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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 volume 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 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 encompasses 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 educational 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 educational mission is broader than in the research mission. The graduates of TTIC might achieve impact by starting successful companies, managing successful products, or influencing government directions in research funding. 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 educational 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.
MESSAGE FROM THE PRESIDENT

Through 2017-2018, Toyota Technological Institute at Chicago (TTIC) continued its dedication to serving its mission: achieve international impact through world-class research and education in fundamental computer science and information technology. Admissions received 207 applications to our PhD program this year, up from 135 last year (and 123 the year before), which was a significant increase. We gave offers to 26 students, most of whom had many other top offers, and eight students accepted.

David McAllester, who has made significant contributions to TTIC as Chief Academic Officer (CAO) for 14 years since its inception, stepped down. Avrim Blum was appointed as new CAO on August 1, 2017. In recognition of outstanding research, professional stature, and contributions to TTIC, Madhur Tulsiani has been promoted to Associate Professor, with tenure. Three PhDs will be awarded this fall 2018, bringing the total number of TTIC’s alumni to 17, and five Master’s diplomas will also be awarded.

The level of recognition and impact of research at TTIC continues to steadily increase, the latest examples being the following noteworthy awards: In terms of paper awards, Jinbo Xu, Yujuan Gao (visiting student), and Sheng Wang (postdoc) received a Best Paper award at APBC 2018, and Jinbo Xu, Sheng Wang, Siqi Sun and Renyu Zhang were awarded the PLOS Computational Biology Research Prize 2018 in the category Breakthrough Advance/Innovation. David McAllester was awarded the 2018 Longuet-Higgins Prize for fundamental contributions in computer vision for his 2008 CVPR paper with Pedro Felzenszwalb and Deva Ramanan.

TTIC faculty gave many invited, distinguished, and keynote talks this academic year. Jinbo Xu was a keynote speaker at the 7th IEEE International Conference on Computational Advances in Bio and Medical Sciences. Matt Walter gave invited talks at the University of Toronto, Northeastern, and UT Austin, as well as the AutoAI conference. Srinadh Bhojanapalli gave invited talks at Allerton and Banff. Karen Livescu gave invited talks at Michigan, Bar-Ilan University, IBM TJ Watson, and the Lisbon Machine Learning School. Yury Makarychev gave invited talks at the Higher School of Economics and Steklov Institute in Russia, as well as at Notre Dame. Madhur Tulsiani gave invited talks at Harvard, Purdue, Simons
Institute, and Banff. Suriya Gunasekar gave invited talks at IU, ITA, and UW-Madison. Avrim Blum gave Distinguished Lectures at Penn and Duke/UNC/NCSU as well as invited talks at MSR, IU, UIUC, and Tokyo Tech.

The faculty actively pursued federal research grants with big success. In 2017-2018, they were awarded nine research grants from federal agencies totaling $4.7 million, an all-time record for the institute. Funding amounts break down as NSF 48%, DOD 28%, and AFOSR 24%.

In terms of the accreditation renewal process, an Interim Report to the HLC (Higher Learning Commission of the North Central Association of Colleges and Schools) was submitted in October 2017, and was accepted. The next HLC comprehensive evaluation visit will be February 2020.

An External Advisory Committee meeting was held at TTIC from March 5-6, 2018. Based on the meetings with constituents of TTIC and additional materials provided to the committee, the committee provided a report which included the committee’s perspective on the current state of TTIC and recommendations for moving the institute forward.

Since I have decided to step down as President in April 2019, after spending six years as President of TTIC, a Presidential Search Committee was activated by the Board of Trustees and the services of a search firm have been retained. The committee is conducting screening and interviews to come up with a final recommendation for the Board to consider.

Our relationship with Toyota Technological Institute in Nagoya (TTIJ) continues to strengthen. Several TTIJ faculty spent from one week to a couple of months at TTIC to conduct joint research with TTIC faculty. Also, the second TTIJ student has been accepted to TTIC’s PhD program for autumn 2018.

The institute’s relationship with the University of Chicago remains strong, both with respect to various kinds of administrative aid, student support and with respect to the potential for collaborative research and academic endeavors. The number of University of Chicago students enrolled in TTIC courses continue to significantly increase.

As TTIC continues to mature as an institution, we are committed to further improvement of academic excellence and to enhancing the already strong relations with our academic partners. We will continue hiring the strongest faculty possible.

Sadaoki Furui
President
I am very pleased to be writing my first letter for the TTIC Annual Report as Chief Academic Officer. I’d like to begin by thanking former CAO David McAllester, President Sadaoki Furui, TTIC’s incredibly engaged and talented faculty, TTIC’s highly dedicated administrative staff, and TTIC’s energetic, hard-working, and intellectually curious students for making TTIC what it is today.

I arrived at TTIC in August 2017, coming from Carnegie Mellon University, where I had been on the faculty for 25 years. I already was quite familiar with TTIC - in fact, two of my former PhD advisees (Adam Kalai and John Langford) were early TTIC faculty - but I wasn’t fully up to speed on all the exciting work going on here. Helping to rectify this, within a one month period of my arrival, I had the pleasure of attending three fantastic thesis defenses. Each of them (Behnam Neyshabur, Somaye Hashemifar, and Hao Tang) was doing important work in a different TTIC research area. This was a great introduction to the Institute. Indeed, one of the distinct pleasures of being CAO is that it is part of my job to learn about all the exciting research going on here - from robotics to speech and NLP, to vision, to computational biology, to machine learning, to theory - and then I get to brag about it all when I visit and give talks at other institutions.

There is indeed a lot at TTIC to brag about. This past year, we had over 200 applicants to our PhD program, a significant jump over the previous high of 135 the year before. We also had a total of over 430 students taking our courses this past year, up from 260 the year before (85% of the students in our classes are from the University of Chicago). Both of these speak to our growing reputation, and the increasing interest in the topics of our research. I am also pleased to report that our three finishing RAPs moved on to excellent positions: Li-Yang Tan to Stanford, Michael Maire to the University of Chicago, and Srinadh Bhojanapalli to Google NYC.
I am also excited to welcome our incoming RAPs for 2018-19: Arturs Backurs, Allyson Ettinger, Steve Hanneke, Sepideh Mahabadi, Thatchaphol Saranurak, Sam Wiseman, and Michael Yu.

I am having a fantastic time at TTIC and look forward to seeing all the great accomplishments that our faculty and students produce in the years to come.

Avrim Blum
Chief Academic Officer

INSTITUTE OVERVIEW

Faculty and Staff

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<th>Role</th>
<th>Count</th>
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<td>Professors</td>
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<tr>
<td>Associate Professors</td>
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<tr>
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<td>3</td>
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<tr>
<td>Research Assistant Professors</td>
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<tr>
<td>Adjoint Faculty</td>
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<tr>
<td>Administrative Office Staff and IT</td>
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<tr>
<td>Postdocs</td>
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PhD Program

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<tr>
<td>Students Enrolled for 2017-18</td>
<td>30</td>
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<tr>
<td>Master’s within the PhD Program Degrees Awarded</td>
<td>7</td>
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<tr>
<td>PhD Degree Requirement Completion</td>
<td>5</td>
</tr>
<tr>
<td>Applicants for the 2017-18 Academic Year</td>
<td>135</td>
</tr>
<tr>
<td>Admitted</td>
<td>21</td>
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<tr>
<td>Enrolled</td>
<td>9</td>
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AWARDS AND HONORS

2017 July  Li-Yang Tan
Research Assistant Prof. Li-Yang Tan, Best Paper Award, 2017 Computational Complexity Conference. “Settling the query complexity of non-adaptive junta testing.” By Xi Chen, Rocco Servedio, Li-Yang Tan, Erik Waingarten and Jinyu Xie.

2017 August  Avrim Blum
CAO Avrim Blum received the 2017 AI Journal Classic Paper Award for his 1997 AI Journal paper “Fast planning through planning graph analysis.” By Avrim Blum and Merrick Furst.

2017 August  Nathan Srebro
Prof. Srebro was awarded the Test of Time Honorable Mention at ICML2017 for the paper “Pegasos: Primal estimated sub-gradient solver for SVM.” By Shai Shalev-Shwartz, Yoram Singer and Nathan Srebro.

2017 August  Kevin Gimpel, Karen Livescu and Lifu Tu
Profs. Kevin Gimpel and Karen Livescu, with student Lifu Tu received a Best Paper Award at the 2nd Workshop on Representation Learning for NLP for their paper “Learning to embed words in context for syntactic tasks.”

2017 August  Hai Wang, Takeshi Onishi, Kevin Gimpel and David McAllester
TTIC Students Hai Wang and Takeshi Onishi, and Profs. Kevin Gimpel, and David McAllester received a Best Paper Award at the 2nd Workshop on Representation Learning for NLP for their paper, “Emergent Predication Structure in Hidden State Vectors of Neural Readers.”

2018 January  Jinbo Xu, Sheng Wang, Yujuan Gao
Visiting student Yujuan Gao, TTIC postdoc Sheng Wang, Yujuan’s advisor Prof. Minghua Deng, and TTIC Prof. Jinbo Xu were awarded the Best Paper Award at the Asia Pacific Bioinformatics Conference (APBS) 2018.
2018 February  Karthik Sridharan

TTIC PhD graduate, with distinction, Karthik Sridharan, was named a Sloan Research Fellow.

2018 June  David McAllester

Prof. David McAllester was awarded the 2018 Longuet-Higgins Prize for fundamental contributions in computer vision for his 2008 CVPR paper, “A Discriminatively Trained, Multiscale, Deformable Part Model,” with Pedro Felzenszwalb and Deva Ramanan.

2018 June  Jinbo Xu, Sheng Wang, Siqi Sun and Renyu Zhang

Prof. Jinbo Xu, postdoc Sheng Wang, and students Siqi Sun, and Renyu Zhang were awarded the PLOS Computational Biology Research Prize 2018 in the category Breakthrough Advance/Innovation for their paper, “Accurate De Novo Prediction of Protein Contact Map by Ultra-Deep Learning Model.”

2017-18  Blake Woodworth

Student and PhD Candidate Blake Woodworth is the recipient of an NSF Graduate Research Fellowship. Blake is advised by Prof. Nathan Srebro.
NEW FACULTY

Avrim Blum  
Chief Academic Officer | PhD - Massachusetts Institute of Technology

Avrim Blum received his BS, MS, and PhD from MIT in 1987, 1989, and 1991 respectively. He then served on the faculty in the Computer Science Department at Carnegie Mellon University from 1992 to 2017. In 2017 he joined the Toyota Technological Institute at Chicago as Chief Academic Officer.

Prof. Blum’s main research interests are in Theoretical Computer Science and Machine Learning, including Machine Learning Theory, Approximation Algorithms, Algorithmic Game Theory, and Database Privacy, as well as connections among them. Some current specific interests include multi-agent learning, multi-task learning, semi-supervised learning, and the design of incentive systems. He is also known for his past work in AI Planning. Prof. Blum has served as Program Chair for the IEEE Symposium on Foundations of Computer Science (FOCS) and the Conference on Learning Theory (COLT). He has served as Chair of the ACM SIGACT Committee for the Advancement of Theoretical Computer Science and on the SIGACT Executive Committee. Prof. Blum is recipient of the AI Journal Classic Paper Award, the ICML/COLT 10-Year Best Paper Award, the Sloan Fellowship, the NSF National Young Investigator Award, and the Herbert Simon Teaching Award, and he is a Fellow of the ACM.

