<table>
<thead>
<tr>
<th>CONTENTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute Mission</td>
<td>3</td>
</tr>
<tr>
<td>Message from the President</td>
<td>5</td>
</tr>
<tr>
<td>Note from the Chief Academic Officer</td>
<td>7</td>
</tr>
<tr>
<td>Institute Overview</td>
<td>8</td>
</tr>
<tr>
<td>Celebrating 10 Years of Progress</td>
<td>9</td>
</tr>
<tr>
<td>Awards and Honors</td>
<td>12</td>
</tr>
<tr>
<td>New Faculty</td>
<td>13</td>
</tr>
<tr>
<td>Faculty By Area</td>
<td>14</td>
</tr>
<tr>
<td>Postdocs</td>
<td>14</td>
</tr>
<tr>
<td>Research and Responsibility</td>
<td>15</td>
</tr>
<tr>
<td>Research Philosophy</td>
<td>15</td>
</tr>
<tr>
<td>Machine Learning</td>
<td>16</td>
</tr>
<tr>
<td>Algorithms and Complexity</td>
<td>18</td>
</tr>
<tr>
<td>Computer Vision and Computational Photography</td>
<td>21</td>
</tr>
<tr>
<td>Speech Technologies</td>
<td>23</td>
</tr>
<tr>
<td>Computational Biology</td>
<td>26</td>
</tr>
<tr>
<td>Collaboration and Cooperation</td>
<td>29</td>
</tr>
<tr>
<td>Seminars and Talks</td>
<td>30</td>
</tr>
<tr>
<td>Education</td>
<td>33</td>
</tr>
<tr>
<td>The PhD Program</td>
<td>33</td>
</tr>
<tr>
<td>Student Progress</td>
<td>34</td>
</tr>
<tr>
<td>Student Publications, Posters, Abstracts</td>
<td>35</td>
</tr>
<tr>
<td>Student Body Growth</td>
<td>36</td>
</tr>
<tr>
<td>Financial Support</td>
<td>36</td>
</tr>
<tr>
<td>Exchange Students</td>
<td>36</td>
</tr>
<tr>
<td>Institute Goals</td>
<td>37</td>
</tr>
<tr>
<td>Accreditation Renewal</td>
<td>37</td>
</tr>
<tr>
<td>Near-Term Goals; Long-Term Goals</td>
<td>38</td>
</tr>
<tr>
<td>Investment Progress</td>
<td>39</td>
</tr>
<tr>
<td>Board Growth and Member Retirement</td>
<td>39</td>
</tr>
<tr>
<td>Interns and Visiting Scholars</td>
<td>41</td>
</tr>
<tr>
<td>Institute Financial Reports</td>
<td>42</td>
</tr>
<tr>
<td>Governance</td>
<td>45</td>
</tr>
<tr>
<td>Board of Trustees</td>
<td>45</td>
</tr>
<tr>
<td>Leadership</td>
<td>48</td>
</tr>
<tr>
<td>Administration</td>
<td>48</td>
</tr>
<tr>
<td>Equal Opportunity Statement</td>
<td>49</td>
</tr>
<tr>
<td>Special Thanks</td>
<td>50</td>
</tr>
</tbody>
</table>
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. Of course TTIC also strives to produce Ph.D.s who achieve academic impact throughout their careers. The institute strives to produce graduates who contribute to society through their intellectual leadership in computer science and information technology. Success in the 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 Ph.D. graduates at high quality research institutions. TTIC also strives to make its Ph.D. students visible to the academic community before graduation. This can be done most effectively through publications prior to graduation.
During the 2013-14 academic year, the Toyota Technological Institute at Chicago (TTIC) continued its steady progress towards fulfilling its mission: achieve international impact through world-class research and education in fundamental computer science and information technology.

In recognition of his outstanding research and professional stature, and his contributions to TTIC, Dr. Yuri Makarychev has been promoted to Associate Professor, with tenure. New research faculty members Stefan Canzar, Ayan Chakrabarti, Qixing Huang, Aly Khan, Mehrdad Mahdavi, Michael Maire and Hammad Naveed will arrive by the fall of 2014, and new tenure-track faculty member, Matthew Walter, will arrive during fall quarter.

TTIC’s level of recognition and impact of research continues to steadily increase, the latest examples being the Best Long Paper Honorable Mention at ACL 2014, Best Paper Award at RECOMB 2014, and ICLP Test of Time Award. The faculty actively pursued federal research grants with sufficient success that the grant volume increases to $1.1 million.

TTIC celebrated its 10-year anniversary in September-October, 2013. As a part of the celebration, we held an Anniversary Symposium on September 27, open to the computer science community. The speakers included TTIC faculty, faculty alumni as well as prominent researchers from the U.S. and around the globe. The symposium was very successful drawing around 70 participants from many institutions. We also published a 10-Year Anniversary commemorative booklet which included messages and well-wishes from supporters of TTIC, an overview of Institute history, milestones, commemorative photos, and historical documents.

As a part of the rigorous accreditation renewal process our institute undergoes in partnership with the Higher Learning Commission (HLC), we are preparing a critical and evidence-based self-study report. The report is emerging from the intense scrutiny we are giving to every aspect of the institution to provide the HLC and the public full assurance of the quality and soundness of our program and operations. TTIC has made significant strides since the last HLC visit held in 2009, in which the institute achieved its first accreditation. The self-study provides a descriptive and normative opportunity to reflect on the progress we are making, and how we plan to achieve future progress. The HLC peer-review team is scheduled for a comprehensive visit to TTIC on November 10-12, 2014.

Our relationship with Toyota Technological Institute (TTIJ) in Japan continues to strengthen. One TTIJ exchange student and one visiting scholar spent a quarter at TTIC during 2013-14 academic year, and for the first time, a student who finished undergraduate study at TTIJ enrolled in TTIC’s Ph.D. program in the autumn quarter.

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.

As TTIC continues to mature as an institution, we are committed to continuous 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
TTIC celebrated its tenth anniversary in the fall of 2013. The accomplishments of TTIC over this decade have been rather remarkable. In the first few years of operation TTIC decided to follow a “hub and spoke” model with hub areas of machine learning and theoretical computer science and hub application areas that benefit from association with the hubs. This proved to be an effective strategy. Machine learning (and big data) continued to increase its influence on computer science generally over this decade and TTIC became known as one of leading departments in these areas. The faculty should feel proud of the state of TTIC after the first decade of operation.

I am particularly proud of the success of the Research Assistant Professors over the years. Of our thirty-five Research Assistant Professor Alumnae, (as of autumn 2014,) twenty-three currently hold faculty positions. Most others hold prominent corporate research positions. The Research Assistant Professor program has been extremely effective in raising the academic profile of TTIC and there is every reason to believe that this will continue to be true.

Computer science is becoming ever more significant to society. I fully expect the next decade to be more eventful and more exciting than the last. TTIC will continue to be an active player in creating the future.

David McAllester
Chief Academic Officer
Faculty and Staff

<table>
<thead>
<tr>
<th>Faculty Rank</th>
<th>Number</th>
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<tbody>
<tr>
<td>Professors</td>
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</tr>
<tr>
<td>Associate Professors</td>
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<tr>
<td>Assistant Professors</td>
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<tr>
<td>Research Assistant Professors</td>
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</tr>
<tr>
<td>Adjoint Faculty</td>
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<tr>
<td>Administrative Office Staff and IT</td>
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Ph.D. Program

<table>
<thead>
<tr>
<th>Category</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Students Enrolled for 2013-14</td>
<td>25</td>
</tr>
<tr>
<td>Master’s within the PhD Program Degrees Awarded</td>
<td>7</td>
</tr>
<tr>
<td>Ph.D. Degrees Awarded</td>
<td>2</td>
</tr>
<tr>
<td>Applicants for the 2014-15 Academic Year</td>
<td>83</td>
</tr>
<tr>
<td>Admitted</td>
<td>6</td>
</tr>
<tr>
<td>Enrolling</td>
<td>2</td>
</tr>
<tr>
<td>Exchange Students in 2013-14</td>
<td>1</td>
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</table>
TTIC celebrated its ten year anniversary in the fall of 2013. TTIC noted this milestone and documented the changing face of TTIC over the last decade with a commemorative booklet, an anniversary reception following the 2013 autumn Board of Trustees meeting, and holding a 10th Anniversary Symposium at the Institute.

The 10th Anniversary Symposium was held on September 27, 2013. Speakers included TTIC professors, TTIC faculty alumni, University of Chicago professors, and highly regarded researchers in the field of computer science. The turnout of attendees was fantastic, and it was an appropriate and enjoyable way to share with the computer science community, TTIC’s progress and engagement in furthering the study of computer science.

