community in order to both disseminate information to and collect information from the TTIC community. The group continues to monitor the public health landscape, follow CDC and local, state, and city health authorities, and safely address the academic and health needs of the TTIC community until the institute can begin to safely resume in-person operations.
Institute Overview

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*An additional 3 more deferring to 2021-2022 due to the pandemic*
Awards and Honors

2020 January  Julia Chuzhoy

Prof. Julia Chuzhoy was awarded the National Academy of Sciences Michael and Sheila Held Prize for advances in discrete optimization and structure of graphs. The award honors outstanding, innovative, creative, and influential research in the areas of combinatorial and discrete optimization, or related parts of computer science, such as the design and analysis of algorithms and complexity theory. Prof. Chuzhoy is recognized for her influential work on algorithms for routing in networks, which has introduced powerful new techniques and resolved deep open questions in the fields of graph algorithms and structural graph theory. She was honored at a ceremony during the National Academy of Sciences’ 157th annual meeting, with 14 other awardees spanning the physical, biological, and medical sciences. The event was moved online due to public health precautions.

2020 February  Jian Peng

TTIC Alumnus Jian Peng (PhD 2013) was the recipient of the 2020 International Society of Computational Biology (ISCB) Overton Prize. The ISCB award highlights scientists in the field of computational biology who are beacons at the junior, mid-term and senior career stage and scientists who have shown extraordinary commitment to the Society and the field at large. The Overton Prize is often considered the most prestigious award for a young scientist in the field of Computational Biology. Dr. Peng is currently an Assistant Professor in the Department of Computer Science and College of Medicine (by courtesy) at the University of Illinois at Urbana-Champaign, as well as the Institute of Genomic Biology (affiliate), Cancer Center at Illinois (affiliate), and National Center of Supercomputing and Applications (affiliate). He conducts research in structure-based genome scale prediction.

2020 June  Julia Chuzhoy

Prof. Julia Chuzhoy served as Program Chair for the 52nd ACM Symposium on Theory of Computing (STOC) 2020. The conference was moved online due to public health precautions.

2019  David Yunis

David Yunis, a newly enrolled student for 2019-20 was awarded a National Science Foundation (NSF) Graduate Research Fellowship. The Fellowship recognizes and supports outstanding graduate students in NSF-supported STEM disciplines who are pursuing research-based master’s and doctoral degrees at accredited U.S. institutions. The five-year fellowship includes three years of financial support including an annual stipend of $34,000 and a cost of education allowance of $12,000 to the institution.
New Faculty: Research Assistant Professors

Brian Bullins | PhD - Princeton University
Mrunmaya Sachan | PhD - Carnegie Mellon University
Saeed Seddighin | PhD - University of Maryland
DJ Sutherland | PhD - Carnegie Mellon University

Faculty Promotion and Tenure

At the May 2020 meeting of the Board of Trustees, upon recommendation of the President, the Trustees approved Greg Shakhnarovich for promotion to full Professor.

Prof. Shakhnarovich received his BSc from Hebrew University in Jerusalem, Israel in 1994 (cum laude), his MSc from Technion, Israel Institute of Technology in 2001 (cum laude), and his PhD from the Massachusetts Institute of Technology in 2005. He spent the next three years as a Postdoctoral Research Associate in the department of computer science and the Brain Sciences Program at Brown University before coming to TTIC.

His research interests include computational vision and machine learning. His current research is focused on automatic understanding of visual scenes, including recovery of three-dimensional structure and detection and categorization of objects. He is also generally interested in similarity-based, supervised and semi-supervised statistical learning methods.

Prof. Shakhnarovich has supervised three TTIC alumni: Payman Yadollahpour, who continued as a postdoc at University of Pittsburgh and MIT CSAIL; Shubhendu Trivedi, who continued as an Institute Fellow at ICERM/Brown University and Research Affiliate of MIT CSAIL; and Mohammadreza Mostajabi, currently a research engineer at Zendar, while advising five students currently in the TTIC PhD program.

He also supervised the thesis of a University of Chicago PhD student, Gustav Larsson, who continued as a Research Engineer at Apple. Prof. Shakhnarovich has been serving as the Director of Admissions since 2014 and serves on several institute committees.
Faculty by Area

**Algorithms and Complexity**
Arturs Backurs
Avrim Blum
Julia Chuzhoy
Madhur Tulsiani
Saeed Seddighin
Sepideh Mahabadi
Thatchaphol Saranurak
Yury Makarychev

**Machine Learning**
Brian Bullins
David McAllester
DJ Sutherland
Nathan Srebro
Steve Hanneke

**Robotics**
Matthew Walter

**Computational Biology**
Michael Yu
Jinbo Xu

**Speech and Language Technologies**
Karen Livescu
Kevin Gimpel
Mrinmaya Sachan
Sam Wiseman

**Computer Vision and Computational Photography**
Greg Shakhnarovich
Matthew Turk

**Post-Docs**

Xiaoyang Jing  | Research Interests: Bioinformatics and machine learning, especially machine learning applications in protein structure prediction

Sheng Wang  | Research Interests: Computational Biology

Hongyang Zhang | Research Interests: Machine Learning, AI Security, Optimization, and their Applications

Pritish Kamath | Research Interests: Machine Learning, Theoretical Computer Science
Accreditation Comprehensive Evaluation Visit

TTIC’s last comprehensive accreditation visit by the Higher Learning Commission (HLC) was in 2014, resulting in a successful renewal.

Accreditation is a ten-year cycle and TTIC follows a “Standard Pathway” which focuses on quality assurance and institutional improvement. Standard Pathway institutional reviews include:

- Annual Institutional Update reports which allow the HLC to monitor organizational health and compliance with certain federal requirements.
- Year 4 Comprehensive Evaluation where an institution undergoes an on-site comprehensive evaluation to ensure it is meeting the Criteria for Accreditation and pursuing institutional improvement.
- Year 10 Comprehensive Evaluation for Reaffirmation, the same process as the evaluation conducted in Year 4, with the addition of a Federal Compliance Review. The Year 10 evaluation leads to an action regarding the reaffirmation of the institution’s accreditation.

On February 3-4, 2020, TTIC underwent its Year 4 Comprehensive Evaluation. The Comprehensive Evaluation involves the following: Submission and review of an Assurance Review (and all supporting evidence) demonstrating compliance with HLC’s Criteria for Accreditation, Student Opinion Survey, and an On-site peer review visit.

The visiting HLC peer reviewers have a tight schedule during their visit and meet with institute leadership, faculty groups, administrative groups, student groups, institute partners, and Trustees. The reviewers determine if the Institute is meeting its obligations under accreditation through discussions and a thorough review of supporting evidence, provided by TTIC. The committee writes a final report at the end of their visit and that report goes before the HLC Institutional Actions Council (IAC) for review and action.

The IAC accepted the peer review team’s report in their meeting on May 4, 2020, and requires one interim report be submitted between now and the Year 10 Comprehensive Evaluation. The Interim Report will be due by June 1, 2022 and include a comprehensive, integrated strategic plan with clear goals and timelines, and with multi-year projections of enrollment, revenues, and expenses. The report should detail how the process "encompasses the institution as a whole and considers the perspectives of internal and external constituent groups."

TTIC was pleased with this outcome, and TTIC President Matthew Turk is undertaking strategic planning efforts for a process that involves all constituents.

The Institute management team is grateful to all parties who participated in the preparation for the HLC Visit, and engaged with the peer reviewing team during their visit in order to share what makes TTIC so unique and productive.

Facility Renovations and Institute Growth

In the summer of 2018, TTIC engaged Gensler, an architectural firm, to develop a plan for our renovation. As part of the design process, Gensler had individual feedback sessions with all constituents – faculty, staff, and students, to ascertain the vision for TTIC’s future. Gensler also assessed the amount of physical space needed to house all the features necessary to accommodate TTIC’s growth plans.

Overall, the goal of the design is to reflect the heart of TTIC: research, education, and collaboration. The design elements direct attention to the main community areas, the spaces adjacent to the atrium on the fifth and fourth floors. And although we are proud of our affiliation with the University of Chicago and grateful to be a member of their community on the Hyde Park campus, the design of our space will reinforce TTIC’s separate and distinguished identity.
In April 2019, the University of Chicago agreed to lease an additional 5,000 square feet in the south side of the floor below our existing two floors in the building. Over the fiscal year 2019-2020, we worked with Gensler to refine and finalize a renovation plan. After receiving the renovation budget approval from the Board of Trustees in Spring 2020, we are now ready to begin renovation in July 2020.