Dr. Blum has a personally maintained website which can be found at http://www.ttic.edu/blum.

Meishan Lin  
Postdoc

Son Nguyen  
Postdoc

Sheng Wang  
Postdoc
FACULTY PROMOTION AND TENURE

At the April 2018 meeting of the Board of Trustees, upon recommendation of the President, the Trustees approved Madhur Tulsiani for promotion to Associate Professor, with tenure.

Madhur Tulsiani received his PhD from the University of California, Berkeley in 2009 and began his appointment at TTIC in 2011. His research is in theoretical computer science, especially on the complexity of optimization problems and pseudorandomness. Madhur’s work appears in the top venues in his field, including the FOCS, STOC, SODA, CCC, and ITCS conferences, and several of his papers have been invited to Special Issue journals for these venues. Madhur was also recipient of the prestigious National Science Foundation CAREER award. Internally to TTIC, Madhur has been serving as Director of Graduate Studies since 2013, a crucial administrative and leadership role, and more generally he has been a strong contributor to TTIC’s intellectual life and a dedicated advisor to his PhD students. Madhur also developed the “Mathematical Toolkit” course, taken by all TTIC PhD students and now emulated at other major universities as well. TTIC is pleased to have Madhur Tulsiani as a tenured Associate Professor.
On Tuesday, September 19, 2017, TTIC hosted a Chief Academic Officer (CAO) Installation Symposium, Convocation, and Commencement event. The full-day celebration event was to acknowledge and thank exiting CAO, David McAllester, for his contributions and years of service to TTIC, to celebrate and welcome incoming CAO, Avrim Blum, and to confer degrees to TTIC’s graduating students.

The day began with a Symposium at TTIC featuring prestigious speakers, many of them long-term friends and contributors to TTIC’s successes, including Pedro Felzenszwalb, Steve Smale, Karen Livescu, and Yishay Mansour. This was followed by a poster session where TTIC students highlighted their work. After lunch, the distinguished lectures continued with talks by Éva Tardos and Lance Fortnow.

The afternoon held the convocation and CAO installation ceremonies. As part of the commencement ceremony, the following students were awarded Master’s within the PhD degrees: Blake Woodworth, Falcon Dai, Nick Kolkin, Ruotian Luo, Rachit Nimavat, Shubham Toshniwal, and Renyu Zhang. The following students were awarded PhDs: Somaye Hashemifar, Behnam Neyshabur, Hao Tang, Zhiyong Wang, and Payman Yadolahpour. Somaye Hashemifar gave an enjoyable speech on behalf of all of the graduating students, which included stories of her experiences as a student at TTIC.

The CAO Installation began with an address from Éva Tardos, explaining the challenges David McAllester overcame to build TTIC to the high level academic program it currently is. Robert Fefferman echoed these sentiments and expressed his gratitude to Dr. McAllester for his dedicated service to the institute. Tom Mitchell spoke on behalf of Avrim Blum, introducing him to TTIC and highlighting Dr. Blum’s reputation as a gifted researcher and mentor. TTIC President, Sadaoki Furui then formally introduced the incoming CAO and welcomed him. Dr. Blum addressed attendees and spoke about his excitement to build upon TTIC’s legacy. Dr. McAllester then spoke about his time as CAO at TTIC. The CAO Installation ceremony concluded with the President symbolically passing the TTIC Chief Academic Officer medallion from David McAllester to Avrim Blum. The ceremony and day’s formal events concluded with a humorous academic lecture by Adam Kalai.

The TTIC community celebrated the CAOs and graduates with an open house reception that immediately followed.
FACULTY BY AREA

**Algorithms & Complexity**
- Blum, Avrim
- Chuzhoy, Julia
- Makarychev, Yury
- Tan, Li-Yang
- Tulsiani, Madhur

**Machine Learning**
- Bhojanapalli, Srinadh
- Gunasekar, Suriya
- McAllester, David
- Ohannessian, Mesrob
- Srebro, Nathan

**Computational Biology**
- Hallen, Mark
- Khan, Aly
- Xu, Jinbo

**Robotics**
- Walter, Matthew

**Computer Vision & Computational Photography**
- Maire, Michael
- Shakhnarovich, Greg

**Speech and Language Technologies**
- Gimpel, Kevin
- Livescu, Karen
- Stratos, Karl

Post-Doctoral Researchers

- Lin, Meishan
- Wang, Sheng
- Nguyen, Son
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 postdocs 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 most recently, 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 met 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 the 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 the limits of efficient computation. The central problem studied by complexity theorists is “Which computational problems can, and which cannot, be solved efficiently?” The study of algorithms and complexity is a part of a broader area called “theory of computer science,” or just “theory.” The area of theory 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.

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

PUBLISHED/SUBMITTED PAPERS

TALKS
“Learning about Agents and Mechanisms from Opaque Transactions.” Keynote talk given at
the 13th Annual Coordinated Science Laboratory (CSL) Student Conference, University of Illinois at Urbana-Champaign, February 2018.

IN INVOLVEMENT
Journal of the ACM, editorial board
FOCS Steering Committee
STOC 2018 Theory Fest Organizing Committee
STOC 2018 Workshop Committee Co-Chair
ACM Knuth Prize Committee
COLT 2018 PC member
NSF CCF Division Director Search Committee
2018 Ad Hoc Committee to Combat Harassment and Discrimination in the Theory of Computing community
Heidelberg Laureate Forum selection committee

HONORS/AWARDS

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31250 - Introduction to the Theory of Machine Learning. This course covers some of the fundamental theory underlying machine learning and the process of generalizing from data. After taking this course, students will be able to recognize different learning models and make rigorous statements about learning methods, will be able to use standard techniques to prove learning guarantees, and will be able to think critically about new learning paradigms.

MISCELLANEOUS
Thesis Committee: Charalampos (Haris) Angelidakis
Advisee PhD Completed: Nika Haghtalab (CMU)

Julia Chuzhoy
Professor
www.ttic.edu/chuzhoy

PUBLISHED/SUBMITTED PAPERS

TALKS
INVOLVEMENT
Editor, *SIAM Journal on Computing (SICOMP)*
Organizing Committee, SIAM Discrete Math 2018
Reviewer, STOC 2018, SIDMA, SODA 2018
Co-organizer, BIRS Workshop on Approximation and Hardness of Approximation, November 2017

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
**TTIC 31080 and CMSC 37503: Approximation Algorithms:** Many combinatorial optimization problems are NP-hard, and are therefore unlikely to have efficient algorithms. However, these problems still need to be handled in practice. A natural approach to overcome this difficulty is to settle for approximation algorithms: efficient algorithms that are guaranteed to produce near-optimal solutions. 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 class also focuses on major approaches and techniques in algorithm design, such as LP-rounding, Primal-Dual scheme, SDP rounding, and so on. The class also explores the question of why some problems have good approximation algorithms while other do not, via hardness of approximation, or inapproximability, proofs.

MISCELLANEOUS
Thesis Committee, Charalampos “Haris” Angelidakis
Advisor, Rachit Nimavat, Zihan Tan, and David H.K. Kim

Yury Makarychev
Associate Professor
www.ttic.edu/makarychev

PUBLISHED/SUBMITTED PAPERS

TALKS
“Algorithmic and Hardness Results for the Hub Labeling Problem.” Talk given at Higher School of Economics, Moscow, October 2017.
“Metric Geometry and Its Applications in Computer Science.” Talk given at Computer Science Club POMI, Russian Academy of Sciences, St. Petersburg, October 2017.
“Algorithms for Stable and Perturbation-Resilient Problems.” Talk given at Laboratory of Mathematical Logic, Steklov Institute, Russian Academy of Sciences, St. Petersburg, October 2017.
“Lipschitz and Outer Bi-Lipschitz Extensions.” Colloquium talk given at Department of Mathematics, University of Notre Dame, IN, March 2018.

INVOLVEMENT
Committee Member: ITCS 18, APPROX 18
Reviewer: SODA 18, ICALP 18, ESA 18
RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31010: Algorithms (CMSC 37000-1): This is a graduate-level course in algorithms.
CMSC 39800: Reading-and-Research: Computer Science.

MISCELLANEOUS
Advisor, Charalampos “Haris” Angelidakis, TTIC PhD Candidate
Director of Faculty Recruitment, TTIC
Programming Experience Czar, TTIC
Committee member, Discrimination, Harassment and Abusive Behavior Policy Committee
Thesis Committee member, Colin White (CMU)

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

PUBLISHED/SUBMITTED PAPERS

TALKS
"Higher-order Fourier analysis and approximate decoding of Reed Muller codes." Talk given at Harvard (CMSA) workshop on Additive Combinatorics, MA, October 2017.
"From Weak to Strong LP Gaps for All CSPs." Talk given at Simons Workshop on Hierarchies and Extended Formuations, University of California, Berkeley, November 2017.
"From Weak to Strong LP Gaps for All CSPs." Talk given at Banff Workshop on Approximation, Alberta, Canada, November 2017.
"From Weak to Strong LP Gaps for All CSPs." Talk given at Purdue Computer Science Colloquium, IN, December 2017.
"From Weak to Strong LP Gaps for All CSPs." Talk given at Dagstuhl Workshop on Constraint Satisfaction Problems, Wadern, Germany, June 2018.
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.

Mark Hallen
Research Assistant Professor
www.ttic.edu/hallen

PUBLISHED/SUBMITTED PAPERS

TALKS
IN INVOLVEMENT
Conference Reviews: PLoS Computational Biology, European Conference on Computational Biology

IN INVOLVEMENT
Journal Reviewer, *Journal of Chemical Theory and Computation*
Program Committee Member, ISMB

Aly Khan
Research Assistant Professor
www.ttic.edu/khan

PUBLISHED/SUBMITTED PAPERS


IN INVOLVEMENT
Program Committee Member: GLBIO 2017
Journal Reviews: *Trends in Immunology, PLoS Computational Biology, Bioinformatics*

RESEARCH FUNDING AWARDS
Fund for Innovation in Cancer Informatics: A COMPUTATIONAL PLATFORM FOR ANALYZING CANCER IMMUNOLOGIC DATA

CLASSES/SEMINARS
Computational Immunology Reading Group

MISCELLANEOUS
Thesis committee membership:
  - Karlynn Neu, PhD Committee, University of Chicago
  - Akinola Olumide Emmanuel, PhD Committee, University of Chicago
  - Yuta Asano, PhD Committee, University of Chicago
Jinbo Xu
Professor
www.ttic.edu/xu

PUBLISHED/SUBMITTED PAPERS

TALKS
“Protein contact prediction and folding by deep learning.” Invited talk at Brown University, Providence, RI, November 2017.

INVolVEMENT
PC member: ISMB 2018, RECOMB 2018, ACM-BCB 2018
Conference Review, IEEE/ACM TCBB 2018

HONORS/AWARDS
2018 PLoS Computational Biology Research Prize in Innovation and Breakthrough.
Best Paper Award, APBC 2018.