<table>
<thead>
<tr>
<th>Symposium Speaker</th>
<th>Institutional Affiliation</th>
<th>Talk Title</th>
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<tbody>
<tr>
<td>Julia Chuzhoy</td>
<td>TTIC</td>
<td>Grid Minors, Routing Problems, and Connections Between Them</td>
</tr>
<tr>
<td>Michael Collins</td>
<td>Columbia University</td>
<td>Spectral Learning of Latent-Variable PCFGs</td>
</tr>
<tr>
<td>Michael Jordan</td>
<td>University of California, Berkeley</td>
<td>On the Computational and Statistical Interface and &quot;Big Data&quot;</td>
</tr>
<tr>
<td>Sham Kakade</td>
<td>Microsoft Research, New England</td>
<td>Tensor Decompositions for Learning Latent Variable Models</td>
</tr>
<tr>
<td>Adam Kalai</td>
<td>Microsoft Research, New England</td>
<td>Learning to Program by Example</td>
</tr>
<tr>
<td>John Lafferty</td>
<td>TTIC, University of Chicago</td>
<td>Information, Optimization, and Estimation</td>
</tr>
<tr>
<td>John Langford</td>
<td>Microsoft Research, New York</td>
<td>Extreme Multiclass</td>
</tr>
<tr>
<td>Seiichi Mita</td>
<td>TTI (Japan)</td>
<td>Collaborative works between TTI and TTIC during the past 10 years</td>
</tr>
<tr>
<td>Sasha Razborov</td>
<td>TTIC, University of Chicago</td>
<td>Continuous Combinatorics</td>
</tr>
<tr>
<td>Shai Shalev-Shwartz</td>
<td>Hebrew University of Jerusalem</td>
<td>What is Learnable and How to Learn?</td>
</tr>
<tr>
<td>Masashi Sugiyama</td>
<td>Tokyo Institute of Technology</td>
<td>Machine Learning with Density Ratio Estimation</td>
</tr>
<tr>
<td>Raquel Urtasun</td>
<td>TTIC</td>
<td>Visual Scene Understanding for Autonomous Systems</td>
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A 10th Anniversary Commemorative booklet was written to document TTIC’s beginning, progress, and where it stands today. The booklet begins with a message from the founding Chairman of the Board, Mr. Tatsuro Toyoda:

“This autumn of 2013 the Toyota Technological Institute at Chicago (TTIC) celebrates an important milestone, its 10th anniversary. As Chairman of the Board of Trustees, I would like to offer my sincere gratitude to all who have supported the Institute over these ten years. Without your initiative, invaluable support, and dedication, we could not have achieved what we have.

TTIC, a unique institution in focus and size, was established by the Toyota Technological Institute (TTI) in Japan for the purpose of strengthening research and education in the area of fundamental computer science, and contributing to society and academia. Now, I understand that TTIC is making noticeable progress, and I feel pleased to have been one of the participants in the founding of the Institute and its growth, both as Chairman of TTIC, as well as Chairman of TTI.

Meaningful collaboration has been established with TTI and the University of Chicago, and such continued efforts have the potential for significant academic research results and reaping great rewards for the institutions and society as a whole. I hope that these relationships may continue to grow and prosper.

While I understand that the field of computer science changes rapidly, our spirit and dedication remains constant. My grandfather, Sakichi Toyoda, spoke the words, “Respect the spirit of research and creativity, and always strive to stay ahead of the times.” Institutions of academia play enduring roles in society. With a respect for the spirit of research and creativity, it is my sincere hope that TTIC has a bright future bringing together the world’s leading computer scientists and the world’s most promising students, and continues to contribute to our global community for many more years.”

Some of the institutions and organizations who have assisted and supported the institute sent words of congratulations which were included in the booklet. It also contained news articles which announced the initial relationship agreement between TTIC and University of Chicago, photos of Chicago’s mayor at TTIC for its grand opening, photos of those first professors and researchers who help get TTIC started, and timelines of steps leading up to TTIC’s initial accreditation in 2009. The resulting booklet is a visual compilation of artifacts, statistics, photographs and names that make TTIC the institution it has become.

And finally, there was a dinner reception held to celebrate the ten year anniversary on October 2, 2013. The Board of Trustees, faculty, staff and some TTIC supporters were invited. The reception was held at the Waldorf Astoria hotel. The reception was an opportunity to celebrate the progress the institute has made, recognize some key leaders who made progress possible, and thank all who invested time, energy, talents and support the TTIC.
TTIC Faculty Alumni speakers at the 10th Anniversary Symposium: (LtoR) Shai Shalev-Shwartz, Sham Kakade, John Langford, Adam Kalai, David McAllester, Sadaoki Furui.

Graduation Ceremony: (LtoR) Nati Srebro, Madhur Tulsiani, Andrew Cotter, David McAllester, Jian Peng, Sadaoki Furui, Jinbo Xu.

Graduation Procession at Symposium: (front to back) Sadaoki Furui, David McAllester, Nati Srebro, Jinbo Xu, Madhur Tulsiani.

Attendees of the 10th Anniversary Symposium.
AWARDS AND HONORS

2013 August  Raquel Urtasun

Prof. Raquel Urtasun co-author of CVPR 2013 Best Paper Runner-Up Award

Raquel Urtasun was awarded the 2013 IEEE Conference of Computer Vision and Pattern Recognition Best Paper Runner-Up Award (sponsored by IBM Research) at the June Conference in Portland, OR, along with Marcus Brubaker and Andreas Geiger. The paper was entitled, "Lost! Leveraging the Crowd for Probabilistic Visual Self-Localization."

2013 September  Julia Chuzhoy

Prof. Chuzhoy invited to speak at International Congress of Mathematicians

Julia Chuzhoy has been invited to speak at the International Congress of Mathematicians to be held in Seoul, South Korea in August of 2014. She will be a Mathematical Aspects of Computer Science section speaker.

The International Congress of Mathematicians (ICM) is the largest conference for the topic of mathematics, with the first meeting held in August of 1897. It meets once every four years. The Fields Medals, the Nevanlinna Prize, the Gauss Prize, and the Chern Medal are awarded during the congress' opening ceremony. Each congress is memorialized by a printed set of Proceedings recording academic papers based on invited talks intended to be relevant to current topics of general interest.

2014 April  David McAllester

Prof. McAllester awarded ICLP Test of Time Award

TTIC Professor and Chief Academic Officer, David McAllester is being awarded the 20-year "Test of Time Award" at the 30th International Conference on Logic Programming (ICLP) in Vienna, Austria in July 2014. McAllester will be recognized for his 1994 paper CLP (Intervals) Revisited, coauthored with F. Benhamou and P. Van Hentenryck. The ALP 20-year Test of Time award identifies the most influential paper from the ICLP proceedings 20 years prior that stood the test of time.

2014 April  Jinbo Xu

Prof. Jinbo Xu's group wins Best Paper Award at RECOMB 2014

TTIC Professor Jinbo Xu and his group of two TTIC students, Jianzhu Ma and Zhiyong Wang, along with post-doc Sheng Wang, won the Best Paper Award at the 18th Annual International Conference on Research in Computational Molecular Biology (RECOMB 2014) in April. RECOMB is one of the top two bioinformatics conferences in the world. The winning paper is titled, "MRFalign: Protein Homology Detection through Alignment of Markov Random Fields."

2014 June  Mohit Bansal

Prof. Mohit Bansal awarded Best Long Paper Honorable Mention at ACL 2014

At the June 2014 52nd Annual Meeting of the Association for Computational Linguistics (ACL 2014), Prof. Mohit Bansal was awarded the Best Long Paper Honorable Mention for the paper "Structured Learning for Taxonomy Induction with Belief Propagation" by Mohit Bansal, David Burkett, Gerard de Melo and Dan Klein.
NEW FACULTY

John Lafferty
Adjoint Professor
PhD - Princeton University
Research Interests: Machine learning, nonparametric estimation, probabilistic modeling, graphical models, text modeling.

Ofer Meshi
Research Assistant Professor
PhD - Hebrew University
Research Interests: Machine learning and optimization. In particular, seeking efficient algorithms for: structured output prediction, probabilistic graphical models, model selection, statistical relational models and other related problems.

Mohit Bansal
Research Assistant Professor
PhD - University of California, Berkeley
Research Interests: Statistical natural language processing and machine learning, with a focus on lexical semantics, syntactic parsing, coreference resolution, information extraction, and structured prediction.

Georgios Papandreou
Research Assistant Professor
PhD - National Technical University of Athens, Greece
Research Interests: Computer vision, machine learning, and multimodal perception using methods from Bayesian statistics, signal processing, and applied mathematics.

Shi Li
Research Assistant Professor
PhD - Princeton University
Research Interests: Theoretical computer science. Specifically, he is interested in designing and analyzing approximation algorithms for NP-hard combinatorial problems, including facility location problems, clustering, network routing, scheduling problems, etc.