The major focus of the fifth floor is to improve the classroom. The classroom will be relocated and oriented against the north wall instead of its current location adjacent to the atrium in the center of the building. The classroom will have a movable partition wall to create two smaller classrooms, as needed. The classrooms will be equipped with a full AV system with broadcasting capabilities. The major focus of the fourth floor is to renovate and improve the main café with an adjacent collaboration space. The Robotics Lab will be moved, doubled in size, and updated with glass walls to highlight the work of the students.

All existing private offices and storage rooms on both the fifth and fourth floors will be refreshed with coordinating colors, carpets, and wall bases. The new elements on the fifth and fourth floors, including the student workstations, collaboration areas, café, and conference room, will be renovated with coordinating finishes and furniture. Ceiling baffles will be installed for acoustical control in key common areas. There will be writable surfaces throughout all common areas.

Finally, the focus for the newly acquired south side of the third floor is to create space for the administrative staff offices and functions. Each private office will have a door with sidelite frame for additional natural light. The new large conference room will have a fully integrated AV system. The space will include a small café and a significant amount of storage. The interior finishes and furnishings will coordinate with the décor on the fifth and fourth floors.

Thank you to the members of TTIC’s Design Committee for your help and vital input in this arduous process. We are looking forward to sharing the newly renovated space with the entire TTIC community!

Sponsored Research

In FY 19-20, tenured and tenure-track faculty were awarded 8 grants totaling over $2.8 million. Of 15 federal proposals submitted, 5 were awarded: 4 National Science Foundation and 1 National Science Foundation/Simons Foundation Collaboration (33% TTIC success rate vs 23% National Science Foundation Computer, Information Science and Engineering funding success rate average).

The current grants portfolio of $10 million includes:

- 17 National Science Foundation basic and collaborative research awards
- 2 National Science Foundation Graduate Research Fellowship awards
- 1 National Institute of Health award
- 2 Department of Defense awards
- 2 Simons Foundation awards
- Recent corporate awards from Google, Amazon, and the Toyota Research Institute.

Federal grant expenditures hit a record $3 million in FY 19-20.

- Up 92% from FY17; up 57% from FY19
- Ranked #457 of 912 in higher education R&D expenditures*

* Source: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey, FY 2018

Effective July 20, 2020, TTIC’s Federal Negotiated Indirect Cost rate was updated to 46.5% of Modified Total Direct Cost Base - this is comparable to 55% of Salaries & Wages Base (previous TTIC rate was 44% of Salaries & Wages Base).
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.
Arturs Backurs
Research Assistant Professor
www.ttic.edu/backurs

PUBLISHED/SUBMITTED PAPERS

TALKS

INvolvement
Co-organizer, RT-TCS Workshop (TTIC)

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

PUBLISHED/SUBMITTED PAPERS


TALKS

INVolVEMENT
Editorial board: Journal of the ACM
Steering Committee Member, FOCS
Co-Chair: Scientific Advisory Board, Simons Institute for the Theory of Computing
Technical Advisory Board, Microsoft Research India
60th Anniversary Celebration Committee Member, FOCS 2019
CCF Panel Member, NSF

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31250 - An Introduction to the Theory of Machine Learning: This course covers basic theory underlying machine learning and the process of generalizing from data. We discuss fundamental concepts including overfitting, uniform convergence, mistake-bounds, formal notions of Occam’s razor, VC-dimension, Rademacher Complexity, and regularization, as well as several classic algorithms including the Perceptron algorithm, SVMs, algorithms for combining expert advice, and boosting. We also discuss limited-feedback (bandit) algorithms, connections between learning and game theory, and formal guarantees on privacy. This is a proof-oriented course: our focus is on proving performance guarantees for algorithms that aim to generalize from data as well as understanding what kinds of performance guarantees we can hope to prove.

MISCELLANEOUS
Advisor: Kevin Stangl, Keziah Naggita (co-advised with Matt Walter), Han Shao, and Naren Manoj (co-advised with Yury Makarychev).
Thesis Committee: Paul Golz (CMU), Kent Quanrud (UIUC).
Hosted summer interns:
2019: Neha Gupta (Stanford) and Paul Golz (CMU).
2020: Saba Ahmadi (UMD/NU), Soheil Behnezhad (UMD), Mahsa Derakhshan (UMD)
Julia Chuzhoy
Professor
www.ttic.edu/chuzhoy

PUBLISHED/SUBMITTED PAPERS

INVolVEMENT
Program Committee Chair, STOC 2020
Member of editorial board, SICOMP
Member of steering committee, SODA

HonORS/AWARDS
Michael and Sheila Held Prize (National Academy of Sciences)

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31080 and CMSC 37503: Approximation Algorithms: The main focus of this course is on the design of approximation algorithms for combinatorial optimization problems. While exploring algorithms for central combinatorial optimization problems, the course also focuses on major approaches and techniques in algorithm design, such as LP-rounding, Primal-Dual scheme, SDP rounding, and so on. The course explores the question of why some problems have good approximation algorithms while others do not, via hardness of approximation, or inapproximability, proofs.

MISCELLANEOUS
Advisor: Rachit Nimavat (TTIC), Zihan Tan (UChicago), Vadim Grinberg (TTIC).

Sepideh Mahabadi
Research Assistant Professor
www.ttic.edu/mahabadi

PUBLISHED/SUBMITTED PAPERS


TALKS


INVOLVEMENT
Program Committee, RANDOM 2020
Conference Reviews: SODA 2020, STOC 2020, ICALP 2020, ESA 2020, FOCS 2020,
Journal Review, Algorithmica
Workshop Reviews: Recent Trends in TCS workshop (2020), WOLA 2020

HONORS/AWARDS
Selected to participate in the Rising Stars in EECS workshop, 2019
Selected as Rising Stars in TCS, 2020

Yury Makarychev
Professor
www.ttic.edu/makarychev

PUBLISHED/SUBMITTED PAPERS


INVolvEMENT
General Co-chair (local organizer), STOC 2020
Program committee member, ESA 2020
Conference reviews: APPROX 2020, FOCS 2020, SODA 2020, STOC 2020
Journal review, Algorithmica
Jointly with N. Srebro and our colleagues at Northwestern University and the University of Chicago, organized the Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), a multi-discipline and multi-institution collaborative institute that focuses on key aspects of the theoretical foundations of data science

RESEARCH FUNDING AWARDS
NSF Small Award CCF-1718820, $449,986 (2017–2020)
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 (2019–2022)

CLAssES/SEMINARS
TTIC 31010/CMSC 37000-1 - Algorithms: This is a graduate level course on algorithms with the emphasis on central combinatorial optimization problems and advanced methods for algorithm design and analysis. Topics covered include greedy algorithms, dynamic programming, randomized algorithms and the probabilistic method, combinatorial optimization and approximation algorithms, linear programming, and online algorithms.
CMSC 39800 - Reading and Research: Computer Science: Students do reading and research in an area of computer science under the guidance of a faculty member.

MISCeLLANEous
Co-advised Naren Manoj (jointly with Avrim Blum)
Advisor Jafar Jafarov (University of Chicago)
Was in charge of faculty hiring
Was in charge of the programming requirement
Served on the Design Committee
Served on the TA Award Committee

Thatchaphol Saranurak
Research Assistant Professor
www.ttic.edu/saranurak

PUBLISHED/SUBMITTED PAPERS


TALKS


“Expander Decomposition: Applications and How to use it.” Workshop on Advances in Distributed Graph Applications, Budapest, Hungary, October 2019.

“Expander Decomposition: Applications and How to use it.” ACO Student Seminar, Georgia Institute of Technology, October 2019.


“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, Northwestern University, February 2020.

“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, Saarland University, February 2020.

“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, Purdue University, February 2020.

“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, Boston University, March 2020.

“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, University of Michigan, Ann Arbor, March 2020.


“Algorithmic Paradigms for Dynamic Graph Problems.” Computer Science Colloquium, Harvard University, April 2020.

INVolvement
Program Committee, STOC20

HOmors/Awards

Madhur Tulsiani
Associate Professor, Director of Graduate Studies
www.ttic.edu/tulsiani

PUBLISHED/SUBMITTED PAPERS

TALKS
“CSPs and Expansion.” Indo-US Joint Center Workshop on Pseudorandomness, New Delhi, India, July 2019.
“CSPs, Expansion and Codes.” Simons Summer Cluster: Error-Correcting Codes and High-Dimensional Expansion, University of California - Berkeley, July 2019.