RESEARCH FUNDING AWARDS
NIH/NIGMS 1R01GM089753-06A1. New Computational Methods for Data-Driven Protein Structure Prediction. 9/1/2015-9/30/2019, no-cost extension, total cost ~$300k/year.

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.
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.

Michael Maire
Research Assistant Professor
www.ttic.edu/maire

PUBLISHED/SUBMITTED PAPERS

INvolvement
Area Chair, CVPR 2018
Senior Program Committee, AAAI 2018
Member, CVDF and COCO dataset group
Co-organizer, COCO challenge at ICCV 2017 Workshop
Greg Shakhnarovich
Associate Professor
www.ttic.edu/gregory

PUBLISHED/SUBMITTED PAPERS

TALKS

IN Volvement
Area Chair: CVPR 2018, ECCV 2018
Associate Editor, IEEE Transactions on Pattern Analysis and Machine Intelligence
Reviewer, SIGGRAPH Asia 2018
Steering Group member, Midwest Vision Workshop

Honors/Awards
Best Paper Award, Midwest Machine Learning Symposium, “Fingerspelling Recognition in the Wild.”

Research Funding Awards
DARPA Lifelong Learning Machines: Self-directed Lifelong Visual Learning: $1,294,730 (TTIC part only), 4 years.
MADLab: Air Force Center of Excellence in Efficient and Robust Machine Learning: $1,129,490 (TTIC part, joint with K. Livescu), 5 years.
JTEKT corporate gift in support of research: $250,000, unrestricted.
Adobe corporate gift in support of research: $10,000, unrestricted.

CLASSES/SEMINARS
**TTIC 31020: Introduction to Machine Learning:** Systematic introduction to the field of modern machine learning, aimed at graduate and advanced undergraduate students
**Machine Learning at TTI Japan:** Course coordinator: Provided teaching content and organized instruction assignments.
Vision Reading Group: Faculty sponsor (organization primarily student driven)

MISCELLANEOUS
Director of Admissions, TTIC PhD program,
IT Faculty Liaison
Anti-harassment and Discrimination Policy committee member
Advisor, TTIC: Shubhendu Trivedi, Mohammadreza Mostajabi, Nick Kolkin, Ruotian Luo, Igor Vasiljevic
Advisor, UChicago: Steven Basart (PhD), Mantas Mazeika (undergrad), Haochen Wang (undergrad).
TTIC student graduated, Payman Yadollahpour (Postdoc at UPitt/MIT CSAIL)
Thesis Committee Member: Jiajun Shen (PhD, UChicago), Steven Basart (MS, UChicago), Behnam Neyshabur (TTIC), Siqi Sun (TTIC)

Machine Learning

Machine Learning generally refers to an engineering or design paradigm where systems are built based on automatic training from examples, rather than detailed expert knowledge, much in the same way humans learn how to perform tasks and interact with the world. Most of modern Machine Learning is statistical in nature, and builds on statistical and probabilistic tools, as well as on algorithmic and computational developments. Especially in recent years, as training data is becoming plentiful, and massive computational and storage resources needed for handling the data are also becoming available, Machine Learning is playing a key role in many application areas. This includes classic artificial intelligence problems, such as computer vision, robotics, machine translation, question answering and dialogue systems. There are also a variety of “non-human” problems such as information retrieval, search, bioinformatics and stock market prediction to be considered. Below is a list of the work done at TTIC this year in the area of Machine Learning.
PUBLISHED/SUBMITTED PAPERS

TALKS
“Role of optimization algorithms in deep learning.” Invited talk given at Banff CMO Workshop on Beyond Convexity, Alberta, Canada, October 2017.
“Effectiveness of local search in machine learning.” Talk given at the Electrical and Computer Engineering Department, Boston University, MA, February 2018.
“Effectiveness of local search in machine learning.” Talk given at the Computer Science Department, University of Illinois at Urbana-Champaign, February 2018.
“Effectiveness of local search in machine learning.” Talk given at the Computer Science Department, University of Illinois at Chicago, February 2018.
“Effectiveness of local search in machine learning.” Talk given at the Computer Science Department, University of Maryland, College Park, March 2018.
“Effectiveness of local search in machine learning.” Talk given at the Computer Science Department, Purdue University, West Lafayette, Indiana, March 2018.
“Effectiveness of local search in machine learning.” Talk given at the Electrical and Computer Engineering Department, Texas A&M University, College Station, TX, April 2018.
“Effectiveness of local search in machine learning.” Talk given at Microsoft Research, Bangalore, April 2018.

INVOLVEMENT
Suriya Gunasekar  
Research Assistant Professor  
www.ttic.edu/gunasekar  

PUBLISHED/SUBMITTED PAPERS  

TALKS  
“Implicit regularization in Matrix Factorization.” Invited talk given at Statistics Department Colloquium, Indiana University, Bloomington, October 2017.  

INVILOVEMENT  
Organizing committee member, Midwest Machine Learning Symposium 2018  
Conference Sub-Reviews: COLT 2018, ALT 2018  
Workshop Program Chair, MMLS 2018  

RESEARCH FUNDING AWARDS  
NSF medium grant #1764032, “Understanding and Improving Optimization for Deep and Recurrent Networks.” Senior research personnel.  

CLASSES/SEMINARS  
Co-taught with Karl Stratos: **Introduction to Machine Learning**: Two week summer school organized by TTIC and CCAM at UChicago as part of NSF RTG. The course followed the format of a short course on beginner level introduction to machine learning and was mainly aimed at graduate students from non-CS departments and senior undergraduates from CS departments.  

MISCELLANEOUS  
Visited MSR Redmond between May 21-25 2018. Hosted by Ilya Razenshteyn. Ongoing long term collaborations with Jason Lee (USC, Los Angeles) and Daniel Soudry (Technion, Israel), and Mor Schpigel (Technion, Israel). Other collaborators: Thodoris Lykouris (Cornell).
David McAllester  
Professor  
www.ttic.edu/mcallester

PUBLISHED/SUBMITTED PAPERS

TALKS
“If Mathematical Proof is a Game, What are the States and Moves?” Invited talk given at Artificial Intelligence and Theorem Proving (AITP), Aussois, France, March 2018.

HONORS/AWARDS
Best Paper Award, Workshop on Representation Learning at ACL, 2017.

CLASSES/SEMINARS
TTIC 31230 - Fundamentals of Deep Learning (CMSC 31230): Introduction to fundamental principles of deep learning. Although deep learning systems are evolving rapidly, this course attempts to teach material that will remain relevant and useful as the field changes. The course emphasizes theoretical and intuitive understanding to the extent possible.

Mesrob Ohannessian  
Research Assistant Professor  
www.ttic.edu/faculty/ohannessian

PUBLISHED/SUBMITTED PAPERS

TALKS

INVOLVEMENT
Conference Reviews: ICML, COLT, NIPS
CLASSES/SEMINARS

**TTIC 31150 - Mathematical Toolkit:** The course is aimed at first-year graduate students and advanced undergraduates. The goal of the course is to collect and present important mathematical tools used in different areas of computer science. The course will mostly focus on linear algebra and probability.

*Guest instructor (one lecture), TTIC 31200 - Information and Coding Theory:* This course is meant to serve as an introduction to some basic concepts in information theory and error-correcting codes, and some of their applications in computer science and statistics.

*Guest instructor (two lectures), TTIC 31180 - Probabilistic Graphical Models:* This graduate-level course will provide a strong foundation for learning and inference with probabilistic graphical models.

*Guest instructor (three lectures), TTI-J Machine Learning Course, Spring 2018*

**How Machines Learn:** Three-week middle school machine learning course at the Summer Lab program at the University of Chicago Laboratory Schools (Summer 2018)

Mathematical Analysis Reading Group

MISCELLANEOUS

Co-host, Hussein Mozannar (summer visiting student, American University of Beirut)

Anti-harassment and Discrimination Policy committee member

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**Nathan Srebro**

Professor

www.ttic.edu/srebro

PUBLISHED/SUBMITTED PAPERS


**Talks**
- "Implicit Biases for Unregularized Separable Linear Classification." Talk given at Information Theory and Applications (ITA), San Diego, February 2018.
- "The Everlasting Database: Statistical Validity at a Fair Price." Talk given at the Department of Computer Science, Tel Aviv University, Israel, March 2018.
- "Optimization’s Hidden Gift to Learning: Implicit Regularization." Talk given at Department of Statistics and Data Science, Yale University, New Haven, CT, April 2018.
- "Optimization’s Hidden Gift to Learning: Implicit Regularization." Talk given at the Department of Industrial and System Engineering, Georgia Institute of Technology, Atlanta, April 2018.
- "Implicit Biases for Linear Classification: From Logistic Regression to CNNs." Talk given at Simons Institute, Berkeley, June 2018.

**Involvement**
- Action Editor, *Journal of Machine Learning*
- Steering Committee, Fairness Accountability and Transparency
- Area Chair, ICML

**Research Funding Awards**
- Google Award
- NSF, “Convex and Non-Convex Distributed Learning.”
- NSF, Collaborative Research: “Understanding and Improving Optimization in Deep and Recurrent Networks.”

**Classes/Seminars**
- **TTIC 31070 Convex Optimization:** The course covers techniques in unconstrained and constrained convex optimization and a practical introduction to convex duality.
- Machine Learning and Optimization Reading Group
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 surround 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
“Natural Language Interaction in Unknown Environments.” Talk given at University of Toronto, November 2017.
“Natural Language Learning for Human-Robot Collaboration.” Talk given at University of Texas, Austin, March 2018.
“Language Learning for Control and Collaboration.” Talk given at University of Michigan, June 2018.

INVolvement
Area Chair, Robotics: Science and Systems (RSS)
Associate Editor, IEEE/RSJ International Conference on Robotics and Automation (ICRA)
Organizer, 2018 Midwest Robotics Workshop
Steering Committee, Northeast Robotics Colloquium
Panelist: NSF Smart and Autonomous Systems, NSF Robust Intelligence Czar, TTIC 2017/2018 Young Researcher Seminar Series
Program Committee: EMNLP, ACL, NIPS, EACL, AISTATS, RoboNLP
Conference Reviews: ICRA, IROS, HRI

research funding awards
Army Research Laboratory (ARL), Robotics Collaborative Task Alliance (RCTA), “Generating Natural Language Scene Descriptions for Shared Situational Awareness.” $160,000

classes/seminars
TTIC 31180: Probabilistic Graphical Models: This graduate-level course provides a strong foundation for learning and inference with probabilistic graphical models.
TTIC 31240: Self-Driving Vehicles: Models and Algorithms for Autonomy: This course considers problems in perception, navigation, and control, and their systems-level integration in the context of self-driving vehicles through an open-source curriculum for autonomy education that emphasizes hands-on experience.

miscellaneous
Qualifying Exam Committee Member: Pedro Savarese, TTIC; Mingda Chen, TTIC
Thesis Examiner, Benjamin Talbot, Queensland University of Technology
Thesis Committee Member, Yuchen He, University of Illinois at Urbana Champaign
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 relies heavily 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
“Data-Efficient NLP.” Talk to be given at Google Natural Language Understanding Workshop, New York, July 2018.