Ryota Tomioka
Research Assistant Professor
PhD - University of Tokyo
Research Interests: Machine learning and optimization when both n and p are large. Finding mathematical structures in solid practical problems and leveraging them to develop better algorithms that can be applied more broadly.
FACULTY BY AREA

Machine Learning
Ben-David, Shai
Kpotufe, Samory
Lafferty, John
McAllester, David
Meshi, Ofer
Mita, Seichi
Sarwate, Anand
Sasaki, Yutaka
Srebro, Nathan *(Sabbatical 2013-14)*
Tomioka, Ryota

Computer Vision &
Computational Photography
Fidler, Sanja
Hazan, Tamir
Lin, Dahua
Maji, Subhransu
Orabona, Francesco
Papandreou, George
Shakhnarovich, Greg
Urtasun, Raquel

Algorithms and Complexity
Chuzhoy, Julia
Fortnow, Lance
Li, Shi
Makarychev, Yury
Moseley, Benjamin
Razborov, Alexander
Tulsiani, Madhur

Speech Technologies
Arora, Raman
Bansal, Mohit
Gimpel, Kevin
Livescu, Karen

Computational Biology
Xu, Jinbo
Shen, Yang

POSTDOCS
Brubaker, Marcus
Margaryan, Gohar
Oliwa, Tomasz
Wang, Sheng
Wang, Weiran
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 and post docs encompassing many areas of research interests, from many countries, 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 the occasion for close and cooperative research with not only the University of Chicago 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 give talks, participate in workshops, and share their research findings, all heightening the feeling of enthusiasm that pulses through the Institute.

The mission of TTIC includes “...achieving international impact through world-class research and education in fundamental computer science and information technology.” The research component of the mission is implemented through high quality research in high impact areas. Currently, there are active research programs in five areas: machine learning, algorithms and complexity, computer vision and computational photography, speech technologies, and computational biology. The areas are reviewed, as follows, and describe the nature of the area and the strategy for achieving impact in that area. A key part of the strategy for achieving impact in all areas is to foster collaboration and communication between the areas.
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 as humans learn how to perform many tasks, and how to interact with the world, mostly based on examples. 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. These include both classic Artificial Intelligence problems, such as computer vision, robotics, machine translation, question answering and dialogue systems, as well as a variety of “non-human” problems such as information retrieval, search, bio-informatics and stock market prediction.

Below is a list of the work done at TTIC this year in the area of Machine Learning.

Kpotufe, Samory
Research Assistant Professor
www.ttic.edu/kpotufe

PUBLISHED/ SUBMITTED PAPERS

McAllester, David
Professor, Chief Academic Officer
www.ttic.edu/mcallester

PUBLISHED/ SUBMITTED PAPERS

INVolVEMENT
Program co-chair for ICML 2013, general chair for ICML 2014.
Reviewer for NIPS 2013, CVPR 2014

RECOGNITION/ AWARDS

CLASSES/ SEMINARS
TTIC 31030 - Mathematical Foundations
This course covers the foundations of mathematics from a classical (nonconstructive) type-theoretic perspective, the general notion of a mathematical structure, the general notion of isomorphism, and the role of axiomatizations and constructions in mathematical definitions. The definition of the real numbers used as a fundamental example. The course also covers the notion of definability in well-typed formalisms. A primary example is the non-definability of a linear bijection between a vector space and its dual. Ontologies (types) relevant to machine learning are emphasized such as the type theory of PCA, CCA and Banach spaces (norms and dual norms).
**Meshi, Ofer**  
Research Assistant Professor  
www.ttic.edu/meshi

**PUBLISHED/ SUBMITTED PAPERS**

**INVOLVEMENT**

**MISCELLANEOUS**
Machine Learning Reading Group:

**Tomioka, Ryota**  
Research Assistant Professor  
www.ttic.edu/tomioka

**PUBLISHED/ SUBMITTED PAPERS**

**TALKS**
"Towards better computation-statistics trade-off in tensor decomposition." Workshop on Mathematical Approaches to Large-Dimensional Data Analysis (ISM, Tokyo, Japan). March 2014.

**INVOLVEMENT**
Editor: Neural Networks

**CLASSES/ SEMINARS**

**MISCELLANEOUS**

Algorithms & Complexity

One of the central tasks in all areas of computer science is that of writing 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 the complexity theorists is: “which computational problems can, and which cannot, be solved efficiently?” The study of algorithms and complexity is often referred to as the ‘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, and ultimately to better algorithms and faster software.

Below is a list of the work done at TTIC this year in the area of Algorithms & Complexity.

**Chuzhoy, Julia**  
Associate Professor  
www.ttic.edu/chuzhoy

**PUBLISHED/ SUBMITTED PAPERS**  

**TALKS**  
- "Polynomial Bounds for the Grid Minor Theorem." Weizmann Institute, December 2013.  

**IN INVOLVEMENT**  
- Programming Committee: FOCS 2014  
- Editor: Algorithmica

**RECOGNITION/ AWARDS**  
- Invited section speaker at International Congress of Mathematicians. Seoul, South Korea. August 2014,

**RESEARCH FUNDING AWARDS**  

**CLASSES/ SEMINARS**  
- TTIC 31080 and CMSC 37503: Approximation Algorithms. This is a graduate level course with the main focus on approximation algorithms for central combinatorial optimization problems.
Makarychev, Yury
Associate Professor
www.ttic.edu/makarychev

PUBLISHED/ SUBMITTED PAPERS

TALKS

IN INVOLVEMENT
Program committee: FOCS 2013, SODA 2015.

RESEARCH FUNDING AWARDS
Supported by National Science Foundation Grant IIS-1302662 (jointly with PI N. Srebro)
Supported by National Science Foundation Career Award CCF-1150062

CLASSES/ SEMINARS
- TTIC 31010 – Algorithms. This is a graduate level course on algorithms with the emphasis on central combinatorial optimization problems and advanced methods for algorithm design and analysis. Topics covered include asymptotic analysis, greedy algorithms, dynamic programming, amortized analysis, randomized algorithms and probabilistic methods, combinatorial optimization and approximation algorithms, linear programming, and advanced data structures.
- CMSC 31100 - Big Ideas in Computer Science (University of Chicago). Taught lectures on approximation algorithms and hardness of approximation.
- Taught a mini-course on Semidefinite Programming and Constraint Satisfaction at the summer REU program organized by TTIC and the University of Chicago (jointly with Madhur Tulsiani).

MISCELLANEOUS
I was the Programming Experience Czar at TTIC, overseeing the successful completion of student projects to fulfill the Programming requirement of the Ph.D. Program.
Promoted to Associate Professor in June 2014.

Moseley, Benjamin
Research Assistant Professor
www.ttic.edu/moseley

PUBLISHED/ SUBMITTED PAPERS


TALKS

INVolvement

RECOGNITION/ AWARDS
Best Paper Award. ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2013)

MISCELLANEOUS
Faculty Summer Sabbatical at Sandia National Laboratories in 2013.

Tulsiani, Madhur
Assistant Professor
www.ttic.edu/tulsiani

PUBLISHED/ SUBMITTED PAPERS
Results and Algorithmic Regularity.” ICALP 2014.

TALKS

INVOLVEMENT
Program Committee for CCC 2014
Editorial board for the journal “Theory of Computing”
Reviewer for STOC, ITCS, FOCS, FSTTCS, SODA, MAPR.

CLASSES/ SEMINARS
Theory Reading Group – Spring/Summer 2014
REU on Semidefinite Programming and Constraint Satisfaction - Summer 2014 (co-taught with Yury Makarychev)
Research course on applications of semidefinite programs, algorithms for solving them using multiplicative updates and the sum-of-squares hierarchy.

MISCELLANEOUS
Served as the Interim Director of Graduate Studies for 2013-14 academic year.

Computer Vision & Computational Photography

Computer vision involves getting computers to extract useful information from pictures and videos. It has applications in robotics, surveillance, autonomous vehicles, and automobile collision avoidance. Historically, this is a central research area of computer science.

Below is a list of the work done at TTIC this year in the area of Computer Vision and Computational Photography.

Orabona, Francesco
Research Assistant Professor
www.ttic.edu/orabona

PUBLISHED/ SUBMITTED PAPERS

TALKS
“Selective sampling and ranking in the partial adversarial setting.” Max Planck Institute, Tübingen, Germany, March 2013.
“Selective sampling and ranking in the partial adversarial setting.” Yahoo! Labs, Sunnyvale, CA, USA, Dec
2012.

IN INVOLVEMENT
Journal reviewer: Neural Computation, IEEE Transactions on Neural Networks and Learning Systems.