INVolvement
Managing Editor, Theory of Computing
Program Committee member, ITCS 2020, STOC 2020
Local Organizer, STOC 2020.
Reviewer: FOCS, SODA, STACS, Journal of Combinatorial Theory

CLASSES/SEMINARS
TTIC 31150 - Mathematical Toolkit: Autumn 2019: The goal of this class is to introduce key concepts in linear algebra and probability, while also providing an exposure to a somewhat rigorous and abstract style of reasoning. In addition to being a required class for all TTIC, it now also satisfies certain requirements for CS students at UChicago.

miSCellaneous
Students Advised: Mrinalkanti Ghosh (TTIC), Shashank Srivastava (TTIC); Fernando Granha Jeronimo (UChicago), Goutham Rajendran (UChicago), Dylan Quintana from (UChicago)
Served as 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.

Jinbo Xu
Professor
www.ttic.edu/xu

PUBLISHED/SUBMITTED PAPERS

INvolvement
Associate Editor: Bioinformatics, Journal of Computational Biology
PC Member: ISMB 2020, RECOMB 2020

Conference Panelist: NSF Bio and NIH MSFD

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31050: Introduction to Bioinformatics and Computational Biology: This course focuses on the application of mathematical models and computer algorithms to studying molecular biology.
Michael Yu  
Research Assistant Professor  
[www.ttic.edu/faculty/yu/](http://www.ttic.edu/faculty/yu/)  

### PUBLISHED/SUBMITTED PAPERS  

### TALKS  

### INVOLVEMENT  
Reviewer, Bioinformatics

### RESEARCH FUNDING AWARDS  
University of Chicago’s Center for Data and Applied Computing Award, “The role of rapid bacterial evolution in human health and disease.” $89,000. April 2019 to April 2020.

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**Computer Vision and Computational Photography**

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.

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Greg Shakhnarovich  
Professor  
[www.ttic.edu/gregory](http://www.ttic.edu/gregory)  

### PUBLISHED/SUBMITTED PAPERS  

TALKS

INvolvement
Area Chair: NeurIPS 2019, CVPR 2020, ICML 2020, ECCV 2020
Associate Editor, IEEE Transactions on Pattern Analysis and Machine Intelligence
Reviewer, SIGGRAPH Asia

HONORS/AWARDS
Innovation Award, ICCV COCO+Mapillary Workshop, 2019.

RESEARCH FUNDING AWARDS
DARPA GARD, “Theoretical Foundations for Highly Robust Learning Systems”, with A. Blum, N. Srebro, M. Balcan (CMU), $2,302,289 (TTIC part), 4 years.
Adobe corporate gift, $7,000.
Toyota Research Institute, Joint TRI/University Program, "Scalable Self-Supervised Learning for 3D Scene Understanding", with J. Solomon (MIT), $522,612 (TTIC part).

MISCELLANEOUS
Advisor: Nick Kolkin, Ruotian Luo, Igor Vasiljevic, Pushkar Shukla (TTIC); Sunnie Kim (TTIC NDVS); Steven Basart (UoC)
Postdoc mentorship: Hongyang Zhang (TTIC, with A. Blum)
Student graduated: Mohammadreza Mostajabi
Internal service: Director of Admissions; IT Faculty Liaison

Matthew Turk
President
www.ttic.edu/turk

PUBLISHED/SUBMITTED PAPERS
TALKS
“Legal and Ethical Considerations of Real-World Face Recognition.” Invited Speaker Talk ICCV Workshop on Real-World Recognition from Low-Quality Images and Videos, Seoul, South Korea, October 2019.
“Legal and Ethical Considerations of Face Recognition.” Distinguished Speaker Talk, Department of Electrical and Computer Engineering, Ohio State University, November 2019.

INvensALvEMEN
Appointed Board Councilor, Toyota Technological Institute at Japan (June 2020)
General Co-Chair, ACM International Conference on Multimodal Interaction (ICMI 2019)
Associate Editor: ACM Transactions on Intelligent and Interactive Systems, Journal of Image and Vision Computing (through 2019)
Area Chair, International Conference on Computer Vision (ICCV 2019)
Co-organizer and Honorary Chair, Workshop on Recognizing Families In the Wild (RFIW), in conjunction with IEEE Face and Gesture Recognition 2020
Updated chapter on Gesture Recognition in Springer publication Computer Vision: A Reference Guide
Reviewer for Proceedings of the National Academy of the Sciences (PNAS), several conferences and workshops

RESEARCH FUNDING AWARDS
(Stepped down as co-PI since all work was planned to take place at UCSB.)

MISCELLANEOUS
Student PhD committees: Xin Wang, Chong Huang, Da Zhang, Jedrzej Kozerawski, Yi Ding, Jocelyn Parong (all UCSB)
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.

**Brian Bullins**
Research Assistant Professor
www.ttic.edu/bullins

**PUBLISHED/SUBMITTED PAPERS**


**TALKS**


**INVOLVEMENT**

**MISCELLANEOUS**
Co-organizer, joint TTIC and University of Chicago Machine Learning Seminar Series
Volunteer instructor, TTIC’s Girls Who Code Club at Andrew Carnegie Elementary School

**Steve Hanneke**
Research Assistant Professor
www.ttic.edu/hanneke

**PUBLISHED/SUBMITTED PAPERS**


TALKS
"VC Classes are Adversarially Robustly Learnable, but Only Improperly.” Google Tech Talk, Google Zurich, Switzerland, August 2019.
"VC Classes are Adversarially Robustly Learnable, but Only Improperly.” Statistical Learning Theory reading group, Northwestern University, August 2019.
"Toward Optimal Agnostic Active Learning.” ML Seminar Series, Purdue University, October 2019.

INvolvement
Area Chair: NeurIPS 2019, ICML 2020, NeurIPS 2020
Action Editor, Machine Learning Journal
Reviewer, Nature Machine Intelligence
Guest reviewer: STOC 2020, COLT 2020

David McAllester
Professor
ttic.edu/mcallester

PUBLISHED/SUBMITTED PAPERS


TALKS

CLASSES/SEMINARS
TTIC 31230 - Fundamentals of Deep Learning (CMSC 31230): Introductory class on general principles of deep learning.
Nathan Srebro  
Professor  
www.ttic.edu/srebro

PUBLISHED/SUBMITTED PAPERS


Rogers, Ryan, Aaron Roth, Adam Smith, Nathan Srebro, Om Thakkar, and Blake Woodworth. “Guaranteed validity for empirical approaches to adaptive data analysis.” Paper presented at the International Conference on Artificial Intelligence and Statistics (AISTATS), Palermo, Italy August 2020.
TALKS
“Inductive Bias and Optimization in Deep Learning.” Israel AI Week, Tel-Aviv, Israel, November 2019.

INvolvement
Member of editorial board, JMLR
Panel member, NSF
Senior Area Chair, NeurIPS 2019
Senior Program Committee Member, COLT 2020
Steering Committee member, Midwest Machine Learning Symposium
Steering Committee member, ACM SIG-FAccT (Fairness Accountability and Transparency)
Expert Reviewer, ICML 2020

Research Funding Awards
NSF: HDR TRIPODS: Collaborative Research: Institute for Data, Econometrics, Algorithms and Learning, $511,610 (TTIC share; lead PI at TTIC)
DARPA: Theoretical Foundations for Highly Robust Learning Systems, $3,088,765 (TTIC share; co-PI)
Simons/NSF: Collaboration on the Theoretical Foundations of Deep Learning, $615,000 (TTIC share; PI at TTIC)

ClaSSes/Seminars
Machine Learning and Optimization Reading Group, about 15 participants, guided seminar analyzing papers in depth

Miscellaneous
PhD thesis committee member, Vaishnavh Nagarajan (CMU)
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
Assistant Professor
www.ttic.edu/walter

PUBLISHED/SUBMITTED PAPERS


TALKS
 "Jointly Optimization over Robot Motion and Control." International Workshop on Symbolic-Neural Learning, Tokyo, Japan, July 2019.
 "Natural Language Learning for Human-Robot Collaboration." DePaul University, May 2020.

INVolVEMENT
 Associate Editor: RA-L, THRI, ICRA
 Steering Committee member, Northeast Robotics Colloquium
 Panelist: NSF Graduate Research Fellowship Program, European Research Council Starting Grant
 Contributor, AI-DO, NeurIPS 2019
 Volunteer Staff, Duckietown Foundation
 Senior Program Committee member: IJCAI, AAAI
 Program Committee member: EMNLP, ACL, NeurIPS, EACL, AISTATS, RoboNLP
 Conference Reviews: ICML, CoRL, Autonomous Robots, ICRA, IROS, HRI
 Organizer, CVPR 2020 Workshop on Frontiers of Monocular 3D Perception (accepted)

CLASSES/SEMINARS
 TTIC 31180: Probabilistic Graphical Models: This course provides a strong foundation for learning and inference with probabilistic graphical models. The course introduces the underlying representational power of graphical models, including Bayesian and Markov networks, and dynamic Bayesian networks. The course also investigates contemporary approaches to statistical inference, both exact and approximate and surveys state-of-the-art methods for learning the structure and parameters of graphical models.
 Robotics Reading Group

MISCELLANEOUS
 Qualifying Exam Committee Member: Xiao Luo (TTIC), Shashank Srivastava (TTIC)
 Thesis Committee Member, Jacob Arkin (University of Rochester)
 Supervisor, Four Chicago Public Schools (CPS) Career and Technical Education (CTE) interns
 Czar: TTIC Young Researcher Seminar Series, TTIC Industry Affiliates Program Senior Member, IIEEE
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.