INvolvement
Area Chair, Machine Learning, EMNLP 2018
Member of Editorial Board, Computational Linguistics
Publications Co-Chair, ACL 2018
Journal Reviewer, Transactions of the Association for Computational Linguistics
Conference Reviewer: NAACL, ICLR, SEM
Workshop Reviewer: RepL4NLP, MRQA, WiNLP, NAACL SRW, SCLeM
Co-organizer, TTIC Summer 2018 Workshop on Collaborative and Knowledge-Backed Language Generation

HONORS/AWARDS

RESEARCH FUNDING AWARDS
Bloomberg Data Science Research Grant, “Representing Knowledge by Learning to Link.” $60,000

CLASSES/SEMINARS
TTIC 31190: Natural Language Processing: Introductory course covering fundamental concepts, problems, and methods in natural language processing. Co-facilitator, Speech and Language at TTIC (SL@TTIC) Reading Group.

MISCELLANEOUS
Advisor: Mingda Chen, Lingyu Gao, Lifu Tu, and Davis Yoshida (TTIC); Zewe Chu, Xiaohan Ding, and Yuanzhe Pang (UChicago)
PhD Dissertation Committee Member: Haoruo Peng (UIUC), Hao Tang (TTIC), Shubhendu Trivedi (TTIC)
Internal service: website committee, faculty coordinator of visiting student program
Karen Livescu
Associate Professor
www.ttic.edu/livescu

PUBLISHED/SUBMITTED PAPERS

TALKS
“Multitask Learning with Low-level Auxiliary Tasks for Encoder-Decoder Based Speech Recognition.” Talk given at Workshop on Symbolic-Neural Learning, Nagoya, Japan, July 2017.
“Neural Architectures for Modelong Compositionality in Natural Language.” Talk given at
Workshop on Symbolic-Neural Learning, Nagoya, Japan, July 2017.
“Acoustic Word Embeddings.” Talk given at Subword and Character Level Models in NLP (SCLeM), Copenhagen, Denmark, September 2017.

INVolVEMENT
Program Co-chair, ICLR 2019
Technical Co-chair, ASRU 2017
Area Chair: ICASSP 2018, EMNLP 2018, ICLR 2018
Associate Editor, IEEE Transactions on Audio, Speech, and Language Processing
Organizing Committee Member: Workshop for Young Female Researchers in Speech Science & Technology, 2017 and 2018; ISCA Workshop on Machine Learning in Speech and Language Processing, 2017; Midwest Speech and Language Days, 2017
Standing Review Committee Member, Transactions of the ACL
External reviewer, NSF BCS 2017
Panelist, ISCA Doctoral Consortium 2017
Member, IEEE Speech and Language Technical Committee
Secretary/Workshop Coordinator, ISCA Special Interest Group on Machine Learning (SIGML)
Conference Reviews: NAACL, SIGMORPHON, MLSLP
Journal Reviewer, IEEE Transactions on Audio, Speech, and Language Processing
Reviewer, Cambridge University Press

HONORS/AWARDS
Best Paper Award, "Learning to Embed Words in Context for Syntactic Tasks." ACL Workshop on Representation Learning for NLP (RepL4NLP), August 2017.

RESEARCH FUNDING AWARDS

CLASSES/SEMINARS
TTIC 31110 - Speech Technologies (CMSC 35110): This course introduces 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 covers core techniques in detail, including hidden Markov models, recurrent neural networks, and conditional random fields. The course includes practical homework exercises to build and experiment with speech processing models.
Finally, it includes a sampling of the connections between speech and other modalities like images and text.

Co-facilitator, Speech and Language at TTIC (SL@TTIC) Reading Group.


MISCELLANEOUS

Advisor: Ankita Pasad, Bowen Shi, Shubham Tosniwal, Shane Settle, Qingming Tang, Hao Tang (only through summer 2017)

Visiting students advised: Sameer Bansal (U. Edinburgh), Kalpesh Krishna (IIT Bombay), Trang Tran (U. Washington), Jon Michaux (U. Chicago), Jack Huang (U. Chicago), Yang Chen (U. Chicago)

Thesis committees: Master’s thesis committee for Bowen Wang, U. Chicago

Internal service:
- Colloquium Coordinator
- Student Support Coordinator
- Student Workshop Co-organizer (With Madhur Tulsiani And Chrissy Novak)
- Discrimination, Harassment, and Abusive Behavior Policy Committee Member
- Website Committee Member
- President Search Support Team Member

Karl Stratos
Research Assistant Professor
www.ttic.edu/stratos

PUBLISHED/SUBMITTED PAPERS


TALKS


“Learning Effective Representations of Text.” Talk given at the Department of Computer Science Engineering, University of Notre Dame, IN, November 2017.

IN Volvement

Area Chair: Machine Learning, EMNLP 2018
Co-organizer and co-instructor: The Introduction to Machine Learning Summer School, TTIC, June 2018
Conference Reviews: ACL, NAACL, NIPS, ICML, ICLR, AAI, CoNLL, COLING, JMLR

RESEARCH FUNDING AWARDS
Bloomberg Data Science Research Grant, 2018

MISCELLANEOUS
Co-advised Zewei Chu (with Kevin Gimpel)
(Unofficially) Advised Daniel Edmiston at the Linguistics Department, University of Chicago
VISITING FACULTY and
NON-RESIDENT ADJOINT FACULTY

Allan Borodin, Visiting Faculty
Professor, University of Toronto
Research Interests: Algorithms, understanding simplicity in algorithm design, on-line algorithms, algorithmic game theory

David Forsyth, Adjoint Professor
Professor, University of Illinois at Urbana-Champaign
Research Interests: Artificial Intelligence, computer vision, computer graphics, machine learning.

Sanjeev Khanna, Visiting Faculty
Professor, University of Pennsylvania
Research Interests: Approximation algorithms, combinatorial optimization, and sublinear algorithms

John Lafferty, Adjoint Professor
Professor, Yale
Research Interests: Machine learning, nonparametric estimation, probabilistic modeling, graphical models, text modeling.

Seiichi Mita, Adjoint Professor
Senior Research Scholar, TTIJ
Research Interests: Digital signal processing for recording and communication channels and machine learning applications for vehicle environment recognition.

Robert Nowak, Adjoint Professor
Professor, University of Wisconsin-Madison
Research Interests: Signal processing, machine learning, optimization, and statistics.

Dan Roth, Adjoint Professor
Professor, University of Illinois at Urbana-Champaign
Research Interests: Artificial Intelligence; database and information systems

Shanghua Teng, Visiting Faculty
Professor, USC Research
Research Interests: Scalable algorithms, spectral graph theory, smoothed analysis of algorithms, computational economics and game theory, scientific computing, combinatorial optimization, and computational geometry.

Yutaka Sasaki, Adjoint Professor
Professor, TTIJ
Research Interests: Machine learning and its application to Natural Language Processing and biomedical informatics. Recent research interests include Order-Sorted Inductive Logic Programming and massively-parallel machine learning and their application to biomedical Text Mining.

Stephen Wright, Adjoint Professor
Professor, University of Wisconsin-Madison
Research Interests: Numerical Optimization
László Babai  
George and Elizabeth Yovovich Professor, Departments of Computer Science and Mathematics, University of Chicago  
Research Interests: Complexity theory, algorithms, combinatorics, asymptotic group theory, and the many interactions among these fields, including problems of “pure mathematics” motivated by questions in the theory of computing.

Michael Franklin  
Liew Family Chair of Computer Science, University of Chicago  
Research Interests: Databases, systems, big data

Mladen Kolar  
Associate Professor of Econometrics and Statistics, Booth School of Business, University of Chicago  
Research Interests: High-dimensional statistical methods, graphical models, varying-coefficient models and data mining, driven by the need to uncover interesting and scientifically meaningful structures from observational data.

Risi Kondor  
Assistant Professor, Departments of Computer Science and Statistics, University of Chicago  
Research Interests: Machine learning and computational harmonic analysis

Janos Simon  
Professor and Director of Graduate Studies, Department of Computer Science, University of Chicago  
Research Interests: Computational complexity, including machine-based complexity, communication complexity, models of parallel computation, distributed computation, algorithms, as well as problems inspired by the world wide web
Karen Livescu and Greg Shakhnarovich have continued collaboration with colleagues in the University of Chicago linguistics department on a project to automatically transcribe portions of American Sign Language videos, as part of an NSF-funded collaborative grant.

Karen Livescu and TTIC student Shane Settle have collaborated with Michael Picheny and Kartik Audhkhasi at IBM Research, on automatic speech recognition models that map directly from acoustics to words.

Karen Livescu has collaborated with University of Edinburgh and Stellenbosch University researchers (Sameer Bansal, Herman Kamper, Sharon Goldwater, and Adam Lopez) on a speech translation project.

Karen Livescu and Greg Shakhnarovich have collaborated with Herman Kamper at Stellenbosch University on learning visually grounded models of speech.

Karen Livescu has collaborated with Northwestern University researchers (led by Marc Slutzky) on a project to decode linguistic units in neural signals.

Karen Livescu and TTIC student Shubham Toshniwal have collaborated with Google researchers (Anjuli Kannan, Chung-Cheng Chiu, Yonghui Wu, and Tara Sainath) on a project studying language models for automatic speech recognition.

Kevin Gimpel, Karen Livescu and TTIC student Shubham Toshniwal have collaborated with Trang Tran and Mari Ostendorf at University of Washington and with Mohit Bansal at University of North Carolina Chapel Hill, on a project to improve parsing of spoken language.

Greg Shakhnarovich and Karen Livescu are part of the newly formed Machine, Algorithms, and Data Lab (MADLab) in collaboration with University of Wisconsin-Madison and University of Chicago researchers. MADLab is headed by Rob Nowak at University of Wisconsin and is funded by the U.S. Air Force Office of Sponsored Research.

Greg Shakhnarovich has been collaborating with Erik Learned-Miller and his group at University of Massachusetts, Amherst, with some of the results appearing in a paper published at ECCV 2018. This collaboration is part of the DARPA Lifelong Learning Machines program, in which TTIC and UMass groups participate in a team which includes also colleagues from NYU and University of Texas, Austin.
Greg Shakhnarovich has continued collaboration with colleagues at TTIJ in Nagoya, working with Prof. Norimichi Ukita and Dr. Muhammad Haris on image and video super-resolution. This work, described in a publication in CVPR 2018, has won top places in two image restoration and enhancement challenges, run as part of CVPR and ECCV workshops.

Greg Shakhnarovich and TTIC student Nick Kolkin have been collaborating with Prof. Jason Salavon, of UChicago Arts, on visual style transfer.

