

# Kiril Solovey

## CURRICULUM VITÆ

(updated March 9, 2021)

### PERSONAL INFORMATION

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**Address:** 496 Lomita Mall, William F. Durand Building, Rm. 009,  
Department of Aeronautics & Astronautics, Stanford University, CA, USA  
**E-mail:** kirilsol@stanford.edu  
**Homepage:** kirilsol.github.io

**Research Interests:** multi-robot systems, autonomous transportation systems, algorithmic aspects of robotics.

### EDUCATION AND ACADEMIC POSITIONS

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**2018–present** Postdoctoral Scholar, Department of Aeronautics & Astronautics, Stanford University. Autonomous Systems Laboratory; PI: Prof. Marco Pavone.  
**2013–2018** Ph.D. in Computer Science, Tel-Aviv University, Israel.  
Dissertation Topic: “Multi-Robot Motion Planning: Theory and Practice”;  
Advisor: Prof. Dan Halperin.  
**2010–2013** M.Sc. in Computer Science, **magna cum laude**, Tel-Aviv University, Israel.  
Dissertation Topic: “ $k$ -Color Multi-Robot Motion Planning”; Advisor: Dan Halperin.  
**2007–2010** B.Sc. in Computer Science, **magna cum laude**, Tel-Aviv University, Israel.

### TEACHING EXPERIENCE

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Selected teaching activities at Tel Aviv University:

**2012–2018** Teaching assistant, *Computer Architecture* (150 undergraduate students per semester). Responsibilities included teaching weekly recitations (3h per week), teaching lecture classes (3-6h per semester), holding office hours and managing online forum, writing homework assignments, designing and grading final exam, curriculum design. **For my role in this course I earned several teaching awards** (see below).  
**2018** Teaching assistant, *Algorithmic Robotics and Motion Planning* (20 graduate students). Responsibilities included teaching lecture classes (9h) and holding office hours.  
**2013** *Teaching assistant* in the undergraduate course “Workshop in Robot Motion Planning”.

## HONORS AND AWARDS

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2020	<b>Best multi-robot systems paper award (finalist)</b> , for “Efficient Large-Scale Multi-Drone Delivery Using Transit Networks,” <i>International Conference on Robotics and Automation</i>
2020	<b>Best student paper award (finalist)</b> , for “Exploiting Locality and Structure for Distributed Optimization in Multi-Agent Systems”, <i>European Control Conference</i>
2018	RSS Pioneers travel grant, <i>Robotics: Science and Systems Foundation</i>
2018	<b>Fulbright Post-doctoral Scholar Award</b> (\$47,500), <i>United States-Israel Educational Foundation (USIEF)</i>
2015-18	<b>Clore Scholars Programme</b> (\$87,000), <i>Clore Israel Foundation</i>
2017	<b>Best paper award</b> , for “Scalable Asymptotically-Optimal Multi-Robot Motion Planning”, <i>International Symposium on Multi-Robot and Multi-Agent Systems</i>
2016	Rector’s excellence in teaching list, <i>Tel-Aviv University</i> (TAU)
2016	<b>Excellence in teaching award</b> , School of Computer Science, TAU
2015	<b>Rector’s excellence in teaching award</b> , TAU
2015	<b>Best student paper award, best paper award (finalist)</b> , for “On the Hardness of Unlabeled Multi-Robot Motion Planning”, <i>Robotics: Science and Systems</i> conference
2014,15	Internship Grant, Ministry of Science, Technology, and Space, Israel
2015	Deutsch Prize, <i>School of Computer Science, TAU</i>
2011,13,14	Excellence Scholarship, <i>Selim and Rachel Benin Scholarship Fund</i> .
2014	Aharon and Ephraim Katzir Travel Grant of the <i>Batsheva de Rothschild Fund</i>
2014	Prof. Rahamimoff Travel Grant for Young Scientists of the <i>US-Israel Binational Science Foundation</i> (declined)
2012	Intel Award, <i>Intel</i> , Israel
2011	Excellence Scholarship in Memory of Brucker Haim, <i>Faculty of Exact Sciences, TAU</i>
2010	Yearly Stipend for Promising M.Sc. Students, <i>School of Computer Science, TAU</i>
2010	Dean’s Honor List, <i>Faculty of Exact Sciences, TAU</i>
2009	Excellence Award for B.Sc. students, <i>School of Computer Science, TAU</i>