Kevin Gimpel
Assistant Professor
www.ttic.edu/gimpel

PUBLISHED/SUBMITTED PAPERS

**TALKS**

**INvolvement**
Member of editorial board, Computational Linguistics
Area Chair, Machine Learning for NLP, ACL 2020
Undergraduate Research Award Committee, CRA 2019 Best Paper Committee, CoNLL
Panel member, NSF 2020
Journal reviews: JMLR, TACL
Conference reviews: *SEM 2020, EMNLP 2019 (outstanding reviewer), CoNLL 2019 (reviewer commendation)

**Honors/Awards**
Best Paper Award, Nomination, ACL 2019 for Shi et al. (2019).

**Research Funding Awards**

**Classes/Seminars**
TTIC 31020: Introduction to Machine Learning. Fall 2019: A systematic introduction to machine learning, covering theoretical as well as practical aspects of the use of statistical methods. Topics include linear models for classification and regression, support vector machines, regularization and model selection, and introduction to structured prediction and deep learning. Application examples are taken from areas like information retrieval, natural language processing, computer vision and others.
Co-facilitator, Speech and Language at TTIC (SL@TTIC) reading group.

**Miscellaneous**
Advisor: Mingda Chen (TTIC), Lingyu Gao (TTIC), Freda Shi (TTIC, co-advised with K. Livescu), Shubham Toshniwal (TTIC, co-advised with K. Livescu), Lifu Tu (TTIC), Davis Yoshida (TTIC), Zewei Chu (UChicago), Xiaolan Ding (UChicago).
Member of PhD dissertation committee for: Zewei Chu (UChicago), Pramod Kaushik Mudrakarta (UChicago), Takeshi Onishi (TTIC), Aynaz Taheri (UIC), Qingming Tang (TTIC), John Wieting (CMU), and Hai Wang (TTIC).
Internal service: website committee, faculty coordinator of visiting student program.
Karen Livescu
Associate Professor
www.ttic.edu/livescu

PUBLISHED/SUBMITTED PAPERS

TALKS

INvolvement
Technical chair, ASRU 2019
Area chair: ICLR 2020, Interspeech 2020
Associate editor, IEEE Open Journal of Signal Processing
Standing review committee member, Transactions of the ACL
Organizing committee member, Workshop for Young Female Researchers in Speech Science and Technology 2018-2019 (Interspeech satellite workshops)
Conference reviews: ICASSP 2020, ACL 2020
Other reviews: NSF Career Award panelist

RESEARCH FUNDING AWARDS
Amazon AWS Machine Learning Research Award, $70K, 2019

CLASSES/SEMINARS
TTIC 31110: Speech Technologies: This course will introduce techniques used in speech technologies, mainly focusing on speech recognition and related tasks. Speech recognition is one of the oldest and most complex structured sequence prediction tasks receiving significant research and commercial attention, and therefore provides a good case study for many of the techniques that are used in other areas of artificial intelligence involving sequence modeling. The course will cover core techniques in detail, including hidden Markov models, recurrent neural networks, and conditional random fields. The course will include practical homework exercises where we will build and experiment with speech processing models. Finally, it will include a sampling of the connections between speech and other modalities like images and text.

MISCELLANEOUS
Steering Committee member, UChicago Center for Data and Computing
TTIC thesis committee member, Lifu Tu (TTIC)
Visiting/external students advised: Shuning Jin (University of Minnesota /University of Maryland), Yushi Hu (UChicago)
Internal TTIC service: Colloquium organizer, student support coordinator, student workshop faculty advisor, renovation design committee member, faculty mentor to Sam Wiseman, acting Director of Graduate Studies (Feb.-Mar.)

Sam Wiseman
Research Assistant Professor
www.ttic.edu/wiseman

PUBLISHED/SUBMITTED PAPERS

IN Volvement
Area Chair, ACL 2020, Generation track.
Conference reviews: ICLR 2020, ICML 2020, NeurIPS 2020
Journal review, TACL

MISCELLANEOUS
Thesis committee member, Lifu Tu (TTIC)
Co-advisor: Shuning Jin (Rutgers), Tianyu Liu (Peking University)
Visiting and Adjoint Faculty

David Chiang, Adjoint Professor, TTIC  
Associate Professor, University of Notre Dame  
PhD - University of Pennsylvania

Travis Dick, Visiting Faculty, TTIC  
Postdoctoral Fellow, University of Pennsylvania  
PhD - Carnegie Mellon University

David Forsyth, Adjoint Professor, TTIC  
Professor, University of Illinois at Urbana-Champaign  
PhD - Balliol College, Oxford

Sanjeev Khann, Adjoint Professor, TTIC  
Professor, University of Pennsylvania  
PhD - Stanford University

Richard Lipton, Adjoint Professor, TTIC  
Professor and Frederick G. Storey Chair (emeritus), Georgia Institute of Technology  
PhD - Carnegie Mellon University

Seiichi Mita, Adjoint Professor, TTIC  
Senior Research Scholar, TTI-Japan  
PhD - Kyoto University

Robert Nowak, Adjoint Professor, TTIC  
Professor, University of Wisconsin-Madison  
PhD - University of Wisconsin-Madison

Alexander Razborov, Resident Adjunct Professor, TTIC  
Professor, University of Chicago  
PhD - Steklov Mathematical Institute

Yutaka Sasaki, Adjoint Professor, TTIC  
Professor, TTI-Japan  
PhD - University of Tsukuba

Stephen Wright, Adjoint Professor, TTIC  
Professor, University of Wisconsin-Madison  
PhD - University of Queensland
László Babai  
George and Elizabeth Yovovich Professor,  
Departments of Computer Science and Mathematics, University of Chicago  
PhD - Hungarian Academy of Sciences, Budapest

Allyson Ettinger  
Assistant Professor, University of Chicago  
PhD - University of Maryland, College Park

Michael Franklin  
Liew Family Chair of Computer Science, University of Chicago  
PhD - University of Wisconsin

Mladen Kolar  
Associate Professor of Econometrics and Statistics, Booth School of Business, University of Chicago  
PhD - Carnegie Mellon University

Risi Kondor  
Assistant Professor, Departments of Computer Science and Statistics, University of Chicago  
PhD - Columbia University

Michael Maire  
Assistant Professor, Department of Computer Science, University of Chicago  
PhD - University of California, Berkeley

Janos Simon  
Professor and Director of Graduate Studies, Department of Computer Science, University of Chicago  
PhD - Cornell University

Rebecca Willett  
Professor, Departments of Statistics and Computer Science, University of Chicago  
PhD - Rice University
Arturs Backurs is working with Kyriakos Axiotis (MIT CSAIL), Karl Bringmann (Max Planck Institute for Informatics), Ce Jin (MIT), Vasileios Nakos (Saarland University), Christos Tzamos (University of Wisconsin, Madison), and Hongxun Wu (Tsinghua University) on the modular subset sum problem, supported by NSF Small Grant CCF-2006806.

Arturs Backurs is working with Amir Abboud (Stanford), Karl Bringmann (Max Planck Institute for Informatics), and Marvin Künnemann (Max Planck Institute for Informatics) on impossibility results for grammar-compressed linear algebra, supported by NSF Small Grant CCF-2006806.

Greg Shakhnarovich is working with Karen Livescu (TTIC), TTIC student Bowen Shi, and Diane Brentari (University of Chicago) on automatic recognition of American Sign Language.

Greg Shakhnarovich and TTIC students Nick Kolkin and Sunnie Kim are collaborating with Jason Salavon (University of Chicago) on deformable style transfer, supported in part by the University of Chicago CDAC seed grant.

Greg Shakhnarovich and TTIC student Nick Kolkin are collaborating with Eli Shechtman and Sylvain Paris (Adobe Research) on automatic visual style transfer, supported in part by a gift from Adobe and the DARPA.