Greg Shakhnarovich has been collaborating with colleagues at the Weizmann Institute of Science, in Israel, on classification robustness and defense against adversarial attacks.
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 (in order of appearance) 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
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<th>Speaker</th>
<th>Institute</th>
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<td>Weizmann Institute</td>
<td>“Blind” Visual Inference</td>
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<td>Zhongtian “Falcon” Dai</td>
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<td>Model-free Treatments for POMDP</td>
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<td>Aravindan Vijayaraghavan</td>
<td>Northwestern University</td>
<td>Learning Mixtures of Well-Separated Gaussians</td>
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<td>Hao Tang</td>
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<td>Thesis Defense: Sequence Prediction with Neural Segmental Models</td>
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<tr>
<td>Behnam Neyshabur</td>
<td>TTIC</td>
<td>Thesis Defense: Implicit Regularization in Deep Learning</td>
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<tr>
<td>Nicholas Kolkin</td>
<td>TTIC</td>
<td>Training Deep Networks to be Spatially Sensitive</td>
<td>8/22/17</td>
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<tr>
<td>Somaye Hashemifar</td>
<td>TTIC</td>
<td>Thesis Defense: Computational Prediction and Analysis of Protein-protein Interaction Networks</td>
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<tr>
<td>Kate Saenko</td>
<td>Boston University</td>
<td>Distribution Alignment for Visual Domain Adaptation</td>
<td>8/31/17</td>
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<tr>
<td>Jason Hartline</td>
<td>Northwestern University</td>
<td>Peer Grading and Mechanism Design</td>
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<tr>
<td>Yishay Mansour</td>
<td>Tel Aviv University</td>
<td>Submultiplicative Glivenko-Cantelli and Uniform Convergence of Revenues</td>
<td>9/19/17</td>
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<tr>
<td>Karen Livescu</td>
<td>TTIC</td>
<td>Learning Spoken Concepts from Unlabeled Audio-Visual Data</td>
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<td>Steve Smale</td>
<td>City University of Hong Kong</td>
<td>Beating in Unison</td>
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<tr>
<td>Pedro Felzenszwalb</td>
<td>Brown University</td>
<td>Scene Grammars, Factor Graphs and Belief Propagation</td>
<td>9/19/17</td>
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<tr>
<td>Eva Tardos</td>
<td>Cornell University</td>
<td>Learning and Efficiency of Outcomes in Games</td>
<td>9/19/17</td>
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<tr>
<td>Adam Kalai</td>
<td>Microsoft Research</td>
<td>Battling Unfairness in Machine Learning Algorithms</td>
<td>9/19/17</td>
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<tr>
<td>Moritz Hardt</td>
<td>University of California, Berkeley</td>
<td>Biases Beyond Observation</td>
<td>9/25/17</td>
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<tr>
<td>Nathan Srebro</td>
<td>TTIC</td>
<td>Learning: Fast, Fair and Foundational</td>
<td>9/29/17</td>
</tr>
<tr>
<td>Ilias Diakonikolas</td>
<td>University of Southern California</td>
<td>Computational Efficiency and High-Dimensional Robust Statistics</td>
<td>10/2/17</td>
</tr>
<tr>
<td>Avrim Blum</td>
<td>TTIC</td>
<td>New Theoretical Results in Multiview Learning</td>
<td>10/6/17</td>
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<tr>
<td>Samory Kpotufe</td>
<td>Princeton University</td>
<td>Adaptive rates in Active Learning with label noise</td>
<td>10/9/17</td>
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<tr>
<td>Jitendra Malik</td>
<td>University of California, Berkeley</td>
<td>Deep Visual Understanding from Deep Learning</td>
<td>10/11/17</td>
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<tr>
<td>Yejin Choi</td>
<td>University of Washington</td>
<td>From Naive Physics to Connotation: Modeling Commonsense in Frame Semantics</td>
<td>10/16/17</td>
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<tr>
<td>Karl Stratos</td>
<td>TTIC</td>
<td>The Afterlife of Unsupervised Learning in NLP</td>
<td>10/20/17</td>
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<tr>
<td>Dan Jurafsky</td>
<td>Stanford</td>
<td>Distinguished Lecture Series: Automatically Extracting Social Meaning from Language</td>
<td>10/23/17</td>
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<tr>
<td>Ashia Wilson</td>
<td>University of California, Berkeley</td>
<td>A Dynamical View of Optimization Algorithms</td>
<td>10/25/17</td>
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<tr>
<td>Li-Yang Tan</td>
<td>TTIC</td>
<td>Computational Complexity through the Lens of Circuits, Proofs, and Randomness</td>
<td>10/27/17</td>
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<td>Ankur Moitra</td>
<td>Massachusetts Institute of Technology</td>
<td>A New Approach to Approximate Counting and Sampling</td>
<td>10/30/17</td>
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<tr>
<td>Name</td>
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<td>Benjamin Recht</td>
<td>University of California, Berkeley</td>
<td>The Statistical Foundations of Learning to Control</td>
<td>11/13/17</td>
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<td>Mark Hallen</td>
<td>TTIC</td>
<td>Learning More Realistic Representations of Proteins for Drug Design</td>
<td>11/17/17</td>
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<tr>
<td>Ben Zhao</td>
<td>University of Chicago</td>
<td>Using Simple ML to Model and Mimic Human Behavior</td>
<td>11/20/17</td>
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<tr>
<td>Regina Barzilay</td>
<td>Massachusetts Institute of Technology</td>
<td>Moving Away from Big Data</td>
<td>11/29/17</td>
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<td>Aly Khan</td>
<td>TTIC</td>
<td>Computational Immunology: New Computational Approaches to Understand Immune Function</td>
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<td>Heather Zheng</td>
<td>University of Chicago</td>
<td>Mobile Sensing at the Edge</td>
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<td>Michael Maire</td>
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<td>Architecting and Regularizing Deep Convolutional Neural Networks</td>
<td>1/5/18</td>
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<td>Thatchaphol</td>
<td>KTH Royal Institute of Technology</td>
<td>Dynamic Spanning Forest: Techniques and Connections to Other Fields</td>
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<td>Saranurak</td>
<td></td>
<td>Determining Whether two Sentences have the Same Meaning</td>
<td>1/12/18</td>
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<tr>
<td>Kevin Gimpel</td>
<td>TTIC</td>
<td>(or: Identifying When Two Texts Mean the Same Thing)</td>
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<tr>
<td>Sam Wiseman</td>
<td>Harvard University</td>
<td>Neural, Search-based Structured Prediction for Natural Language</td>
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<td>Madhur Tulisiani</td>
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<td>Approximability of Polynomials and Matrix Norms</td>
<td>1/19/18</td>
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<tr>
<td>C.C. Jay Kuo</td>
<td>University of Southern California</td>
<td>Why and Why Not Convolutional Neural Networks (CNNs)?</td>
<td>1/22/18</td>
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<td>Shubham Tulisiani</td>
<td>University of California, Berkeley</td>
<td>Learning Single-view 3D Reconstruction of Objects and Scenes</td>
<td>1/24/18</td>
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<tr>
<td>Srinadh Bhojanapalli</td>
<td>TTIC</td>
<td>On the Effectiveness of Local Search in Machine Learning</td>
<td>1/26/18</td>
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<tr>
<td>Arturs Backurs</td>
<td>Massachusetts Institute of Technology</td>
<td>Below P vs NP: Conditional Quadratic-Time Hardness For Big Data Problems</td>
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<td>Jacob Andreas</td>
<td>University of California, Berkeley</td>
<td>Learning from Language</td>
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<td>Yang Yuan</td>
<td>Cornell University</td>
<td>Provable and Practical Algorithms for Non-convex Problems in Machine Learning</td>
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<td>Jieming Mao</td>
<td>Princeton University</td>
<td>Algorithms in Strategic or Noisy Environments</td>
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<td>Genevieve Patterson</td>
<td>Microsoft Research</td>
<td>Uncommon Sense: Using Neural Networks for Exploration and Creativity</td>
<td>2/7/18</td>
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<td>Yonatan Belinkov</td>
<td>Massachusetts Institute of Technology</td>
<td>Internal Representations in Deep Learning for Language and Speech Processing</td>
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<td>Steve Hanneke</td>
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<td>Principles of Active Learning</td>
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<td>Michael Yu</td>
<td>University of California, San Diego</td>
<td>Hierarchical Modeling of Biological Systems</td>
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<td>Lisa Anne Hendricks</td>
<td>University of California, Berkeley</td>
<td>Look, Listen, and Speak: Vision Systems that Communicate with Natural Language</td>
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<td>Danqi Chen</td>
<td>Stanford University</td>
<td>Knowledge from Language via Deep Understanding</td>
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<td>Allyson Ettinger</td>
<td>University of Maryland</td>
<td>Bridging NLP and brain science to improve natural language understanding</td>
<td>2/19/18</td>
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<tr>
<td>Adith Swaminathan</td>
<td>Microsoft Research AI</td>
<td>Learning from Logged Bandit Feedback</td>
<td>2/20/18</td>
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<tr>
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<td>Saurabh Gupta</td>
<td>University of California, Berkeley</td>
<td>Visual Perception and Navigation in 3D Scenes</td>
<td>2/22/18</td>
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<td>Alexander Schwing</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Cs of Computer Vision</td>
<td>2/26/18</td>
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<tr>
<td>He He</td>
<td>Stanford University</td>
<td>Learning Interactive Agents</td>
<td>2/27/18</td>
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<tr>
<td>Chelsea Finn</td>
<td>University of California, Berkeley</td>
<td>Generalization and Self-Supervision in Deep Robotic Learning</td>
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<tr>
<td>Mike Roberts</td>
<td>Stanford University</td>
<td>Trajectory Optimization Methods for Drone Cameras</td>
<td>3/1/18</td>
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<td>Siddhartha Srinivasa</td>
<td>University of Washington</td>
<td>Mathematical Models for Human-Robot Collaboration</td>
<td>3/5/18</td>
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<tr>
<td>Wei-Lun (Harry) Chao</td>
<td>University of Southern California</td>
<td>Transfer Learning towards Intelligent Systems in the Wild</td>
<td>3/7/18</td>
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<tr>
<td>Chenyan Xiong</td>
<td>Carnegie Mellon University</td>
<td>Text Representation, Retrieval, and Understanding with Knowledge Graphs</td>
<td>3/8/18</td>
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<tr>
<td>Hosna Jabbari</td>
<td>University of Alberta</td>
<td>Computational Informatics for Improving Efficacy of Gene Therapy</td>
<td>3/12/18</td>
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<tr>
<td>Andrew Owens</td>
<td>University of California, Berkeley</td>
<td>Learning Sight from Sound</td>
<td>3/28/18</td>
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<tr>
<td>Ramakrishna Vedantam</td>
<td>Georgia Institute of Technology</td>
<td>Connecting Vision and Language for Interpretation, Grounding and Imagination</td>
<td>3/29/18</td>
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<tr>
<td>David McAllester</td>
<td>TTIC</td>
<td>Reinforcement Learning and The Game of Mathematics</td>
<td>4/6/18</td>
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<td>Rohit Prabhavalkar</td>
<td>Google</td>
<td>End-to-End Modeling For Automatic Speech Recognition</td>
<td>4/9/18</td>
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<tr>
<td>Naftali Tishby</td>
<td>Hebrew University of Jerusalem</td>
<td>Information Theory of Deep Learning</td>
<td>4/18/18</td>
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<td>Suriya Gunasekar</td>
<td>TTIC</td>
<td>Implicit Bias of Optimization in Learning</td>
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<td>Bruce Donald</td>
<td>Duke University</td>
<td>Some Mathematical and Computational Challenges Arising in Structural Molecular Biology</td>
<td>4/23/18</td>
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<tr>
<td>Vijay Vazirani</td>
<td>University of California, Irvine</td>
<td>Distributive Lattices, Stable Matchings, and Robust Solutions</td>
<td>4/25/18</td>
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<tr>
<td>Julia Chuzhoy</td>
<td>TTIC</td>
<td>Excluded Grid Theorem: New Directions and Open Problems</td>
<td>4/27/18</td>
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<tr>
<td>Blake Woodworth</td>
<td>TTIC</td>
<td>The Everlasting Database: Statistical Validity at a Fair Price</td>
<td>4/27/18</td>
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<tr>
<td>Sanjoy Dasgupta</td>
<td>University of California, San Diego</td>
<td>Using Interaction for Simpler and Better Learning</td>
<td>4/30/18</td>
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<tr>
<td>Chandra Chekuri</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Tree Packing, Global Mincut, and Faster Algorithms for Metric-TSP and Related Problems</td>
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<td>Mesrob Ohannessian</td>
<td>TTIC</td>
<td>Adapting to the Effective Dimension of Categorical Distributions</td>
<td>5/4/18</td>
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<tr>
<td>Cynthia Dwork</td>
<td>Harvard University</td>
<td>What's Fair?</td>
<td>5/7/18</td>
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<tr>
<td>Abhishek Das</td>
<td>Georgia Institute of Technology</td>
<td>Connecting Vision and Language to Actions</td>
<td>5/9/18</td>
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<td>Matthew Walter</td>
<td>TTIC</td>
<td>Representation Learning for Localization and Locomotion</td>
<td>5/11/18</td>
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<td>Ross Girshick</td>
<td>Facebook</td>
<td>Scaling Up Visual Recognition</td>
<td>5/14/18</td>
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<tr>
<td>Yury Makarychev</td>
<td>TTIC</td>
<td>Algorithms for Instance-Stable and Perturbation-Resilient Problems</td>
<td>5/18/18</td>
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<td>Jonathan Weed</td>
<td>Massachusetts Institute of Technology</td>
<td>Near-Linear Time Approximation Algorithms for Optimal Transport</td>
<td>5/18/18</td>
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<tr>
<td>Yasaman Bahri</td>
<td>Google Brain</td>
<td>Wide, Deep Neural Networks are Gaussian Processes</td>
<td>5/22/18</td>
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<tr>
<td>Gregory Shaknarovich</td>
<td>TTIC</td>
<td>Towards Symbolic Reasoning about the Visual World</td>
<td>5/25/18</td>
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<tr>
<td>Yuqing Kong</td>
<td>University of Michigan</td>
<td>Eliciting and Aggregating Information: An Information Theoretic Approach</td>
<td>6/5/18</td>
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<tr>
<td>Bowen Shi</td>
<td>TTIC</td>
<td>Fingerspelling Recognition in the Wild</td>
<td>6/8/18</td>
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<tr>
<td>Charalampos “Haris” Angelidakis</td>
<td>TTIC</td>
<td>Thesis Defense: Shortest Path Queries, Graph Partitioning and Covering Problems in Worst and Beyond Worst Case Settings</td>
<td>6/21/18</td>
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<tr>
<td>Greg Durrett</td>
<td>University of Texas, Austin</td>
<td>Hand-holding Learning of Latent Structure for Natural Language Processing</td>
<td>6/25/18</td>
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</tbody>
</table>