Papandreou, George
Research Assistant Professor
http://www.ttic.edu/papandreou

PUBLISHED/ SUBMITTED PAPERS

IN INVOLVEMENT

CLASSES/ SEMINARS
Two guest lectures for the TTI (Japan) machine learning class.
TTIC Reading Group Participation: Computer Vision, Machine Learning, Speech and Language Processing

RESEARCH FUNDING AWARDS

Shakhnarovich, Greg
Assistant Professor
www.ttic.edu/gregory

PUBLISHED/ SUBMITTED PAPERS
• E. Ahmed, G. Shakhnarovich, S. Maji, "Knowing a good HOG filter when you see it: Efficient selection of filters for detection." ECCV 2014. (oral)

TALKS

INVolvEMENT
Reviewing for IEEE TPAMI, CVPR, ICCV
Program committee: CVPR Workshop on Computer Vision and Human Computation

RECOGNITION/ AWARDS
IBM Faculty Award
Google Faculty Research Award (joint with K. Gimpel, D. Batra and C. Dyer)

RESEARCH FUNDING AWARDS
IBM gift: $10,000
NVIDIA research hardware gift: approx. $11,000
NSF RI core program medium award (jointly with K. Livescu) $854,000 for 3 years

CLASSES/ SEMINARS
TTIC 31020 - Introduction to Statistical Machine Learning
Core course in machine learning for graduate and senior undergraduate students at TTIC and University of Chicago

TTI (Japan) Introduction to Machine Learning
I prepared and distributed the material for the entire course, and coordinated teaching assignments among TTI faculty.

MISCELLANEOUS
Assisting the TTIC Accreditation Steering Committee in preparation for the Institute’s accreditation renewal in November 2014, including attending a learning assessment conference.

Speech Technologies

This area is concerned with getting computers to analyze and extract information from spoken language, as well as to generate spoken audio. At TTIC, current speech research focuses mainly on the analysis side. For example, speech recognition is the problem of transcribing the words being spoken in an audio signal, such as that recorded from a microphone. Speech processing heavily relies on techniques from machine learning and statistics, as well as ideas from linguistics and speech science, and shares algorithms with computer vision and computational biology. This area has applications such as automated telephone information centers, dictation systems, machine translation, archiving and search of spoken documents, assistance for the visually or hearing-impaired, and other human-computer interface systems.

Below is a list of the work done at TTIC this year in the area of Speech Technologies.
**Bansal, Mohit**  
Research Assistant Professor  
www.ttic.edu/bansal

**PUBLISHED/ SUBMITTED PAPERS**

**TALKS**

**INVOLVEMENT**
Session chair: ACL 2014  

**RECOGNITION/ AWARDS**

**RESEARCH FUNDING AWARDS**
IARPA Babel program ("agile and robust speech recognition technology for limited-resource languages"), Consultant, February to June 2014.

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**Gimpel, Kevin**  
Research Assistant Professor  
www.ttic.edu/gimpel

**PUBLISHED/ SUBMITTED PAPERS**

**INVOLVEMENT**

**RECOGNITION/ AWARDS**
Google Faculty Research Award, 2013, jointly with Chris Dyer (CMU), Dhruv Batra (Virginia Tech), and Greg Shakhnarovich (TTIC)
Livescu, Karen  
Assistant Professor  
www.ttic.edu/livescu

PUBLISHED/ SUBMITTED PAPERS

TALKS
"Learning from Speech Production for Improved Recognition." University of Maryland CLIP Distinguished Colloquium, January 2014.
"Discriminative learning with latent articulatory variables." Workshop on Speech Production in Automatic Speech Recognition, September 2013.
"Multi-view learning of speech features with linear and non-linear canonical correlation analysis" NYU CS, November 2013.

IN INVOLVEMENT
Associate Editor: IEEE Transactions on Audio, Speech, and Language  
Subject Editor: Speech Communication journal  
Associate Editor: IEEE Transactions on Audio, Speech, and Language  
Subject Editor: Speech Communication journal

RECOGNITION/ AWARDS
ASRU 2013 Best Student Paper 2nd place

RESEARCH FUNDING AWARDS

CLASSES/ SEMINARS
TTIC 31110 (CMSC 35900) - Speech Technologies
This course introduces techniques used in speech technologies, mainly focusing on speech recognition. 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. It is also a good example of the effectiveness of combining statistics and learning with domain knowledge. The course includes practical homework exercises using Matlab and speech toolkits.

MISCELLANEOUS
Thesis committee membership: Preethi Jyothi, Ohio State University; Rohit Prabhavalkar, Ohio State University
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 optimization techniques (e.g., linear programming and convex optimization) will find significant applications in this field. Algorithm design and complexity analysis will 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

**PUBLISHED/ SUBMITTED PAPERS**

- Jianzhu Ma, Sheng Wang and Jinbo Xu, “MRFalign: protein remote homology detection through alignment of Markov Random Fields.” RECOMB2014. (Best Paper Award, an extended version appears at PLOS Computational Biology.)
- Zhiyong Wang and Jinbo Xu, “Predicting protein contact map using evolutionary and physical constraints by integer programming.” ISMB2013, also appears in Bioinformatics (2013) 29 (13):i266-i273.
- Dinanath Sulakhe, Sandhya Balasubramanian, Bingqing Xie, Eduardo Berrocal, Bo Feng, Andrew Taylor, Bhadrachalam Chitturi, Utpal Dave, Gady Agam, Jinbo Xu, Daniela Börnigen, Inna Dubchak, T Conrad Gilliam, Natalia Maltsev, “High-Throughput Translational Medicine: Challenges and Solutions.” In Systems Analysis of Human Multigene Disorders, 2014. (Book Chapter)

**TALKS**

Talks at conferences and workshops including ISMB, RECOMB, and Zing

**INVolVEMENT**

Area chair: ISMB 2014
Associate editor: IEEE/ACM Trans. Bioinformatics and Computational Biology
Program Committee: ACM BCB 2014, ICML 2014, and others
Panelist: NIH K99 program
Reviewer for the following journals and conferences: PNAS, IEEE/ACM TCBB, PLoS Computational Biology, Bioinformatics, BMC Bioinformatics, Journal of Computational Biology, PROTEINS and Proteome.

RECOGNITION/ AWARDS
• Presentation entitled “MRFalign: protein remote homology detection through alignment of Markov Random Fields” won the Warren DeLano Award for Structural Bioinformatics and Computational Biophysics in ISMB 3DSIG 2014. ISMB is one of the top 2 bioinformatics conferences.
• Paper entitled “MRFalign: protein remote homology detection through alignment of Markov Random Fields” won the Best Paper Award in RECOMB 2014, one of the top 2 bioinformatics conferences.
• The Best Poster Award in the 2013 Zing conference for protein and RNA structure analysis. The poster is about protein homology detection by aligning two Markov Random Fields.

RESEARCH FUNDING AWARDS
• Jinbo Xu. National Science Foundation DBI. “Continued development of RaptorX server for protein structure and functional prediction.” July 2013-June 2016. $180,000/year. (This grant can be interpreted as the renewal of the above one)
• Jinbo Xu. Sloan Fellowship. 2013-2014, $50,000 in total.

CLASSES/ SEMINARS
Bioinformatics group reading.

TTIC 31050: Introduction to Bioinformatics and Computational Biology
This course focuses on the application of mathematical models and computer algorithms to studying molecular biology.

Shen, Yang
Research Assistant Professor
www.ttic.edu/shen

PUBLISHED/ SUBMITTED PAPERS
• Yang Shen. “New Results on Predicting and Disrupting Protein–Protein Interactions.” Protein Discovery 2013 Summit — Protein–Protein Interaction, Oct. 2013, San Diego, California. Oral presentation selected from “exemplary submitted abstracts”.

27
TALKS
"Predicting and Designing Protein Interactions Through Mechanistic Modeling." MIT, April 2014.
"Predicting and Designing Protein Interactions Through Optimization and Learning." Texas A&M University, April 2014.

INVOLVEMENT
Program Committee: ISMB 2014.
Panelist for National Science Foundation
Ad hoc reviewer for National Science Foundation

RESEARCH FUNDING AWARDS

CLASSES/ SEMINARS
Taught three lectures for "Introduction to Machine Learning" at TTI (Japan), May 2014.
This year, TTIC continued its collaboration with Toyota Central Research and Development (TCRD). In particular, Koichiro Yamaguchi of TCRD worked closely with TTIC's Raquel Urtasun and David McAllester on stereo and motion algorithms in computer vision with applications to autonomous cars. Collaboration was also started with the autonomous car group at Toyota Research Institute of North America (TRINA) in Michigan. David McAllester started a collaborative project working with Michael James. Collaborative work on autonomous cars continued between David McAllester and Seiichi Mita's group at TTI in Japan.

There was collaboration between Nati Srebro of TTIC and Yutaka Sasaki's group at TTI (in Japan) on computational linguistics for medical applications.

Collaboration with the University of Chicago continues with strong ties in the area of theoretical computer science and with Alexander Razborov and John Lafferty being a part of both faculties. These collaborations are expected to continue and strengthen in the coming years.
Seminars are an important part of any academic institution. They are both a way for researchers to promote their research, and keep abreast of recent developments. They also play an important role in establishing the level of intellectual activity and influx of innovative ideas at an organization: research is more likely to be productive in an active environment with significant interaction between researchers.