Greg Shakhnarovich and TTIC student Ruotian Luo are collaborating with Rebecca Willett (University of Chicago) on recognition of change in visual data, supported in part by the NSF and the Air Force University Center of Excellence.

Greg Shakhnarovich and TTIC student Igor Vasiljevic are collaborating with Adrien Gaidon and Vitor Guizilini (Toyota Research Institute) on 3D perception with camera systems, supported in part by the Air Force University Center of Excellence and the TRI University 2.0 program.

Greg Shakhnarovich is working with Norimichi Ukita (Toyota Technological Institute) on image and video super-resolution, supported in part by the DARPA and the Air Force University Center of Excellence.
Talks, Seminars, and Workshops

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

The table below lists seminars given at TTIC, many of which are given by speakers from other universities and research institutions, as part of the TTIC Colloquium: a forum for talks by invited speakers on work of current relevance and broad interest to the computer science community. Other talks may be a part of the Research at TTIC series: a weekly seminar series presenting research currently underway at the Institute. Every week a different TTIC faculty member will present their research. The lectures are intended both for students seeking research topics and advisers, and for the general TTIC and University of Chicago communities interested in hearing what their colleagues are currently involved in. The Young Researcher Seminar Series features talks by PhD 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Speakers</th>
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<td>Madhur Tulsiani</td>
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</table>
TTIC held its second annual Summer Workshop Program over the summer of 2019. There were four exciting week-long workshops organized by researchers around the country (and globe) and held at TTIC. All four workshops involved a lively exchange of ideas. Workshops supported by internal TTIC funding and in part by external support including NSF grant CCF-1815011.

Automated Algorithm Design

[August 7-9, 2019] This workshop focused on new machine learning techniques for automatically designing algorithms. Algorithms are central to modern computing, and they have lots of applications in our life. Yet, writing correct, efficient algorithms is a time-consuming and difficult task. This often requires intuition and expertise to tailor algorithmic choices to specific instances that arise in particular applications. However, there have been a number of recent advancements that have allowed algorithms to be selected or designed from specific algorithmic families automatically, often leading to either state-of-the-art empirical performance or provable performance guarantees on observed instance distributions. In this workshop, we took a broad view of the problem and sought to bring together researchers with different viewpoints and approaches to the general challenge.

Organizers: Nina Balcan (Carnegie Mellon University), Bistra Dilkina (University of Southern California), Carl Kingsford (Carnegie Mellon University), Paul Medvedev (Penn State University)

Learning-Based Algorithms

[August 12-14, 2019] This workshop covered recent developments in using machine learning to improve the performance of “classical” algorithms, by adapting their behavior to the properties of the input distribution. This reduces their running time, reduces space usage, or improves their accuracy, while (often) retaining worst case guarantees.

This workshop covered general approaches to designing such algorithms, as well as specific case studies. We planned to cover learning-augmented methods for designing data structures, streaming and sketching algorithms, on-line algorithms, compressive sensing and recovery, error-correcting codes, scheduling algorithms, and combinatorial optimization. The attendees spanned a diverse set of areas, including theoretical computer science, machine learning, algorithmic game theory, coding theory, databases, and systems.

Organizers: Piotr Indyk (MIT), Yaron Singer (Harvard), Ali Vakilian (MIT), Sergei Vassilvitskii (Google Research, NYC)
Midwest Computational Biology Workshop

[September 12-13, 2019] The 2019 Midwest Computational Biology Workshop explored emerging topics in the field of computational biology, covering a spectrum of algorithmic and machine learning challenges to address biological questions. The workshop will bring together a wide range of participants from different backgrounds (computer science, biology, and medicine) and positions (undergrads, grad students, faculty, and industry professionals). By connecting these researchers, the workshop aimed to initiate new interdisciplinary interactions and collaborations. The workshop was organized around five sessions: protein structure, cancer genomics, immunology, brain connectomics, and microbiome. Each session included 4 invited talks about current research and open problems, as well as a discussion period to brainstorm collaborative solutions.

Organizers: Michael Yu (TTIC), Aly Khan (TTIC), Jinbo Xu (TTIC)

Recent Trends in Clustering: Theory and Practice

[September 18-20, 2019] Clustering and classification play a central role in machine learning systems for processing images, text, high-dimensional data, graph-based learning and various other use cases of unsupervised and supervised learning. Despite its long history, clustering and classification are still active areas of research, and in the past decade, a variety of new techniques and new models have been applied to these applications. This workshop gave an overview of new angles on this topic including scalable algorithms for high-dimensional and graph-based data, novel models and objectives (including hierarchical and overlapping), applications in semi-supervised and unsupervised learning, beyond worst-case analysis and robustness, fairness and privacy, and deep learning-augmented techniques.

Organizers: Vahab Mirrokni (Google Research, NYC), Suresh Venkatasubramanian (University of Utah), Grigory Yaroslavtsev (Indiana University, Bloomington)

TTIC has selected the 2020 summer workshops, however due to public health regulations of the COVID-19 pandemic, those workshops will be held in the summer of 2021.
Distinguished Lecture 2019

Shafi Goldwasser
Director, Simons Institute for the Theory of Computing
Professor, Electrical Engineering and Computer Science, University of California Berkeley
Professor, Electrical Engineering and Computer Science, MIT
Professor, Computer Science and Applied Mathematics, Weizmann Institute of Science

[November 8, 2019 at TTIC]
Talk Title: “Pseudo Deterministic Algorithms and Proofs”

Recent Trends in Theoretical Computer Science Workshop

[January 31, 2020 at TTIC]
The workshop aimed to bring together leading researchers from different areas of Theoretical Computer Science (TCS) with the goal of presenting the latest research to a broad TCS audience from Chicago and surrounding areas, and increasing the interaction between different areas of TCS. The workshop was organized by TTIC Research Assistant Professors Arturs Backurs and Sepideh Mahabadi. There were over 20 speakers.

4th Annual TTIC Student Workshop

[February 21, 2020 at TTIC] The 4th annual TTIC Student workshop aimed to help students develop professionally and be better prepared for a career in academia or industry. The workshop was all-day and highlighted student research including talks and poster sessions.

Student Symposium: This included 9 research talks and 2 poster presentation sessions by students working at TTIC (enrolled or not). Students submitted abstracts and gave a talk or poster presentation. This is intended to accustom the students to presenting their research and also create an awareness for the research being done by students at TTIC to the greater community. A committee consisting of faculty members awarded best talk and best poster awards at the conclusion of the symposium. The keynote talk was given by TTIC alumnus, Hao Tang (PhD 2017).

Awards for the 2019 Student Workshop went to:

Best Talk Award: Davis Yoshida
Best Poster Award: Pedro Savarese

Organizing Committee: Sudarshan Babu, Freda Shi, Karen Livescu, Madhur Tulsiani, Erica Cocom, Chrissy Coleman
Talk Award Committee: Pritish Kamath, Sepideh Mahabadi, Sam Wiseman
Poster Award Committee: Arturs Backurs, Mrinmaya Sachan
The TTIC PhD 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 of Chicago, 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 awarded one doctoral diploma at the diploma ceremony in September 2019 to:

Mohammadreza Mostajabi, studied under Professor Greg Shakhnarovich, with research interests in machine learning and computer vision. Mohammadreza is currently employed as a Research Engineer at Zendar.

TTIC expects three PhD Candidates to be eligible for doctoral degrees in the September 2020 diploma ceremony.

Students Sudarshan Babu, Andrea Daniele, Lingyu Gao, Shengjie Lin, Shengjie Lin, Omar Montasser, Ankita Pasad, Kevin Stangl, Igor Vasiljevic, and Davis Yoshida successfully fulfilled all requirements to complete the Master’s portion of the PhD Program, and received master’s diplomas from the institute at the September 2019 diploma ceremony at the start of the academic year. Pics of grads/ event

Kevin Stangle was awarded the first-ever Outstanding Teaching Assistant Award at the September 2019 diploma ceremony. The annual award was created to recognize outstanding performance of teaching assistants (TAs) of courses at the Toyota Technological Institute at Chicago. Students enrolled in TTIC courses may nominate the course TA(s) for the award throughout the academic year. An award committee reviews nominations and selects a winner. A TA Award plaque displays the names of award recipients.
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 continues to increase.

TTIC instructors are proud to offer a quality curriculum and rigorous courses to institute PhD students and the students from the University who take part. The increase in course enrollments, and with that, course delivery demands, is a consideration as TTIC moves forward in its space needs planning.