Distinguished Lecture Series 2017-18

[October 2017 through May 2018, at TTIC]

Speakers included:

**Jitendra Malik**, University of California, Berkeley  
Talk Title: “Deep Visual Understanding from Deep Learning”

**Dan Jurafsky**, Stanford University  
Talk Title: “Automatically Extracting Social Meaning from Language”

**Naftali Tishby**, Hebrew University of Jerusalem  
Talk Title: “Information Theory of Deep Learning”

**Cynthia Dwork**, Harvard University  
Talk Title: “What’s Fair?”
2nd Annual TTIC Student Workshop 2017

[November 10, 2017, at TTIC] TTIC held its second annual student workshop in the fall of 2017. Now an annual event, the aim is to help students develop professionally and be better prepared for a career in academia or industry. The workshop was all-day and had two parts:

**Student Symposium:** This included research talks and poster presentations 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.

**Panel discussion:** A discussion with a panel comprised of various TTIC faculty and alumni, and guests. Students are encouraged to ask questions they have about preparing for careers in academia and industry, or general academic best practices.

Awards for the 2017 Student Workshop went to:

**Best Talk:** Charles Schaff, "Jointly Learning Design and Control with Deep Reinforcement Learning."

**Best Talk Runner-up:** Blake Woodworth, "Learning Non-Discriminatory Predictors."

**Best Poster:** Andrea Daniele, "A Multiview Approach to Learning Articulated Motion Models."
2018 Midwest Theory Workshop

[April 12-13, 2018 at TTIC] The 68th Midwest Theory Day brought together researchers interested in Theoretical Computer Science, from across the Midwest area. Keynote speakers included: Allan Borodin, University of Toronto; Anupam Gupta, Carnegie Mellon University; and Sanjeev Khanna, University of Pennsylvania.

Midwest ML Symposium 2018

[June 6-7, 2018, at TTIC] The Midwest ML Symposium aims to convene regional machine learning researchers for stimulating discussions and debates, to foster cross-institutional collaboration, and to showcase the collective talent of machine learning researchers at all career stages.

Best poster prizes went to: Bowen Shi (TTIC), Cesar Uribe (UIUC), and Daniel Vial (UMICH).
Midwest Robotics Workshop at TTIC

[June 14-15, 2018, at TTIC] The robotics field is experiencing tremendous growth as a result of algorithmic and technological advances, the availability of common, low-cost sensors and platforms, and a standardization in open-source development. These factors together with the growing community of talented, highly-trained roboticists combine to render feasible real-world applications in our homes and workplaces, and on our streets.

The Midwest Robotics Workshop (MWRW) is intended to bring together roboticists from academia and industry in and around Midwestern United States. Building on last year’s workshop, it is an opportunity for researchers and practitioners to share their work with others and to network, with the goal of creating a more cohesive and vibrant robotics community in the Midwest. The workshop featured invited talks by leading researchers, and an exciting collection of oral presentations and interactive poster sessions.

Workshop website: [http://www.ttic.edu/mwrw/](http://www.ttic.edu/mwrw/)
The PhD Program

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 enroll in classes TTIC offers, for credit. Students of both institutions have taken full advantage of this opportunity. TTIC students 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 may experience the shared and traditional experiences that come with a large university.
Graduates and Diplomas

TTIC awarded five doctoral diplomas at the diploma ceremony in September 2017 to:

- **Somaye Hashemifar**, studied under Professor Jinbo Xu, research interest is in bioinformatics.
- **Behnam Neyshabur**, studied under Professor Nathan Srebro, research interest is in machine learning; now employed at Institute for Advanced Study
- **Hao Tang**, studied under Professor Karen Livescu, research interest is in Machine Learning and Automatic Speech Recognition; now employed at MIT.
- **Zhiyong Wang**, studied under Professor Jinbo Xu, research interest is in Bioinformatics and Computational Biology. He is currently employed at Google.
- **Payman Yadollahpour**, studied under Professor Greg Shakhnarovich, research interest is in Machine learning and Computer Vision.

TTIC expects three more PhD Candidates to be eligible for doctoral degrees in the September 2018 diploma ceremony.

Students Falcon Dai, Nicholas Kolkin, Ruotian Luo, Rachit Nimavat, Shubham Toshniwal, Blake Woodworth and Renyu Zhang 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 2017 diploma ceremony at the start of the academic year.
Quality Curriculum

TTIC instructors serve the TTIC student population in their courses, and under the TTIC-University of Chicago Agreement, University students may enroll in TTIC’s courses and receive credit through the University, and vice-versa. TTIC views this as part of serving the Education Mission of the Institute. The amount of University students who register for TTIC courses has been sharply increasing the last several years in almost every course.

Course TTIC 31020 Introduction to Statistical Machine Learning, taught by Prof. Greg Shakhnarovich, has had the following student enrollment the last four autumn quarters:

TTIC instructors are proud to offer a quality curriculum to its PhD students and share rigorous courses with the quality 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.

Two new courses were introduced for 2017-18:

**TTIC 31240- Self-driving Vehicles: Models and Algorithms for Autonomy | Prof. Matthew Walter**
This course considers problems in perception, navigation, and control, and their systems-level integration in the context of self-driving vehicles through an open-source curriculum for autonomy education that emphasizes hands-on experience. Integral to the course, students will collaborate to implement concepts covered in lecture on a low-cost autonomous vehicle with the goal of navigating a model town complete with roads, signage, traffic lights, obstacles, and citizens. The wheeled platform is equipped with a monocular camera and a performs all processing onboard with a Raspberry Pi 3, and must: follow lanes while avoiding obstacles, pedestrians and other robots; localize within a global map; navigate a city; and coordinate with other robots to avoid collisions. The platform and environment are carefully designed to allow a sliding scale of difficulty in perception, inference, and control tasks, making it usable in a wide range of applications, from undergraduate-level education to research-level problems. For example, one solitary robot can successfully wander the environment using only line detection and reactive control, while successful point-to-point navigation requires recognizing
TTIC 31250 - Introduction to the Theory of Machine Learning | Prof. Avrim Blum

This course will cover some of the basic theory underlying machine learning and the process of generalizing from data. We will talk about both the PAC model for batch learning (learning over one set of data with the intent of producing a predictor that performs well on new data) and models for learning from feedback over time (online learning). We will discuss important fundamental concepts including overfitting, uniform convergence, formal notions of Occam’s razor, VC-dimension, and regularization, as well as several classic algorithms including the Perceptron algorithm, SVMs, algorithms for combining expert advice, and boosting. We will also discuss limited-feedback (bandit) algorithms, reinforcement learning, connections between learning and game theory, and formal guarantees on privacy. This will be a proof-oriented course: our focus will be 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.

Specific Topics Include: The PAC (Probably Approximately Correct) batch learning model; Overfitting and generalization; Cardinality and description-length bounds: Occam’s razor; Regularization; The online mistake bound model; The Perceptron algorithm; Hinge-loss and inseparable data; Kernel functions, SVMs; Online to batch conversion; VC-dimension, the growth function, and Sauer’s lemma; Uniform convergence proofs using ghost samples; Boosting; Learning and Game Theory; Bandit algorithms; Reinforcement learning; Differential Privacy

Expected outcomes:
• Ability to recognize different learning models and make rigorous statements about learning methods
• Ability to use standard techniques to prove learning guarantees
• Ability to think critically about new learning paradigms


Student Admissions and Student Body Growth

In the fall of 2004, TTIC matriculated its first three students. The 2017-18 academic year began with thirty students, nine who enrolled as new students for Autumn 2017.

Eight students were admitted and plan to enroll for the 2018-19 year.

PhD program applicants continue to increase year after year, with its highest jump coming in the admissions season 2018.

Dr. Greg Shakharovich is the Director of Admissions and has had success improving TTIC’s outreach strategy, student visit days, and application review and selection processes. The Admissions Office continues to strive for the selection of the most promising applicants, placing high value on diversity in the student population.