The table below lists seminars given at TTIC, many of which are given by speakers from other universities and research institutions, as part of the **TTIC Colloquium**: a forum for talks by invited speakers on work of current relevance and broad interest to the computer science community. Other talks may be a part of the **Research at TTIC** series: a weekly seminar series presenting the 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 up to. And lastly, 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 found on the TTIC home page: [www.ttic.edu](http://www.ttic.edu)

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Institute</th>
<th>Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavio Villanustre</td>
<td>LexisNexis</td>
<td>Algorithms of the HPCC Systems platform, ECL language, latest developments in distributed machine learning</td>
<td>7/16/13</td>
</tr>
<tr>
<td>Andrew Cotter</td>
<td>TTIC</td>
<td>Thesis Defense: Stochastic Optimization for Machine Learning</td>
<td>07/19/13</td>
</tr>
<tr>
<td>Fernando de la Torre</td>
<td>Carnegie Mellon University</td>
<td>Component Analysis for Human Sensing</td>
<td>7/29/13</td>
</tr>
<tr>
<td>Konrad Schindle</td>
<td>ETH Zurich</td>
<td>Dense 3D scene flow estimation for locally rigid scenes</td>
<td>7/30/13</td>
</tr>
<tr>
<td>Jieping Ye</td>
<td>Arizona State University</td>
<td>Large-Scale Sparse Learning for Biomedical Data</td>
<td>8/14/13</td>
</tr>
<tr>
<td>Zhiyong Wang</td>
<td>TTIC</td>
<td>Machine learning methods for predicting macromolecule 3D structures</td>
<td>9/6/13</td>
</tr>
<tr>
<td>Mark Braverman</td>
<td>Princeton University</td>
<td>Optimal Provision-After-Wait in Healthcare</td>
<td>10/3/13</td>
</tr>
<tr>
<td>Juri Ganitkevitch</td>
<td>Johns Hopkins University</td>
<td>Large-Scale Paraphrasing – Extraction and Application</td>
<td>10/7/13</td>
</tr>
<tr>
<td>Samory Kpotufe</td>
<td>TTIC</td>
<td>Self-tuning in nonparametric regression</td>
<td>10/18/13</td>
</tr>
<tr>
<td>Feng Zhao</td>
<td>TTIC</td>
<td>Thesis Defense: Structural Learning for Template-free Protein Folding</td>
<td>10/25/13</td>
</tr>
<tr>
<td>Shi Li</td>
<td>TTIC</td>
<td>Better Algorithms and Hardness for Broadcast Scheduling via a Discrepancy Approach</td>
<td>10/25/13</td>
</tr>
<tr>
<td>Speaker</td>
<td>Institute</td>
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<tr>
<td>Anand Sarwate</td>
<td>TTIC</td>
<td>Active Learning with Outcome-Dependent Query Costs</td>
<td>11/1/13</td>
</tr>
<tr>
<td>Francesco Orabona</td>
<td>TTIC</td>
<td>Adaptation in Online Learning through Dimension-free Exponentiated Gradient</td>
<td>11/8/13</td>
</tr>
<tr>
<td>Frank Rudzicz</td>
<td>University of Toronto</td>
<td>Completing the noisy circuit: Systems of feedback in models of dysarthria</td>
<td>11/12/13</td>
</tr>
<tr>
<td>Greg Shakhnarovich</td>
<td>TTIC</td>
<td>Region ranking methods for image segmentation</td>
<td>11/15/13</td>
</tr>
<tr>
<td>Madhur Tulsiani</td>
<td>TTIC</td>
<td>A Characterization of Approximation Resistance</td>
<td>11/22/13</td>
</tr>
<tr>
<td>Yury Makarychev</td>
<td>TTIC</td>
<td>Bilu-Linial Stable Instances of Max Cut and Minimum Multiway Cut</td>
<td>1/10/14</td>
</tr>
<tr>
<td>Jordan Boyd-Graber</td>
<td>University of Maryland</td>
<td>Big Data Analysis with Topic Models: Human Interaction, Streaming Computation, and Social Science Applications</td>
<td>1/16/14</td>
</tr>
<tr>
<td>Hal Daume-Graber</td>
<td>University of Maryland</td>
<td>Predicting Linguistic Structures Accurately and Efficiently</td>
<td>1/17/14</td>
</tr>
<tr>
<td>Mehrdad Mahdavi</td>
<td>Michigan State University</td>
<td>Exploiting smoothness in statistical learning, online learning, and stochastic optimization</td>
<td>1/23/14</td>
</tr>
<tr>
<td>George Papandreou</td>
<td>TTIC</td>
<td>Describing Images with Visual Dictionaries of Mini-Epitome Patches</td>
<td>1/24/14</td>
</tr>
<tr>
<td>Brendan O'Connor</td>
<td>Carnegie Mellon University</td>
<td>Statistical Text Analysis for Social Science</td>
<td>1/27/14</td>
</tr>
<tr>
<td>Maria Florina (Nina) Balcan</td>
<td>Georgia Institute of Technolo</td>
<td>Foundations For Learning in the Age of Big Data</td>
<td>1/28/14</td>
</tr>
<tr>
<td>Praneeth Netrapalli</td>
<td>University of Texas, Austin</td>
<td>Statistical Guarantees for Alternating Minimization</td>
<td>1/29/14</td>
</tr>
<tr>
<td>Sivan Sabato</td>
<td>Microsoft Research New England</td>
<td>Learning with Lower Information Costs</td>
<td>1/30/14</td>
</tr>
<tr>
<td>Adam Lopez</td>
<td>Johns Hopkins University</td>
<td>A Formal Model of Semantics-Preserving Translation</td>
<td>2/3/14</td>
</tr>
<tr>
<td>Jackie Cheung</td>
<td>University of Toronto</td>
<td>Ready for Primetime: Distributional Semantics for Complex Text Applic</td>
<td>2/5/14</td>
</tr>
<tr>
<td>Alexander Rush</td>
<td>Massachusetts Institute of Technology</td>
<td>Lagrangian Relaxation for Natural Language Processing</td>
<td>2/6/14</td>
</tr>
<tr>
<td>Mohit Bansal</td>
<td>TTIC</td>
<td>Syntactic Parsing with Word Embeddings</td>
<td>2/7/14</td>
</tr>
<tr>
<td>Daniel Roy</td>
<td>Emmanuel College, University of Cambridge</td>
<td>Computational foundations of Bayesian inference and probabilistic programming</td>
<td>2/10/14</td>
</tr>
<tr>
<td>Michael Mandel</td>
<td>Ohio State University</td>
<td>Detailed models for understanding speech in noise</td>
<td>2/12/14</td>
</tr>
<tr>
<td>Anand Louis</td>
<td>Georgia Institute of Technolo</td>
<td>Spectral and Approximation Algorithms for Graph Partitioning Problems</td>
<td>2/13/14</td>
</tr>
<tr>
<td>Subhransu Maji</td>
<td>TTIC</td>
<td>Rich semantic representations for detailed visual recognition</td>
<td>2/14/14</td>
</tr>
<tr>
<td>Grigory Yaroslavtsev</td>
<td>Brown University, ICERM</td>
<td>Approximating Graph Problems: The Old and the New</td>
<td>2/17/14</td>
</tr>
<tr>
<td>Matthew Walter</td>
<td>Massachusetts Institute of Technology</td>
<td>Learning Cognitive Models from Machine Vision and Natural Language</td>
<td>2/19/14</td>
</tr>
<tr>
<td>Qixing Huang</td>
<td>Stanford University</td>
<td>Joint Object Matching via Matrix Completion</td>
<td>2/20/14</td>
</tr>
<tr>
<td>Ross Girshick</td>
<td>University of California, Berkeley</td>
<td>Learning Architectures for Visual Object Recognition</td>
<td>2/21/14</td>
</tr>
<tr>
<td>Xi (Alice) Gao</td>
<td>Harvard University</td>
<td>Understanding Incentives in Social Computing</td>
<td>2/24/14</td>
</tr>
<tr>
<td>Huy Nguyen</td>
<td>Princeton University</td>
<td>Compact representations for high dimensional data</td>
<td>2/26/14</td>
</tr>
<tr>
<td>Aly Khan</td>
<td>University of Chicago</td>
<td>New computational approaches for old biological challenges.</td>
<td>2/27/14</td>
</tr>
<tr>
<td>Speaker</td>
<td>Institute</td>
<td>Title</td>
<td>Date</td>
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<tr>
<td>Karen Livescu</td>
<td>TTIC</td>
<td>Multi-view learning of speech representations for improved recognition</td>
<td>2/28/14</td>
</tr>
<tr>
<td>Alexander Rush</td>
<td>Massachusetts Institute of Techno</td>
<td>Lagrangian Relaxation for Natural Language Processing</td>
<td>3/6/14</td>
</tr>
<tr>
<td>Dan Goldwasser</td>
<td>University of Maryland</td>
<td>Predicting Real World Outcomes over Structured Latent Representations</td>
<td>3/10/14</td>
</tr>
<tr>
<td>Michael Maire</td>
<td>California Institute of Techrolo</td>
<td>Constrained Spectral Embedding Approaches to Segmentation and Object Detection</td>
<td>3/13/14</td>
</tr>
<tr>
<td>Byron Boots</td>
<td>University of Washington</td>
<td>Machine Learning For Modeling Real-World Dynamical Systems</td>
<td>3/17/14</td>
</tr>
<tr>
<td>Stefan Canzar</td>
<td>Johns Hopkins University</td>
<td>Digging deeper: An algorithm for recovering low-expressed transcripts from RNA-seq</td>
<td>3/19/14</td>
</tr>
<tr>
<td>Jinbo Xu</td>
<td>TTIC</td>
<td>Computational Methods for Data-Driven Protein Study</td>
<td>3/21/14</td>
</tr>
<tr>
<td>Martin Strauss</td>
<td>University of Michigan</td>
<td>Closing in on Optimal Sparse Recovery</td>
<td>3/27/14</td>
</tr>
<tr>
<td>Kevin Gimpel</td>
<td>TTIC</td>
<td>Natural Language Processing for Twitter</td>
<td>3/28/14</td>
</tr>
<tr>
<td>Saket Navlakha</td>
<td>Carnegie Mellon University</td>
<td>Analyzing and learning from biological networks</td>
<td>3/31/14</td>
</tr>
<tr>
<td>Ryota Tomioka</td>
<td>TTIC</td>
<td>Towards better computation-statistics trade-off in tensor decomposition</td>
<td>4/4/14</td>
</tr>
<tr>
<td>Hammad Naveed</td>
<td>King Abdullah University of Scienc</td>
<td>Computational Methods for Rational Drug Design</td>
<td>4/7/14</td>
</tr>
<tr>
<td>Li Haiquan</td>
<td>University of Arizona, Tucson</td>
<td>Semantic similarity approaches for integrative data mining on omics data: towards network mechanisms of complex diseases</td>
<td>4/8/14</td>
</tr>
<tr>
<td>Li-Yang Tan</td>
<td>Columbia University</td>
<td>Structure theorems, analytic methods, and algorithmic applications</td>
<td>4/9/14</td>
</tr>
<tr>
<td>Julia Chuzhoy</td>
<td>TTIC</td>
<td>On Routing Problems, Grid Minors and Flat Walls</td>
<td>4/11/14</td>
</tr>
<tr>
<td>Shi Li</td>
<td>TTIC</td>
<td>A Dynamic Programming Framework for Non-Preemptive Scheduling Problems on Multiple Machines</td>
<td>4/18/14</td>
</tr>
<tr>
<td>Hossein Azari</td>
<td>Harvard University</td>
<td>Revisiting Random Utility Models for Rank Data</td>
<td>5/1/14</td>
</tr>
<tr>
<td>Ben Moseley</td>
<td>TTIC</td>
<td>New Developments and Insights in Resource Allocation</td>
<td>5/2/14</td>
</tr>
<tr>
<td>Ofer Meshi</td>
<td>TTIC</td>
<td>Efficient training of structured output predictors via smooth dual losses</td>
<td>5/9/14</td>
</tr>
<tr>
<td>Rina Dechter</td>
<td>University of California, Irvine</td>
<td>Modern Exact and Approximate MAP Algorithms for Graphical models</td>
<td>5/22/14</td>
</tr>
<tr>
<td>David McAllester</td>
<td>TTIC</td>
<td>The Problem of Reference</td>
<td>5/23/14</td>
</tr>
<tr>
<td>Kevin Gimpel</td>
<td>TTIC</td>
<td>Enriched Unsupervised Natural Language Processing with Cost-Augmented Contrastive Estimation</td>
<td>6/13/14</td>
</tr>
<tr>
<td>Koh Takeuchi</td>
<td>NTT, Japan</td>
<td>Extracting hidden structure from multiple higher order arrays</td>
<td>6/18/14</td>
</tr>
<tr>
<td>Iasonas Kokkinos</td>
<td>Ecole Centrale Paris</td>
<td>Fast and Exact Algorithms for Object Detection with Deformable Models</td>
<td>6/20/14</td>
</tr>
</tbody>
</table>
The TTIC Ph.D. Program is designed to prepare students for academic or research careers. To complete the program a student must make an original and significant contribution to the field of computer science and this contribution must be described in a doctoral thesis. In addition to the thesis, there are course and examination requirements to complete the program. The main component of the program is the process by which the student learns to do research and becomes a part of the academic community.