Course Enrollment Numbers for TTIC Courses

![Course Enrollment Numbers](image-url)
COVID-19 Pandemic Leads To Academic Changes

In March 2020, the COVID-19 global pandemic and the growing infection rate around the globe led to new restrictions in the state of Illinois and city of Chicago. TTIC very quickly had to move from fully in-person operation to fully remote operation, advisement, and course instruction inside of one week, starting with the final exam period for the spring quarter 2020. Faculty and students were quickly able to utilize resources such as Canvas, Zoom, Slack, and the Google Workspace to connect and persist in their work.

In cooperation with the University of Chicago, TTIC adjusted its spring academic calendar, delaying the start of the quarter by one week (from March 30 to April 6) to allow faculty and administration to prepare for an effective change to fully remote operation. The following courses were offered for Spring Quarter 2020, which became fully remote:

- TTIC 31180 - Probabilistic Graphical Models | Matthew Walter
- TTIC 31110 - Speech Technologies (CMSC 35110) | Karen Livescu
- TTIC 31250 - Introduction to the Theory of Machine Learning | Avrim Blum

TTIC added a question to all spring course evaluations to allow students to comment on their experience with regards to the online format and delivery. Over 75% of student respondents were satisfied or pleased with the remote course delivery. Faculty continued to share tips and proven applications with other faculty as the group learned more about what worked well in courses, check-ins with students, and online group interactions.

Qualifying exams, typically held in the spring, were conducted remotely over the spring and summer of 2020. Exam committees and students managed the revised process well, and the remote format seemed to have no negative impact on exam outcomes.

The 2020 admission season involved challenges for international students accepted into the PhD program. Globally, U.S. embassies closed and it was not possible to process student visas or conduct immigration interviews. Additionally, government guidance for students inside the U.S. on student visas became unclear as their requirements for in-person attendance did not keep up with changing circumstances where campuses were switching to remote operation. In the end, four newly admitted students plan to enroll at TTIC in autumn 2020, and 3 will defer to autumn 2021 in hopes that immigration and travel safety may be more normal.

TTIC observed processes of informing the Higher Learning Commission (HLC) about changes to program operations and curriculum delivery. The PhD program is an in-person, in-residence program, and the institute confirmed with the HLC that as soon as public health restrictions are lifted, the program will return to that format.

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. All students at TTIC may expect to receive financial support that covers tuition, health services, health insurance and student services fees, a new student equipment allowance, and a stipend paid for research assistance, provided they remain full-time and in good academic standing.


Student Admissions and Student Body Growth

In the fall of 2004, TTIC matriculated its first three students. The 2019-20 academic year began with forty-two students, nine who enrolled as first time new students for Autumn 2019.

PhD program applicants continue to increase year after year, with the highest jump in the 2018 admissions season. TTIC saw one of its largest incoming classes to date in 2019, of 9 students. This ties with 9 students in 2015.

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<td>2013</td>
<td>33</td>
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TTI Japan Exchange Students

This year TTIC welcomed four exchange students from the Toyota Technological Institute located in Nagoya, Japan (TTIJ).

Takahiro Maeda and Takeru Oba arrived in September 2019, and enrolled in TTIC courses. They returned to TTIJ in late December. Masaki Asada and Tomoki Tsujimura arrived in January, and engaged in research over the winter quarter. Tomoki spent time studying at TTIC once before in 2016-17.

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 and plans to enroll will continue as soon as in-person instruction resumes.
The year 2020 will forever be synonymous with the COVID-19 pandemic, and like all other higher education institutions, the virus forced us to change how we operate. However, unlike most other higher education institutions, TTIC did not experience adverse financial repercussions. In fact, fiscal year 2019-2020 was another year of progress in our plans for growth, related to our infrastructure and financial assets.

The Board of Trustees approved a high-level budget of approximately $7 million to allow renovation to begin on TTIC’s existing and newly acquired space under lease from the University of Chicago. The Finance Committee of the Board of Trustees decided to fund renovation through a withdrawal of unrestricted investments. Although there were competitive and low borrowing rates available to TTIC, ultimately the Committee did not want to take on debt.

Because of remote operations due to the COVID-19 pandemic, TTIC will not incur the cost of “swing space” for operations while facility renovations are underway. TTIC has hired the University of Chicago Facilities Services to manage the renovation, which will begin in July 2020 and is estimated to be completed in time for Autumn Quarter in October 2020.

In January 2020, TTIC hired Aon Investments USA Inc. to assist the Finance Committee in creating an Investment Policy Statement (IPS). Restructuring our asset allocation to increase investment return with an acceptable level of risk is our first step in generating additional operating revenue to support our growth plans. The IPS will apply to all TTIC’s investable assets, and will serve to identify roles and responsibilities, establish investment objectives policies and procedures, define annual draw policy, establish long-term asset allocation targets, and establish guidelines to monitor the performance in comparison to stated objectives. At the end of fiscal year 2019-2020, the Finance Committee is in the process of finalizing the IPS, specifically the annual draw policy and evaluating the right endowment management model for TTIC.
Operating Results

A portion of TTIC’s operating revenue is derived from external grants, equating to 30%. As TTIC’s research was able to continue remotely, there was no impact on grant revenue due to COVID-19. Except for tuition paid by the University of Chicago, the remainder of TTIC’s operating revenue is the distribution of investment return, which to date, has not been significantly impacted by COVID-19. Overall, operating revenue exceeded budget by 4%, primarily due to an increase in grants revenue.

Regarding operating expenses, TTIC has been able to successfully transition to remote operations. While TTIC is saving money on travel and events-related expenses, we have also paid for the outfitting of work-from-home set-ups and a monthly telecommunication stipend of $100 for the entire community. Overall, TTIC ended the fiscal year with an operating surplus of over $1 million.

Although there are still more questions than answers regarding how the COVID-19 pandemic ends, TTIC is fortunate to be in a strong financial position with approximately $68 million in unrestricted financial assets. Not only is TTIC poised to successfully navigate the challenges of the global pandemic, but we are also in a strong financial position to continue our growth plan.

In conclusion, I would like to thank the TTIC administrative staff for their flexibility during a stressful time. Transitioning to remote operations was sudden, and the team rose to the challenge. I am very grateful for their hard work, commitment, and teamwork. I am looking forward to returning from remote operations to a newly renovated facility – and celebrating with the entire TTIC community!

Jessica Jacobson
Chief Financial Officer
# Toyota Technological Institute at Chicago

## Statement of Financial Position

### June 30, 2020 and 2019

<table>
<thead>
<tr>
<th>Assets</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$13,901,797</td>
<td>$5,384,737</td>
</tr>
<tr>
<td>Receivables:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous receivable</td>
<td>$85,165</td>
<td>$120,387</td>
</tr>
<tr>
<td>Grants receivable</td>
<td>$737,034</td>
<td>$602,271</td>
</tr>
<tr>
<td>Due from TTI (Note 10)</td>
<td>$1,299</td>
<td>$1,559</td>
</tr>
<tr>
<td>Interest receivable</td>
<td>$1,169,499</td>
<td>$1,268,401</td>
</tr>
<tr>
<td>Investment distribution receivable</td>
<td>$4,089,694</td>
<td>$4,035,253</td>
</tr>
<tr>
<td>Prepaid expenses and other current assets</td>
<td>$330,690</td>
<td>$26,310</td>
</tr>
<tr>
<td><strong>Investments</strong> (Note 4)</td>
<td>$243,833,782</td>
<td>$254,134,213</td>
</tr>
<tr>
<td><strong>Furniture and Equipment</strong> - Net (Note 5)</td>
<td>$6,830,440</td>
<td>$706,704</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$270,979,400</td>
<td>$266,279,835</td>
</tr>
</tbody>
</table>

| Liabilities and Net Assets      |               |               |
| Current Liabilities             |               |               |
| Accounts payable                | $125,888      | $429,029      |
| Accrued expenses                | $917,640      | $738,377      |
| Accrued lease liability (Note 8) | $284,191     | $329,775      |
| Deferred revenue                | $11,600       | $922,607      |
| **Total liabilities**           | $1,327,719    | $2,419,788    |

| **Net Assets** (Note 6)         |               |               |
| Without donor restrictions      | $67,932,936   | $65,272,026   |
| With donor restrictions         | $201,718,745  | $198,588,021  |
| **Total net assets**            | $269,651,681  | $263,860,047  |

| **Total liabilities and net assets** | $270,979,400 | $266,279,835 |
## Toyota Technological Institute at Chicago