<table>
<thead>
<tr>
<th>Admissions Year</th>
<th>Total Applicants</th>
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<tr>
<td>2013</td>
<td>33</td>
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</table>

Financial Support for Students

Full financial support is offered to all enrolled students in good academic standing, in residence, 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 life fees (which provide student privileges on campus), and a stipend paid for research or teaching assistance, provided they remain full-time and in good academic standing.
Financial Support, Continued

Partha Niyogi Memorial Fellowship

Autumn 2017 marked the first award of the the Partha Niyogi Memorial Fellowship. The Partha Niyogi Memorial Fellowship is funded by the TTIC endowment and supports select students entering the PhD program, and provides support at a higher level than base stipends over the awardee’s first year in the program. The fellowship is intended to recognize outstanding applicants to the PhD program, based on academic merit and promise. The 2017-18 award went to Omar Montasser.

Women In Science Conference Support

TTIC supports a small but highly engaged community of women at TTIC: their efforts and pursuit of graduate study and profession. With TTIC’s female population small in size, the Institute strives to try to find ways to support the female student population and allow them access to larger networks of support including individual and group academic support, peer mentoring, STEM career advising, support for conference attendance, professional meetings, and professional development opportunities.

TTIC announced that beginning in the 2017-18 academic year, it is committed to providing financial support for two separate conferences per female student at two timing points in their student career to support those students for the reasons listed above: one Pre-Candidacy conference and one in Candidacy. The funding support in this policy is of the institute, and not an advisor or faculty sponsored or matched fund.

Pre-Candidacy Conference: TTIC recommends the CRA-W grad cohort workshop typically held in April, and to be attended the second year after enrollment at TTIC. A student may propose an alternate conference. Pre-Candidacy is considered the first eight quarters enrolled at the Institute, or the period prior to being approved for Candidacy.

Candidacy Conference: TTIC recommends the Grace Hopper Conference held in the fall. This exceptional conference is renowned for supporting female scientists, and is aimed at students later in their studies, poised for professional development. Candidacy is considered the third year of enrollment at the Institute, and beyond, or the period after being approved for Candidacy.

Eligible expenses include conference registration, meals, and round-trip travel expense to the conferences.
INSTITUTE GOALS

New Chief Academic Officer

For the first time since its founding, TTIC installed a new Chief Academic Officer (CAO), Dr. Avrim Blum. Dr. Blum began his appointment in August 2017 after many prestigious years at Carnegie Mellon University. He is working with institute constituents devising a new strategic plan and long term vision for TTIC.

Dr. David McAllester served as CAO from fall of 2002- summer 2017, and oversaw the growth and maturing of the institute, played a role in developing a reputation for TTIC, and how eventually, faculty, students, and the PhD program would be received by other research institutions and the computer science community at large. Dr. McAllester maintains a professorship at TTIC.

Updated Strategic Plan

The Strategic Plan for the institute was revised in April 2018 by CAO Avrim Blum and President Sadaoki Furui, in consultation with TTIC faculty and External Advisory Committee. The revised Strategic Plan addresses a range of TTIC’s operations:

**Faculty:** TTIC shall remain committed to maintaining high quality Research Assistant faculty and attracting strong researchers who will have a positive impact on TTIC and the computer science community. Also, an aim to hire five more tenure-track faculty over the next five to eight years.

**Students & Education:** Maintain quality students; pursue ongoing formal agreements with University of Chicago regarding support for academic operations (including TAs and graders or monetary compensation for the large number of their students attending TTIC courses); develop and implement mechanisms for increasing the visibility of TTIC students, to help them become well-positioned in the job market.

**External Relationships:** Further strengthen the relationship with the University of Chicago and the courtesy faculty appointments aimed to foster and acknowledge collaboration. TTIC remains committed in its partnership with TTIJ and together, impact Computer Science in Japan more broadly,
through visits and interactions with other institutes in Japan, and possibly creating special programs and opportunities for Japanese students and scholars.

**Space and Activity:** Continue to explore options for space that will accommodate its medium and long-term planned growth, including improved classroom and event space, as well as additional offices, research, and meeting space. Increase visibility through research-related and teaching-related programs: visiting student program, summer workshops, and distinguished lecture series. The high-level goal is to make TTIC a destination location, spark collaborations, and provide a rich experience for students.

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### Expanding Administrative Support

To support institute growth, the program and increased collaboration and research efforts, the institute hired a Grants Administrator and an Events and Facilities Manager in 2017. Some of these job duties were previously held by other administrative staff, but full-time staff in these roles became necessary as the need for support increases with growth. The newly created positions allowed for expansion of value-added support service by individuals certified in their respective fields.

Rose Bradford, Grants Administrator came to TTIC with 18 years of experience from the University of Illinois at Chicago and is a Certified Research Administrator. At TTIC, Ms. Bradford provides critical support to faculty related to all federal and non-federal grant awards policies and procedures, compliance, and regulatory issues during all phases of the award cycle. During her first year at TTIC, Ms. Bradford was responsible for the overhaul and implementation of various policies and procedures, including conflicts of interest and effort reporting.

Latrice Richards, Events and Facilities Manager, is responsible for the execution of all internal and external events including board meetings, workshops, and lectures. This new position was critical with the increase in frequency and attendance of academic workshops and visitors at TTIC. Although TTIC leases space from the University of Chicago, Ms. Richards’ job includes responsibility for the overall safety, function, and appearance of institute facilities.
FY 2017-2018 was a record year for sponsored research. TTIC tenure and tenure-track faculty were awarded nine research grants from federal agencies totaling over $4.6 million, an all-time record for the Institute. The nine awarded grants (out of twelve submissions) represented a 75% success rate, which is well-above average. The federal grants portfolio includes basic research, CAREER Awards, collaborative research, and conference grants. In fiscal year 2017-18, TTIC spent $1.8 million on grant expenditures, an increase of 11% from the prior year. Available funding exceeds $8.3 million, another TTIC record. Total award volume since inception has reached $20 million, with NSF, TTIC’s cognizant agency, representing 68% of this total.
NOTES FROM THE CFO

TTIC remains financially sound as investments represent 95% of TTIC’s net assets. Investments increased by $25 million with the payment of the pledge receivable from TTIC’s primary donor, Toyota Motor Corporation. This cash investment was offset by market losses on the year. As of June 30, 2018, TTIC had an unrealized loss of $5.4 million related to notes and bonds. TTIC’s overall investment return for FY17-18 was a loss of $1.8 million, as the bond and note losses were offset by gains in the University of Chicago Total Return Investment Pool (TRIP) fund.

Operating expenses were 3% less than the Board-approved budget for the fiscal year.

Looking ahead to FY 2018-2019, TTIC will focus on long-term financial planning and budgeting to accommodate the anticipated growth of enrollment and faculty in the coming years.

Jessica Johnston
Chief Financial Officer
### Toyota Technological Institute at Chicago

**Statement of Financial Position**

<table>
<thead>
<tr>
<th></th>
<th>June 30, 2018 and 2017</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2018</td>
<td>2017</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$5,940,183</td>
<td>$7,259,580</td>
</tr>
<tr>
<td>Receivables:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous receivable</td>
<td>20,115</td>
<td>49,853</td>
</tr>
<tr>
<td>Grants receivable</td>
<td>785,151</td>
<td>646,143</td>
</tr>
<tr>
<td>Due from TTI</td>
<td>1,646</td>
<td>965</td>
</tr>
<tr>
<td>Interest receivable</td>
<td>1,384,271</td>
<td>1,222,795</td>
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<tr>
<td>Investment distribution receivable</td>
<td>3,300,935</td>
<td>2,851,656</td>
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<tr>
<td>Prepaid expenses and other current assets</td>
<td>62,798</td>
<td>73,680</td>
</tr>
<tr>
<td>Investments</td>
<td>245,162,211</td>
<td>223,294,086</td>
</tr>
<tr>
<td><strong>Pledges Receivable</strong></td>
<td>-</td>
<td>25,000,000</td>
</tr>
<tr>
<td><strong>Furniture and Equipment - Net</strong></td>
<td>619,188</td>
<td>523,307</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$257,276,486</td>
<td>$260,921,965</td>
</tr>
<tr>
<td><strong>Liabilities and Net Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable - Trade Accounts payable</td>
<td>$351,552</td>
<td>$153,068</td>
</tr>
<tr>
<td>Accrued expenses</td>
<td>663,502</td>
<td>546,112</td>
</tr>
<tr>
<td>Accrued lease liability</td>
<td>360,953</td>
<td>378,006</td>
</tr>
<tr>
<td>Deferred revenue</td>
<td>588,420</td>
<td>515,684</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>1,984,427</td>
<td>1,592,770</td>
</tr>
<tr>
<td><strong>Net Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unrestricted</td>
<td>62,275,497</td>
<td>69,159,915</td>
</tr>
<tr>
<td>Temporarily restricted</td>
<td>977,575</td>
<td>1,006,574</td>
</tr>
<tr>
<td>Permanently restricted</td>
<td>192,058,987</td>
<td>189,162,706</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td>255,312,059</td>
<td>259,329,195</td>
</tr>
<tr>
<td><strong>Total liabilities and net assets</strong></td>
<td>$257,276,486</td>
<td>$260,921,965</td>
</tr>
</tbody>
</table>
## Statement of Activities and Changes in Net Assets

**Years Ended June 30, 2018 and 2017**

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unrestricted</td>
<td>Temporarily Restricted</td>
</tr>
<tr>
<td><strong>Revenue, Gains, and Other Support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student tuition and fees</td>
<td>$900,000</td>
<td>$ -</td>
</tr>
<tr>
<td>Scholarships</td>
<td>(900,000)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total net student tuition and fees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal grants and contracts</td>
<td>2,109,344</td>
<td>-</td>
</tr>
<tr>
<td>Other interest</td>
<td>29,087</td>
<td>-</td>
</tr>
<tr>
<td>Contributions</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Not realized and unrealized (loose) gains on investments</td>
<td>(1,889,196)</td>
<td>(28,999)</td>
</tr>
<tr>
<td>Interest income</td>
<td>5,041,830</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total revenue, gains, and other support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5,341,065</td>
<td>(28,999)</td>
</tr>
<tr>
<td><strong>Expenses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational expenses - Instruction</td>
<td>6,859,827</td>
<td>-</td>
</tr>
<tr>
<td>Management and general expenses - Institutional support</td>
<td>2,460,676</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total expenses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9,329,202</td>
<td>-</td>
</tr>
<tr>
<td><strong>(Decrease) Increase in Net Assets - Before transfers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3,988,137)</td>
<td>(28,999)</td>
</tr>
<tr>
<td><strong>Transfers</strong></td>
<td>(2,885,281)</td>
<td>-</td>
</tr>
<tr>
<td><strong>(Decrease) Increase in Net Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(6,884,418)</td>
<td>(28,999)</td>
</tr>
<tr>
<td><strong>Net Assets - Beginning of year</strong></td>
<td>69,159,915</td>
<td>1,006,574</td>
</tr>
<tr>
<td><strong>Net Assets - End of year</strong></td>
<td>$62,275,497</td>
<td>$977,576</td>
</tr>
</tbody>
</table>
INTERNS AND VISITING SCHOLARS

TTIC maintains a steady number of interns and visiting scholars who engage in study and research on the premises. Summer 2018 had seventeen visiting scholars from other institutions in the U.S. and abroad who came to the Institute to work with TTIC faculty over the summer months.