As part of the associated partnership between TTIC and the University of Chicago, students of TTIC can take and receive credit for courses through the University of Chicago, and University of Chicago students can take advantage of classes TTIC offers as well. Students have taken full advantage of this opportunity. They also have full access to the University of Chicago library system, athletic facilities, the student health center and transportation on campus. TTIC students enjoy the benefits and great rewards of an intimate learning setting, exposure to state-of-the-art research and opportunities in the greater computer science community and a shared and traditional experience and opportunities that come with a large university.
TTIC students Jian Peng, studying under Professor Jinbo Xu, and Andrew Cotter, studying under Professor Nati Srebro, both successfully defended their theses and received their diplomas in a ceremony in September 2013, the fourth and fifth diplomas to be awarded to date. The ceremony was performed as a part of the 10 Years Anniversary Symposium, and all attendees celebrated the graduates’ success.

Jian Peng’s research interest is in bioinformatics. He is currently employed as a postdoctoral researcher in the Department of Mathematics and the Computation and Biology Group in CSAIL at MIT.

Andrew Cotter’s research interest is in machine learning. He is currently employed at Google Research, Mountain View.

Student Feng Zhao successfully defended his thesis in October 2013, and will be awarded his diploma at the October 2014. Feng has gone on to work in New York City at Validus Group.

TTIC has several more students working on their theses and expects more graduates in the next year.

Students Heejin Choi, Somaye Hashemifar, Jianzhu Ma, Siqi Sun, Behnam Tavakoli Neyshabur and Jian Yao successfully completed all requirements to complete the Master’s portion of the Ph.D. Program, and received master’s-within-the-PhD-Program diplomas from the Institute at the Symposium/Diploma Ceremony in September 2013 as well. At the conclusion of 2014, Haris Angelidakis, Vikas Garg, Kaustav Kundu, Wenjie Luo and Abhishek Sen fulfilled the requirements for a Master’s, and will be receiving their diplomas at the autumn 2014 diploma ceremony.
• Jianzhu Ma, Sheng Wang and Jinbo Xu, “MRFalign: protein remote homology detection through alignment of Markov Random Fields.” RECOMB2014. (Best Paper Award, an extended version appears at PLOS Computational Biology.)
• Siqi Sun, Yuancheng Zhu and Jinbo Xu, “Adaptive Variable Clustering in Gaussian Graphical Models.” AISTATS 2014.
• Zhiyong Wang and Jinbo Xu, “Predicting protein contact map using evolutionary and physical constraints by integer programming.” ISMB2013, also appears in Bioinformatics (2013) 29 (13):i266-i273.
• Jianzhu Ma, Sheng Wang, Feng Zhao and Jinbo Xu, “Protein threading using context-specific alignment potential.” ISMB2013, also appears in Bioinformatics (2013) 29 (13):i257-i265.
• Fei Song, Shubhendu Trivedi, Yu Tao Wang, Gabor Sarkozy, Neil T. Heffernan. "Applying Clustering to the Problem of Predicting Retention within an ITS: Comparing Regularity Clustering with Traditional Methods." AAAI FLAIRS.
Student Body Growth

In the fall of 2004, TTIC matriculated its first three students. We began the 2013-14 academic year with twenty-five students. TTIC matriculated four students who began in the fall 2013, and one more in January 2014. The Institute plans to enroll two more students for the 2014-15 year.

Financial Support

Full financial support is offered to all enrolled students in good standing, making progress towards their degree. The tuition for an academic year is $30,000 and all students at TTIC may expect to receive financial support that covers tuition, health services and student life fees, and a scholarship to assist with living expenses, provided they remain full-time and in good academic standing.

Exchange Students

This year TTIC welcomed an exchange student from the Toyota Technological Institute (TTI) located in Nagoya, Japan. Ryuta Okuyama arrived in September 2013, took TTIC and University of Chicago courses, and returned to TTI in late December.

TTIC remains pleased with the exchange program with TTI, as the experience continues to be a positive success for all involved. It has been determined that one TTI student is scheduled to enroll at TTIC for autumn quarter 2014.
Accreditation Renewal

TTIC achieved full accreditation from the Higher Learning Commission of the North Central Association (HLC) in 2009, and will be engaged in an accreditation renewal process which will include a comprehensive on-site visit in November 2014. As in 2009, TTIC is preparing a Self-Study Report in which the institute describes the policies and processes by which it fulfills the Commission’s Criteria for Accreditation, and assures that TTIC operates a quality program for all constituents. The report includes the five Criterion of the HLC, along with 21 components and 67 sub-components.

TTIC is engaging in an unprecedented effort of collaboration, planning and preparation for the November 2014 visit. The TTIC Accreditation Steering Committee overseeing the planning has involved faculty, students, staff, and board members in discussions, meetings, focus groups, and training at conferences and workshops.