### Statement of Activities and Changes in Net Assets

**Years Ended June 30, 2020 and 2019**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue, 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</td>
<td>$1,357,088</td>
<td>$ -</td>
<td>$1,357,088</td>
<td>$1,135,848</td>
<td>$ -</td>
<td>$1,135,848</td>
</tr>
<tr>
<td>Scholarships</td>
<td>(1,290,000)</td>
<td>-</td>
<td>(1,290,000)</td>
<td>(1,050,000)</td>
<td>-</td>
<td>(1,050,000)</td>
</tr>
<tr>
<td>Total net student tuition and fees</td>
<td>67,088</td>
<td>-</td>
<td>67,088</td>
<td>85,848</td>
<td>-</td>
<td>85,848</td>
</tr>
<tr>
<td>Other interest</td>
<td>93,657</td>
<td>-</td>
<td>93,657</td>
<td>38,317</td>
<td>-</td>
<td>38,317</td>
</tr>
<tr>
<td>Net realized and unrealized gains on investments</td>
<td>1,807,887</td>
<td>5,822,489</td>
<td>7,630,376</td>
<td>2,889,883</td>
<td>8,020,961</td>
<td>10,910,844</td>
</tr>
<tr>
<td>Investment (loss) income - Net of investment fees</td>
<td>(245,637)</td>
<td>4,552,517</td>
<td>4,306,880</td>
<td>(163,320)</td>
<td>4,801,726</td>
<td>4,638,406</td>
</tr>
<tr>
<td>Net assets released from restrictions</td>
<td>7,244,282</td>
<td>(7,244,282)</td>
<td>-</td>
<td>7,271,228</td>
<td>(7,271,228)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total revenue, gains, and other support</strong></td>
<td>13,341,479</td>
<td>3,130,724</td>
<td>16,472,203</td>
<td>12,477,362</td>
<td>5,551,459</td>
<td>18,028,821</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>8,226,644</td>
<td>-</td>
<td>8,226,644</td>
<td>7,378,567</td>
<td>-</td>
<td>7,378,567</td>
</tr>
<tr>
<td>Management and general expenses - Institutional support</td>
<td>2,453,925</td>
<td>-</td>
<td>2,453,925</td>
<td>2,102,266</td>
<td>-</td>
<td>2,102,266</td>
</tr>
<tr>
<td><strong>Total expenses</strong></td>
<td>10,680,569</td>
<td>-</td>
<td>10,680,569</td>
<td>9,480,833</td>
<td>-</td>
<td>9,480,833</td>
</tr>
<tr>
<td><strong>Increase in Net Assets</strong></td>
<td>2,660,910</td>
<td>3,130,724</td>
<td>5,791,634</td>
<td>2,996,529</td>
<td>5,551,459</td>
<td>8,547,988</td>
</tr>
<tr>
<td><strong>Net Assets - Beginning of year</strong></td>
<td>65,272,026</td>
<td>198,588,021</td>
<td>263,860,047</td>
<td>62,275,497</td>
<td>193,036,562</td>
<td>255,312,059</td>
</tr>
<tr>
<td><strong>Net Assets - End of year</strong></td>
<td>$67,932,936</td>
<td>$201,718,745</td>
<td>$269,651,681</td>
<td>$65,272,026</td>
<td>$198,588,021</td>
<td>$263,860,047</td>
</tr>
</tbody>
</table>
TTIC maintains a steady number of interns and visiting scholars who engage in study and research on the premises. Summer 2019 had seventeen visiting scholars from other institutions in the U.S. and abroad who came to the Institute to work on research projects in collaboration with TTIC faculty and students. Due to pandemic travel restrictions and closed campus, TTIC faculty could only offer remote engagement for interns over the summer 2020.

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. TTIC hopes to be back to the usual intern/visiting scholar program in the summer of 2021.

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

Carlson, Charles, University of Colorado, Boulder (Yury Makarychev)
Dahirrooyfard, Mina, Massachusetts Institute of Technology (Julia Chuzhoy & Yury Makarychev)
Derakhshan, Mahsa, University of Maryland (Avrim Blum)
Ge, Ruiquan, Hangzhou Dianzi University of Technology, China (Jinbo Xu)
Gölz, Paul, Carnegie Mellon University (Avrim Blum)
Granha, Fernando Jeronimo, University of Chicago (Madhur Tulsiani)
Gupta, Neha, Stanford University (Avrim Blum)
He, Linyang, Fudan University (Allyson Ettinger)
Hou, Yifan, The Chinese University of Hong Kong (Mrinmaya Sachan)
Hu, Yushi, University of Chicago (Sam Wiseman)
Jafarov, Jafar, University of Chicago (Yury Makarychev)
Jin, Shuning, University of Minnesota, Duluth (Karen Livescu)
Khan, Samir, University of Chicago (Nati Srebro)
Kim, Suhyoung (Sunnie), Princeton University (Greg Shakhnarovich)
Kong, Lupeng, Institute of Computing Technology, Chinese Academy of Sciences (Jinbo Xu)
Li, Jason, Carnegie Mellon University (Julia Chuzhoy & Yury Makarychev)
Li, Jin Jun, University of Chicago (Jinbo Xu)
Liu, Dongpeng, University of Missouri (Jinbo Xu)
Liu, Qingyuan, University of Michigan (Jinbo Xu)
McPartlon, Matthew, University of Chicago (Jinbo Xu)
Melia, Owen, University of Chicago (Nati Srebro)
Rajendran, Goutham, University of Chicago (Madhur Tulsiani)
Tan, Zihan, University of Chicago (Julia Chuzhoy)
Wu, Fandi, Institute of Computing Technology, Chinese Academy of Sciences (Jinbo Xu)
Zhang, Ruotian, Tsinghua University (Jinbo Xu)
Cabada, Cristian, Chicago Public Schools (Matt Walter)
Coward, Julian, Chicago Public Schools (Matt Walter)
Morales, Alonso, Chicago Public Schools (Matt Walter)
Padua, Jonathan, Chicago Public Schools (Matt Walter)
Wu, Katherine, Thomas Jefferson High School for Science and Technology (Jinbo Xu)
Constituent and Community Outreach

Support for Black Lives Matter

The summer of 2020 put race and equity under a microscope. The U.S experienced widespread social unrest as events involving the killing of African-Americans, many at the hands of the police, false police reports, and shootings of innocent black citizens continued to be made public.

TTIC is located in the Hyde Park neighborhood on the South Side of Chicago: a neighborhood known for its student and faculty population, treasured diversity, and a proud history of social activism. Members of the TTIC community felt compelled to look inward and explore what they and the institute can do to address civil rights and injustice and to promote diversity and equity.

TTIC made a public statement via our website and social media:

TTIC supports those demanding an end to intolerance, discrimination, marginalization, and bigotry. TTIC’s Mission Statement says: “TTIC is committed to the values of human freedom, dignity, prosperity, and diversity.” President Turk confirmed in an internal mail to the TTIC community on Tuesday that the Institute is firmly committed to those values, and supports those demanding an end to intolerance, discrimination, marginalization, and bigotry. Racism and discrimination have devastating effects on society. Silence plays a key role in upholding and supporting narratives that contribute to systems of oppression and injustice.

The recent killings of George Floyd, Breonna Taylor, and Ahmaud Arbery, along with too many others, have caused profound new grief and adversely affect our lives and the lives of those we care about in significant ways. We must individually and collectively reflect on the lives lost unnecessarily, and the systemic problems and challenges we all face as a society. The unnecessary race-based killings and violence must end.

TTIC announced that any donation made by a TTIC member (faculty, staff students) to an organization supporting causes of civil liberties would be matched by TTIC, with TTIC’s donation going to Black Lives Matter. On June 25, 2020, TTIC donated $2,050 to Black Lives Matter.
Students Donate to Support Diversity on the South Side

The PhD program student body organized over summer 2020 and elected to donate $750 of their TTIC-provided Student Body Funds (funding for student social activity) to Brave Space Alliance, an organization dedicated to providing a “brave space” for TGNC (trans gender non-conforming) people of color on the South and West Side of Chicago.

New Institute Diversity, Equity, and Inclusion Committee

TTIC created a Diversity, Equity and Inclusion (DEI) Committee consisting of faculty, staff and student volunteers who will examine the DEI landscape within the institute, in the surrounding community, and in the U.S. The committee will consider what individuals, the institute, and the field of computer science can do to support and broaden the impact of supportive efforts on equity, diversity, and inclusion. This will be a standing committee of TTIC and the community is enthusiastic to play a role.