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

Visiting students from eleven universities, listed below (faculty hosts in parentheses):

Vedat Levi Alev, University of Waterloo (Y. Makarychev and M. Tulsiani)
Yang Chen, University of Chicago (K. Livescu)
Chen Dan, Carnegie Mellon University (A. Blum)
Jack Huang, University of Chicago (K. Livescu)
Fernando Granha Jeronimo, University of Chicago (M. Tulsiani)
Akash Kumar, Purdue University (M. Tulsiani)
Zhen Li, Hong Kong University (J. Xu)
Xiao Luo, University Science and Technology of China (J. Xu)
Thodoris Lykouris, Cornell University (A. Blum)
Hussein Mozannar, American University of Beirut (M. Ohannessian and N. Srebro)
Chongming Ni, Tsinghua University (J. Xu)
Yuanzhe Pang, University of Chicago (K. Gimpel)
Samira Samadi, Georgia Tech. (A. Blum)
Saeed Seddighin, University of Maryland (A. Blum)
Ayush Sekhari, Cornell University (S. Bhojanapalli and N. Srebro)
Haochen Wang, University of Chicago (G. Shakhnarovich)
Changzhi Xie, Tsinghua University (A. Blum)

Those interested in joining TTIC as a visiting student may apply online on the TTIC website. Students also visit during other times of the year, and some students maintain long-standing collaborations with TTIC faculty.
CONSTITUENT & COMMUNITY OUTREACH

McDade Classical School Partnership

TTIC’s grant administrator, Ms. Rose Bradford, assisted by TTIC robotics Assistant Professor, Matt Walter, assisted the James E. McDade Classical Elementary School (a Chicago public school in TTIC’s neighborhood) to secure a $5000 grant to enhance the school’s STEM programming and support. TTIC made a partial-match donation of $1000. Part of the donation was used to cover transport of students to visit TTIC and experience Prof. Walter’s Robotics Laboratory. Remaining funds are intended to be used to help purchase materials and support instructor training for the Duckietown project that Prof. Walter introduced.
Robotics Week

A team of robotics students and Prof. Matt Walter participated in Robotics Week at Chicago’s Museum of Science and Industry in April 2018. They featured the Duckiebots, and Husky, the robotic chess-playing arm, and gave demonstrations for the Robotics Week museum visitors.

Natural Disaster Relief

In September 2017, the TTIC community collectively made a $1000 donation to Hurricanes Harvey and Irma hurricane relief efforts. TTIC matched the funds, for a total donation of $2000 to One America Appeal, a 501 nonprofit organization founded on September 7, 2017, by all five then-living former United States Presidents: Jimmy Carter, George H. W. Bush, Bill Clinton, George W. Bush, and Barack Obama.

1000th Tweet

TTIC made it’s 1000th twitter “tweet” on June 6, 2018. With the twitter handle @TTIC_Connect, the feed is used to communicate upcoming TTIC talks, thesis defenses, important public events at TTIC, photos of activity, announcements and admissions, research and academic opportunities. Twitter continues to be a useful social media tool to connect TTIC to its constituents, alumni, the computer science community, STEM and higher learning organizations, and perfect strangers with a passion for the work done here. For those who don’t use Twitter: a feed of TTIC tweets is located at the bottom of the TTIC website.
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

Rita Colwell
Chairman, Canon US Life Sciences, Inc.
Distinguished Professor, University of Maryland College Park and Johns Hopkins University
11th Director of the National Science Foundation, 1998-2004
Author or co-author of 16 books and more than 700 scientific publications
A geological site in Antarctica, Colwell Massif, named in recognition of her work in the Polar Regions
Trustee since September 2008

Sharon Darling
President and Founder, National Center for Family Literacy
Frequent keynote speaker: Businessweek Fortune 500 Forum and the National Governors Association
Recipient of the 2002 National Humanities Medal awarded by President and Mrs. George W. Bush, and the Albert Schweitzer Prize for Humanitarianism from Johns Hopkins University
Serves on the boards of: the Barbara Bush Foundation for Family Literacy, the National Fund for Excellence in American Indian Education, Corporation for Public Broadcasting’s Ready to Learn, and the Heart of America Foundation
Trustee since April 2007

Robert A. Fefferman
Max Mason Distinguished Service Professor, Division of the Physical Sciences, University of Chicago
Former Dean, Division of the Physical Sciences, University of Chicago
Former Chairman, Department of Mathematics, University of Chicago
Recipient, Quantrell Award for Excellence in Undergraduate Teaching, and University of Chicago Sloan Foundation Fellow
Trustee since October 2003

Sadaoki Furui
President, Toyota Technological Institute at Chicago
Professor Emeritus, Tokyo Institute of Technology
Professor, Academy for Global Leadership, 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

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 Dept. 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
Professor and Executive Associate Dean, College of Computing, Georgia Institute of Technology
Co-Chair, Computing Research Association’s Subcommittee on Education
Co-leader of the Threads reform of the undergraduate computing curriculum: a successful, comprehensive restructuring of the computing curriculum that provided a cohesive, coordinated set of contexts for teaching and learning computing skills.
Recipient of: Modern Day Technology Leader Award (Black Engineer of the Year Award, 2009); Scholar of Note (Black Issues in Higher Education, 2004); One of the 50 Most Important African American Technologists (Soul of Technology, eAccess Corp, 2009)
Committed mentor of young minority faculty
Trustee since October April 2018

Masanori Kashiwara
Executive Advisor, Toyota Technological Institute
Member of the Board of Directors, Toyota School Foundation
Former Chief Administrative Officer, Toyota Technological Institute
Former Vice President, Toyota Motor North America, Inc.
Former Secretary and Treasurer, Toyota Motor Corporate Services of North America, Inc.
Trustee since October 2009

Edward ‘Rocky’ Kolb
Dean, Division of Physical Sciences, University of Chicago
Arthur Holly Compton Distinguished Service Professor
Member, Enrico Fermi Institute
Board Member, Giant Magellan Telescope, 2010-present; Adler Planetarium, 2010-present
Trustee since October 2013

Yoshihiko Masuda
Chairman of the Board of Trustees, Toyota School Foundation
Advisor, Toyota Central R&D Labs, Inc. and Toyota Motor
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
Former Editor-in-chief of Speech Communication
Fellow of the IEEE and of the International Speech Communication Association (ISCA)
Trustee since April 2015
Toshiaki Taguchi  
Advisor, Toyota Motor Corporation  
Former President and CEO, Toyota Motor North America, Inc.  
Former Executive Vice President, Toyota Motor Corporation  
Trustee since October 2002

Masatami Takimoto  
Chairman of the Board of Trustees, Toyota Technological Institute at Chicago  
Chairman of the 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

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

Mitsuru Nagasawa  
President Emeritus
Trustee Departures
Mr. Toshiaki Taguchi: Service of Oct 2002 – Oct 2017
Dr. Richard Samuels: Service of July 2015 – Jan 2018
Dr. Rita Colwell: Service of Sept 2008 – April 2018

Trustee Appointments
Dr. Yoshihiko Masuda: Appointed Oct 2017
Dr. Mari Ostendorf: Appointed Oct 2017
Dr. Charles Isbell: Appointed April 2018
Mr. Ivan Samstein: Appointed April 2018

In Memoriam: The Passing of Tatsuro Toyoda

TTIC mourns the loss of Institute Chairman Emeritus and visionary business leader, Tatsuro Toyoda, who passed on December 30, 2017 at the age of 88. Mr. Toyoda was the second son of Ki-ichiro Toyoda, the founder of Toyota Motor Corporation (TMC) and led the company’s climb to become one of the world’s top automakers. Mr. Toyoda served as Toyota Motor Corporation’s seventh president, stepped down as president in 1995, and continued to serve the corporation as an adviser, a title he held until his death.

Throughout his career, Tatsuro Toyoda upheld the convictions of his father, Ki-ichiro, and his grandfather, Sakichi, who had invented automated looms, laying the basis for the Toyota group. One of their beliefs was, “Respect the spirit of research and creativity and always strive to stay ahead of the times.” This belief was honored by Tatsuro and his colleagues, especially his uncle, Eiji Toyoda, and led them to found Toyota Technological Institute (TTI) in Japan in 1981. While Tatsuro served as the second Chairman of TTI’s Board, he promoted the plan to found TTIC. Tatsuro was the founding Chairman of TTIC’s Board of Trustees and served from 2002 until 2013, when he was made the first Chairman Emeritus. Mr. Toyoda’s generosity in the support of education and research, and his dedication of time, service, and attention to the success of TTIC are part of his legacy that we will continue to appreciate.
LEADERSHIP

Dr. Sadaoki Furui, President
Ms. Jessica Johnston, Chief Financial Officer
Dr. Avrim Blum, Chief Academic Officer
Ms. Chrissy M. Novak, Secretary of the Institute

ADMINISTRATION

Adam Bohlander, Director of Information Technology
Rose Bradford, Grants Administrator
Erica Cocom, Student Services Assistant
Jessica Johnston, Chief Financial Officer
Director of Operations
Mary Marre, Administrative Assistant
Amy Minick, Human Resources Generalist, Immigration Specialist
Title IX Coordinator
Chrissy M. Novak, Administrative Director of Graduate Studies, Publications;
Secretary of the Institute
Accreditation Liaison Officer
Deputy Title IX Coordinator
Latrice Richards, Events and Facilities Manager
James Vann, Staff Accountant

Equal Opportunity Statement

TTIC, in admissions, employment and access to programs, considers all faculty, staff and students on the basis of individual merit and without regard to race, color, religion, sex, sexual orientation, national or ethnic origin, age, disability, or any other legally protected status.
SPECIAL THANKS

The External Advisory Committee
Eric Grimson, Chancellor and Professor of Computer Science and Engineering, Massachusetts Institute of Technology
Takeo Kanade, UA and Helen Whitaker University Professor, Robotics Institute, Carnegie Mellon University
Richard Karp, Professor of Electrical Engineering and Computer Science, University of California, Berkeley
Éva Tardos, Jacob Gould Schurman Professor of Computer Science, Cornell University

The University of Chicago greater community
Booth School of Business
Chicago Center for Teaching
Computation Institute
Department of Computer Science
Department of Mathematics
Department of Statistics
English Language Institute
Faculty and Administration of the Division of Physical Sciences
Office of the Bursar
Office of International Affairs
Office of Investments
Office of the Registrar
Physical Science Division
PSD Graphic Arts
Staff of the Regenstein and Eckhart Libraries
Student Health and Counseling Services
University Research Administration
University IT Services
The professionals at the 6045 S. Kenwood Avenue building

Distinguished Speakers at the 2017 CAO Installation Event
Pedro Felzenszwalb, Professor of Engineering and Computer Science, Brown University
Steve Smale, Professor Emeritus of Mathematics, UC Berkeley
Yishay Mansour, Professor of Computer Science, Tel-Aviv University
Lance Fortnow, Professor and Chair, School of Computer Science, Georgia Tech College of Computing
Éva Tardos, Jacob Gould Schurman Professor of Computer Science, Cornell University
Robert Fefferman, Max Mason Distinguished Service Professor in Mathematics, University of Chicago
Tom Mitchell, E. Fredkin University Professor, Machine Learning Department, School of Computer Science, Carnegie Mellon University
Adam Kalai, Principal Researcher, Microsoft Research Cambridge

The professionals at the Higher Learning Commission
The Toyota Central R&D Labs, Inc.
Toyota Motor Corporation
Toyota Technological Institute (Nagoya, Japan)