TTIC is one of the last institutions to undergo its renewal process under the PEAQ system, Program to Evaluate and Advance Quality. The new system, from 2015, is called Pathways. It will feature a ten-year cycle, and a focus on both assurance and improvement.

Assurance Reviews would occur in years 4 and 10, and the use of the HLC electronic Assurance System to upload and link evidentiary materials to Assurance Arguments, which make the case for how the institution meets the Commission’s Criteria for Accreditation. There will be an annual filing of the Institutional Update, annual monitoring of financial and non-financial indicators, and adherence to Commission policies and practices on institutional change.

The on-site visit for accreditation renewal will take place November 10-12, 2014, and TTIC should be notified of the status of its accreditation renewal request in March of 2015.
TTIC is operating under a hub and spoke model with the hub areas being “fundamental” and the spoke areas being “applied.” We currently have two hub areas: theoretical computer science and machine learning. The faculty search of 2013/14 yielded a new faculty member, Matthew Walter, in Robotics. As we move into the 2014/15 academic year our application areas (spoke areas) are computational biology, computer vision, speech processing, natural language processing and robotics. We have only one permanent faculty member, Nati Srebro, engaged in fundamental machine learning as his primary research area. We have no permanent faculty in the area of natural language processing. The primary hiring objective for 2014/15 is to hire permanent faculty members in machine learning and natural language processing.

Senior faculty hiring remains a near-term goal and, as always, presents challenges. Our endowment situation continues to be an issue for senior hires. However, we will continue to pursue various senior candidates in our hub and spoke areas, in line with the institute’s Strategic Plan.

Another near-term goal is to continue to maintain an appropriate level of grant funding per faculty member. Long-term budgets assume approximately $200,000 in grant income per faculty per year.

As always, TTIC will pursue research excellence, as witnessed by our publication record and academic awards.

Near-Term Goals

Long-Term Goals

The Institute’s mission is, “To achieve international impact through world-class research and education in fundamental computer science and information technology.” As with any academic department or institution, the primary method of achieving this mission is to hire faculty who themselves have international impact. Long-term plans call for growing to 12-16 permanent faculty (tenured and tenure-track) with a total faculty of 30 (including research assistant professor positions) by 2020.

TTIC plans to continue the hub and spoke model with the spokes being application areas of the fundamental hub areas of computer science. In the long-term, TTIC has the goal of adding more application areas. Which areas are added depends to some extent on the areas in which TTIC is able to hire strong faculty members. Possible additional application areas include Electronic Commerce and Computer Security.

Senior faculty hiring remains a near-term goal and, as always, presents challenges. Our endowment situation continues to be an issue for senior hires. However, we will continue to pursue various senior candidates in our hub and spoke areas, in line with the institute’s Strategic Plan.

Another near-term goal is to continue to maintain an appropriate level of grant funding per faculty member. Long-term budgets assume approximately $200,000 in grant income per faculty per year.

As always, TTIC will pursue research excellence, as witnessed by our publication record and academic awards.
Investment Progress

Financial stability and independent oversight of the Institute's endowment and investments is TTIC's utmost priority. In the spring of 2014, an endowment of $65 million was added as a cash infusion from Toyota Motor Corporation (TMC), and the Institute plans to use it to cover anticipated spending deficits ten to fifteen years in the future.

There are currently discussions of an additional significant monetary infusion from TMC including lifting the donor restriction in order to strengthen endowment longevity and financial independence. The TTIC management team anticipates resolving the matter in early 2015.

Board Growth and Member Retirement

The TTIC Board of Trustees continues its service to the Institute, and has experienced notable changes this year.

In October 2013 at the autumn Board meeting, founding Board Chairman, Mr. Tatsuro Toyoda stepped down, retiring from the Board. Chairman Toyoda is one of the sons of the founder of Toyota Motor Corporation, and has been dedicated to the corporation’s initiatives to “Respect the spirit of research and creativity, and always strive to stay ahead of the times,” a quote from Sakichi Toyoda, who laid the basis of Toyota group about a century ago. Chairman Toyoda has made TTIC’s success his mission, and served the institute well in his position as Chairman. Mr. Toyoda served TTIC from October 2002 to October 2013. Mr. Toyoda was named Chairman Emeritus of TTIC, in gratitude of his service to the Institute.

At the same Board meeting, founding President, Dr. Mitsuru Nagasawa, named President Emeritus in 2010, stepped down and retired from the Board. President Nagasawa served TTIC in a capacity that allowed the institute to grow and develop, both in academic quality and service, and begin realizing its mission. He served as President of TTIC from 2002 to 2010, and as a Board member from 2002 to 2013.

Dr. Stuart Rice served TTIC as Dean from September 2006 to October 2010, and then appointed Interim President from October 2010 to April 2013. After Dr. Sadaoki Furui was appointed as President, Dr. Rice continued serving TTIC as a Board member, and retired from the Board in October 2013. Dr. Rice has been a fixture and distinguished professor at the University of Chicago since 1957, and his work with TTIC helped to promote the relationship between the
two academic institutes, and his knowledge and leadership progressed TTIC through the succession of founding President to new President. Dr. Rice was named an Honorary Interim President, in gratitude of his service to the Institute.

Mr. Masatami Takimoto, Trustee since October 2010, was nominated and appointed Board Chairman at the same October 2013 meeting, and Mr. Masashi Hisamoto was re-elected as Treasurer and Secretary for another year. In addition, three new members were appointed to the Board:

- Dr. Edward Kolb, Dean, Division of Physical Sciences, University of Chicago
- Mr. Kosuke Ikebuchi, Advisor and Senior Technical Executive, Toyota Motor Corporation
- Mr. Mark Hogan, Director, Toyota Motor Corporation; President Dewey Investments LLC

The Board of Trustees was present at the TTIC 10-year anniversary reception held the evening following the conclusion of the autumn Board meeting, and the group celebrated the institute’s success and growth over the last decade, in the company of faculty, supporters and administrators.
TTIC maintains a steady number of interns and visiting scholars who engage in study and research on the premises. There were nineteen visiting scholars from other institutions in the US and abroad who came to the Institute to work with TTIC faculty. These 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.

<table>
<thead>
<tr>
<th>Visitor</th>
<th>Home Institution</th>
<th>TTIC Host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaz Ahmed</td>
<td>University of Maryland</td>
<td>G. Shakhnarovich and Subhransu Maji</td>
</tr>
<tr>
<td>MengFei Cao</td>
<td>Tufts University</td>
<td>J. Xu</td>
</tr>
<tr>
<td>Liang-chieh, Chen</td>
<td>University of California, Los Angeles</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Rajesh Chitnis</td>
<td>University of Maryland</td>
<td>J. Chuzhoy</td>
</tr>
<tr>
<td>Marco Fornoni</td>
<td>Idiap Research Institute</td>
<td>F. Orabona</td>
</tr>
<tr>
<td>Chen Kong</td>
<td>Tsingua University</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Young Kun Ko</td>
<td>University of Chicago</td>
<td>M. Tulsiani</td>
</tr>
<tr>
<td>Ilja Kuzborskii</td>
<td>Idiap Research Institute</td>
<td>F. Orabona</td>
</tr>
<tr>
<td>Anand Louis</td>
<td>Georgia Tech</td>
<td>M. Tulsiani</td>
</tr>
<tr>
<td>Rahul Mehta</td>
<td>University of Chicago Lab School</td>
<td>S. Maji</td>
</tr>
<tr>
<td>Zhou Ren</td>
<td>University of California, Los Angeles</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Edgar Simo-Serra</td>
<td>Universitat Politècnica de Catalunya</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Yali Wang</td>
<td>Laval University</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Botao Wang</td>
<td>Shanghai Jiao Tong University</td>
<td>D. Lin</td>
</tr>
<tr>
<td>John Wright</td>
<td>Carnegie Mellon University</td>
<td>M. Tulsiani</td>
</tr>
<tr>
<td>Jia Xu</td>
<td>University of Wisconsin, Madison</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Siyu Yang</td>
<td>Princeton University</td>
<td>J. Chuzhoy</td>
</tr>
<tr>
<td>Meng Ye</td>
<td>Beihang University</td>
<td>R. Urtasun</td>
</tr>
<tr>
<td>Yuan Zhou</td>
<td>Carnegie Mellon University</td>
<td>Y. Makarychev</td>
</tr>
</tbody>
</table>
### Toyota Technological Institute at Chicago