Committee members:
- Rose Bradford (Co-Chair), Administrator
- Erica Cocom, Administrator
- Lingyu Gao, Student
- Sepideh Mahabhadi, Faculty
- Greg Shaknarovich (Co-Chair), Faculty
- David Yunis, Student

Women at TTIC

Women at TTIC is a group of women faculty, research assistant professors, courtesy faculty, and PhD students. Over the 2019-20 academic year, they were pleased to welcome two new PhD students to the group, and also enjoyed the interim company of two visiting students. The group has been enjoying hearty conversations over lunch for a little over three years now, usually meeting quarterly. The remote setting for the latter half of 2020 urged them to get more creative, and they were able to have a couple of fun sessions with virtual Balderdash and Escape room events. They were also able to have a joint event with University of Chicago Grad Women in Computer Science (GWICS) which enabled more interdepartmental interaction.

Chicago Youth and TTIC Partnerships

TTIC participated for the first time in the Chicago Public Schools’ Career and Technical Education (CTE) program, engaging with CPS students through mentorship and professional development. Prof. Matt Walter hosted a Job Shadow Day as well as a six-week summer internship for four Lindblom Math & Science Academy students. The exposure helps students to develop job readiness and professional skills, and gain real-world experience and a better perspective on future plans. Other outreach to local minority-serving Chicago Public Schools began in 2018 with STEM-related community grant submission assistance and matching and continued in 2019 with a Computer Science Education Week lecture and robotics demonstration (James E. McDade Classical School).
Girls Who Code

TTIC is facilitating Girls Who Code clubs (girlswhocode.ttic.edu) at two local Chicago Public schools, Kenwood Academy High School and Andrew Carnegie Elementary School (within one block of the Institute). TTIC faculty, students, and staff volunteer time and ideas and coordinate field trips. Professors Matt Walter, Nati Srebro, Greg Shaknarovich, Karen Livescu and Brian Bullins have provided mentoring, talks, and demos. In our Girls Who Code community partner role, we look forward to engaging with even more schools in the future.

TTIC intends to sustain our partnerships with both Girls Who Code and the Chicago Public Schools CTE program, which have the potential for substantial impact by engaging one young mind at a time.

*December 2019* | Kenwood Academy High School Field Trip to Accenture  
*February 2020* | Andrew Carnegie Elementary visit to TTIC Robotics Lab  
*May 2020* | TTIC's Girls Who Code Club for 3-5 graders wrapped up our first year on May 29 with 6 weeks of virtual programming that included building and programming robot kits. The girls were excited to put their learned skills to practical use and look forward to next year's club.

The TTIC club member from Kenwood, Junior Alonda Robinson, has been accepted into the GWC Summer Immersion program and looks forward to sharing her experiences with us in a presentation in the fall. The Summer Immersion Program is a FREE 7-week summer program for rising juniors and seniors to learn the computer science skills they need to make an impact in their community while preparing for a career in tech. Classes are hosted at influential tech companies and corporate offices, like Goldman Sachs, AT&T, and Disney, where girls will be exposed to mentors and role models.
Governance

Board of Trustees

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

Sadaoki Furui
Chair, Board of Trustees, Toyota Technological Institute at Chicago
Former President, Toyota Technological Institute at Chicago
Professor Emeritus, Tokyo Institute of Technology
Former Director of University Library, Tokyo Institute of Technology
Former Dean of Graduate School of Information Science and Engineering, Tokyo Institute of Technology
Former Director of Furui Research Laboratory, NTT Human Interface Laboratories, Japan
Former Director of Speech and Acoustics Laboratory, NTT Human Interface Laboratories, Japan
Trustee since April 2013, Chair from July 2019

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

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

Charles Isbell, Jr.
Professor, Executive Associate Dean, 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
Noboru Kikuchi
President, Toyota Central R&D Labs, Inc.
Professor Emeritus, Mechanical Engineering, University of Michigan
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
Trustee since May 2019

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

Jim Merz
Frank M. Freimann Professor Emeritus of Engineering, Concurrent Professor of Physics, University of Notre Dame
Fellow, American Physical Society
Trustee since July 2015

Nelson Morgan
Professor-in-residence (emeritus) Electrical Engineering and Computer Science Dept., University of California, Berkeley
Emeritus Director, International Computer Science Institute
First to use neural networks for speech classification in a commercial application, and to incorporate time-frequency distributions for event-related potentials (brain waves).
An originator of the neural network/HMM hybrid system approach to speech recognition now in broad research and commercial use.
Over 200 publications; holds patents in speech processing methods, including one that has been used in millions of CDMA cell phones.
Former Editor-in-chief of Speech Communication, and has been a member of the IEEE Speech Technical Committee and the IEEE Neural Networks Committee.
Fellow of the IEEE and of the International Speech Communication Association (ISCA)
Received the Signal Processing Magazine best paper award (together with co-author Herve Bourlard).
Trustee since April 2015
Angela Olinto
Dean of the Physical Sciences Division, University of Chicago
Albert A. Michelson Distinguished Service Professor, Department of Astronomy and Astrophysics; Enrico Fermi Institute; and the College, 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

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
President, Toyota Technological Institute
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
Vice President and Chief Financial Officer, University of Chicago
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
Balaji Srinivasan
Executive Vice President for Science, Innovation, and Strategy, University of Chicago
Deputy Provost, University of Chicago
Chief International Officer, University of Chicago
Former managing director of Och Ziff Capital Management (India and Hong Kong)
Former executive director of Goldman Sachs Hong Kong
Former associate director of Jardine Fleming (Singapore, Hong Kong, and Mumbai)
Trustee since July 2019

Masatami Takimoto
Former Chair, Board of Trustees, Toyota Technological Institute at Chicago
Former Chair, Board of Directors & the Board of Trustees, Toyota School Foundation
Special Advisor, Toyota Central R&D Labs., INC.
Former Executive Vice President, Toyota Motor Corporation
Trustee since October 2011

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
Co-founder, Vision Technology Group at Microsoft Research
Fellow of the IEEE and the IAPR
Former Fulbright-Nokia Distinguished Chair in Information and Communications Technologies
Trustee since July 2019

Tatsuro Toyoda
Chair Emeritus
Mitsuru Nagasawa
President Emeritus

Mark Hogan (Advisor to the Board)
Director, Toyota Motor Corporation
President, Dewey Investments, LLC

Trustee Departures:
Jim Merz (July 2015 - Sep 2019)
Nelson Morgan (April 2015 - May 2020)

Trustee Appointments:
Noboru Kikuchi (Appointed May 2020)
Balaji Srinivasan (Appointed July 2019)
Matthew Turk (Appointed July 2019)
IN MEMORIAM

Passing of Mitsuru Nagasawa (Founding President)

Dr. Mitsuru Nagasawa, the founding President of TTIC (2001-2010) and President Emeritus (from 2010) passed away on May 8, 2020 at the age of 97. His fellowship and leadership built the foundation on which TTIC has continued to grow.

President Mitsuru Nagasawa (President of TTI Japan, at the time) proposed a plan to make a department-sized school of computer science in the United States, and was instrumental in locating TTIC on the University of Chicago campus and securing the funding to make it a reality. In 2001, President Nagasawa and University of Chicago’s President Don Randall signed the first Memorandum of Understanding, linking the two schools in partnership.

Dr. Nagasawa oversaw the incorporation of the institute, initial faculty hiring, enrollment of the first students to the PhD program, and seeing the first PhD graduation. He helped the institute achieve accreditation, secured the institute endowment, championed the expansion of facilities, and initiated sound policy, principles and structures that would allow TTIC to grow, develop, and achieve. The institute and the work it does is possible thanks to his vision and determination.

Passing of Latrice Richards

On April 12, 2020, Latrice Richards passed away peacefully after a long health struggle. Latrice was TTIC’s Events and Facilities Manager, and she elevated the institute through her incredible work.

Latrice joined TTIC in September of 2017. Her talent for organization kept our growing TTIC community comfortable and functioning even as physical space became increasingly tight. She was proactive in keeping the facilities well-maintained, and made sure that events ran smoothly, each one better than the last.

Her positive attitude and friendly demeanor were infectious to all who interacted with her, and her straightforward manner kept her looking ahead to a future in which she was healthy. Latrice never gave up fighting, and repeatedly said how much she loved working at TTIC and wanted to return to us. Unfortunately, that was not able to happen.

TTIC made a donation to the American Cancer Society in memory of Latrice, in accordance with her family’s requests. When COVID-19 restrictions ease, there will be a short memorial for Latrice, to honor her life and her contributions to TTIC.
Leadership

Matthew Turk, President
Jessica Jacobson, Chief Financial Officer
Chrissy M. Coleman, Secretary of the Institute
Avrim Blum, Chief Academic 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
Deree Kobets, Controller
Mary Marre, Administrative Assistant
Alicia McClarin, Administrative Assistant
Amy Minick, Director of Human Resources and International Affairs, Title IX Coordinator
Latrice Richards, Events and Facilities Manager

Non-Discrimination Statement

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