**Statement of Financial Position**

<table>
<thead>
<tr>
<th></th>
<th>June 30, 2014</th>
<th>June 30, 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$ 6,174,571</td>
<td>$ 6,774,369</td>
</tr>
<tr>
<td>Grants receivable</td>
<td>283,075</td>
<td>183,116</td>
</tr>
<tr>
<td>Due from TTI (Note 9)</td>
<td>–</td>
<td>3,667</td>
</tr>
<tr>
<td>Prepaid expenses and other current assets</td>
<td>–</td>
<td>30,903</td>
</tr>
<tr>
<td>Interest receivable</td>
<td>1,222,946</td>
<td>714,361</td>
</tr>
<tr>
<td>Investments (Note 3)</td>
<td>170,632,596</td>
<td>108,561,906</td>
</tr>
<tr>
<td>Furniture and equipment – Net (Note 4)</td>
<td>689,553</td>
<td>766,127</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>$ 179,002,741</strong></td>
<td><strong>$ 117,034,449</strong></td>
</tr>
</tbody>
</table>

|                    |               |               |
| **Liabilities**    |               |               |
| Trade accounts payable | $ 174,265 | $ 66,955      |
| Due to TTI (Note 9) | 32,996        | 16,694        |
| Accrued expenses   | 239,612       | 149,208       |
| Accrued lease liability | 347,164 | 310,436       |
| Deferred revenue   | 163,032       | 198,004       |
| **Total liabilities** | 957,069     | 741,297       |

|                    |               |               |
| **Net Assets**     |               |               |
| Unrestricted       | 70,819,137    | 7,892,492     |
| Temporarily restricted | 1,002,550 | 1,006,288      |
| Permanently restricted | 106,223,985 | 107,394,372  |
| **Total net assets** | **178,045,672** | **116,293,152** |

**Total liabilities and net assets**

|                    |               |               |
| **Total liabilities and net assets** | **$ 179,002,741** | **$ 117,034,449** |
### Revenue, Gains, and Other Support

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unrestricted</td>
<td>Temporarily Restricted</td>
</tr>
<tr>
<td>Student tuition and fees</td>
<td>$692,214</td>
<td>$ -</td>
</tr>
<tr>
<td>Scholarship allowance</td>
<td>(680,000)</td>
<td>(680,000)</td>
</tr>
<tr>
<td>Net tuition and fees</td>
<td>2,214</td>
<td>-</td>
</tr>
<tr>
<td>Federal grants and contracts</td>
<td>1,098,379</td>
<td>-</td>
</tr>
<tr>
<td>Contributions (Note 9)</td>
<td>65,000,000</td>
<td>-</td>
</tr>
<tr>
<td>Net realized and unrealized gains and losses on investments</td>
<td>393,351 (3,738) (1,170,387) (780,774)</td>
<td>-</td>
</tr>
<tr>
<td>Interest income</td>
<td>3,590,805</td>
<td>-</td>
</tr>
<tr>
<td>Other interest</td>
<td>71,513</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total revenue, gains, and other support</strong></td>
<td>$70,156,262 (3,738) (1,170,387) 68,982,137</td>
<td>4,245,215</td>
</tr>
</tbody>
</table>

### Expenses

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Educational costs</td>
<td>Management and general - Institutional support</td>
</tr>
<tr>
<td></td>
<td>Instruction</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Management and</td>
<td>general - Institutional support</td>
</tr>
<tr>
<td></td>
<td>support</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5,586,027</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1,643,590</td>
<td>-</td>
</tr>
<tr>
<td>Total expenses</td>
<td>$7,229,617</td>
<td>6,955,866</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Net Asset Transfers</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Increase (Decrease) in Net Assets</td>
<td>62,926,645 (3,738) (1,170,387) 61,752,520 (3,300,491) (3,395) (3,087,350) (6,421,800)</td>
<td></td>
</tr>
<tr>
<td>Net Assets - Beginning of year</td>
<td>$7,892,492 1,006,288 107,394,372 116,293,152</td>
<td>$7,892,492 1,004,247 110,481,722 122,714,952</td>
</tr>
<tr>
<td>Net Assets - End of year</td>
<td>$70,819,137 1,002,550 106,223,985 178,045,672</td>
<td>$7,892,492 1,006,288 107,394,372 116,293,152</td>
</tr>
</tbody>
</table>
GOVERNANCE

Board of Trustees

**Tatsuro Toyoda**
Chairman of the Board of Trustees
Senior Advisor, Toyota Motor Corporation
Former President and Vice Chairman, Toyota Motor Corporation
Former Chairman, Japan Automobile Manufacturers Association
Former President, NUMMI
*Trustee since Oct. 2002*

**Mitsuru Nagasawa**
Founding President, Toyota Technological Institute at Chicago; President Emeritus, TTI
Postdoctoral Research Associate, University of Chicago, 1959-1961 (Fulbright Program)
President Emeritus, Toyota Technological Institute, Nagoya Japan
Professor Emeritus & Former Dean of Faculty of Engineering, Nagoya University
*Trustee since Oct. 2002*

**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 Apr. 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
Authored or co-authored 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 Sep. 2008*

**Sharon Darling**
President & Founder, National Center for Family Literacy
Frequent keynote speaker: Business Week 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 Apr. 2007*

**Robert A. Fefferman**
Dean and Max Mason Distinguished Service Professor, 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 Oct. 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 Apr. 2013

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.  
U.S. 23rd Secretary of Labor, first African American to lead the U.S. 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.

Mark Hogan  
Director, Toyota Motor Corporation  
President, Dewey Investments LLC  
Member, Board of Directors, Toyota Motor Corporation  
Former director, president and chief executive officer of the Vehicle Production Group LLC  
Trustee since Oct. 2013

Kosuke Ikebuchi  
Advisor/ Senior Technical Executive, Toyota Motor Corporation  
Member, Toyota Board of Directors from 1988  
Former Executive Vice Chairman, Toyota Board of Directors  
Trustee since Oct. 2013

Masanori Kashiwara  
Senior Managing Director, 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 Oct. 2009

Edward 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 Oct. 2013

David W. Oxtoby  
President, Pomona College  
Former Dean, Division of Physical Sciences, University of Chicago  
Former member, Argonne National Laboratory, Board of Governors  
Trustee, Bryn Mawr College  
John Simon Guggenheim Foundation Fellow  
Trustee since Oct. 2002
Stuart Rice
Honorary Interim President, Toyota Technological Institute at Chicago
University of Chicago faculty member, 1957–present
Awarded the National Medal of Science, 1999
Former Director, James Franck Institute, 1961-1967; Chairman, Department of Chemistry, 1971-1976; Dean, Physical Sciences Division, 1981-1995. University of Chicago
Fellow of the National Academy of Sciences, the American Academy of Arts and Sciences, the Royal Danish Academy of Sciences, and the Royal Irish Academy of Sciences
Academies Fellow of the American Philosophical Society
Mentored over 100 doctoral students throughout his career
Recipient of the 2011 Wolf Prize in chemistry
*Trustee since Oct. 2010*

Hiroyuki Sakaki
President, Toyota Technological Institute
Appointed as an associate professor in 1973 at the Institute of Industrial Science, University of Tokyo, promoted to full professor in 1987, and engaged in R&D and education in the area of semi-conductor electronics.
Professor Emeritus in 2007
Appointed as Vice President of Toyota Technological Institute (Nagoya, Japan) in 2007 and promoted to President in 2010
Awarded the National Recognition as a Person of Cultural Merit, Japan Academy Award, Leo Esaki Award, Heinrich Welker Award, Medal of Purple Ribbon from the Emperor of Japan, IEEE David Sarnoff Award, Fujiwara Prize, Japan IBM Science Award, and the Hattori-Hoko Award
*Trustee since Oct. 2010*

Toshiaki Taguchi
Advisor, Toyota Motor Corporation
Former President & CEO, Toyota Motor North America, Inc.
Former Executive Vice President, Toyota Motor Corporation
Former Board of Directors of Japan Society, the Japanese Chamber of Commerce and Industry of New York and The Nippon Club
*Trustee since Oct. 2002*

Masatami Takimoto
CEO, Toyota Central R&D Labs., INC.
Chairman of the Board of Directors & the Board of Trustees, Toyota School Foundation
Former Executive Vice President and Director, Toyota Motor Corporation
*Trustee since Oct. 2011*
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Mr. Masashi Hisamoto, Treasurer and Secretary to the Board
Dr. David McAllester, Chief Academic Officer
Mr. Gary Hamburg, Chief Administrator

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Dawn Ellis, Administrative Coordinator and Bookkeeper
Liv Leader, Director of Human Resources and International Affairs
Chrissy M. Novak, Administrative Director of Graduate Studies, Publications
Anna Ruffolo, Controller
Chendi Wu, Staff Accountant
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 Toyota Technological Institute at Chicago would like to extend a heartfelt thank you to the many people, organizations and efforts that assisted us through 2013-14, and continue to lend us their assistance, support and services. We appreciate it very much.

Special thanks to:

**The External Advisory Committee**
Eric Grimson, Chancellor and Professor of Computer Science and Engineering, Massachusetts Institute of Technology
Takeo Kanade, U.A. 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

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Department of Statistics
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Registrar’s Office
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

Dr. Sunil Ahuja of the Higher Learning Commission
The Toyota Central R & D Labs, Inc.
The Toyota Technological Institute (Nagoya, Japan)