## PUBLICATIONS

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### JOURNAL PAPERS

- [J1] Shushman Choudhury, **Kiril Solovey**, Mykel Kochenderfer, and Marco Pavone, “Efficient Large-Scale Multi-Drone Delivery Using Transit Networks.” *Journal of Artificial Intelligence Research*, 2021. See **extensive media coverage** below.
- [J2] Rahul Shome, **Kiril Solovey**, Jingjin Yu, Dan Halperin and Kostas Bekris, “Fast, High-Quality Dual-Arm Rearrangement in Synchronous, Monotone Tabletop Setups.” Special issue (**invited**), *Transactions on Automation Science and Engineering*, 2021.
- [J3] Robin Brown, Federico Rossi, **Kiril Solovey**, Michael T. Wolf, and Marco Pavone, “On Local Computation for Network-Structured Convex Optimization in Multi-Agent Systems.” *Transactions on Control of Network Systems*, 2020.
- [J4] **Kiril Solovey** and Michal Kleinbort, “The Critical Radius in Sampling-based Motion Planning.” Special issue (**invited**), *International Journal of Robotics Research*, 2019.
- [J5] Michal Kleinbort, **Kiril Solovey**, Zakary Littlefield, Kostas E. Bekris, and Dan Halperin, “Probabilistic completeness of RRT for geometric and kinodynamic planning with forward propagation.” *IEEE Robotics and Automation Letters*, 2018.

- [J6] Andrew Dobson, **Kiril Solovey**, Rahul Shome, Dan Halperin, and Kostas E. Bekris, “dRRT\*: Scalable and Informed Asymptotically-Optimal Multi-Robot Motion Planning.” Special issue **(invited)**, *Autonomous Robots*, 2018.
- [J7] Aviel Atias, **Kiril Solovey**, Oren Salzman, and Dan Halperin, “Effective Metrics for Multi-Robot Motion-Planning.” Special issue **(invited)**, *International Journal of Robotics Research*, 2018.
- [J8] **Kiril Solovey**, Oren Salzman and Dan Halperin, “New Perspective on Sampling-Based Motion Planning via Random Geometric Graphs.” Special issue **(invited)**, *International Journal of Robotics Research*, 2018.
- [J9] **Kiril Solovey** and Dan Halperin, “On the Hardness of Unlabeled Multi-Robot Motion Planning.” Special issue **(invited)**, *International Journal of Robotics Research*, 35(14): 1750-1759, 2016.
- [J10] Oren Salzman, **Kiril Solovey** and Dan Halperin, “Motion Planning for Multi-Link Robots by Implicit Configuration-Space Tiling.” *IEEE Robotics and Automation Letters*, 1(2): 760-767, 2016.
- [J11] **Kiril Solovey\***, Oren Salzman\* and Dan Halperin (\* equal contribution), “Finding a Needle in an Exponential Haystack: Discrete RRT for Exploration of Implicit Roadmaps in Multi-Robot Motion Planning.” Special issue **(invited)**, *International Journal of Robotics Research*, 35(5): 501-513, 2016.
- [J12] Aviv Adler, Mark de Berg, Dan Halperin and **Kiril Solovey** (alphabetical order), “Efficient Multi-Robot Motion Planning for Unlabeled Discs in Simple Polygons.” Special issue **(invited)**, *Transactions on Automation Science and Engineering*, 12(4): 1309-1317, 2015.
- [J13] **Kiril Solovey** and Dan Halperin, “ $k$ -Color Multi-Robot Motion Planning.” Special issue **(invited)**, *International Journal of Robotics Research*, 33(1): 82-97, 2014.

#### PEER-REVIEWED CONFERENCE PROCEEDINGS

- [C1] Dror Dayan, **Kiril Solovey**, Marco Pavone, and Dan Halperin, “Near-Optimal Multi-Robot Motion Planning with Finite Sampling”, *International Conference on Robotics and Automation*, Xi’an, China, 2021.
- [C2] **Kiril Solovey**, Saptarshi Bandyopadhyay, Federico Rossi, Michael T. Wolf, and Marco Pavone, “Fast Near-Optimal Heterogeneous Task Allocation via Flow Decomposition”, *International Conference on Robotics and Automation*, Xi’an, China, 2021.
- [C3] Matthew Tsao, **Kiril Solovey**, and Marco Pavone, “Sample Complexity of Probabilistic Roadmaps via Epsilon-nets.” In *International Conference on Robotics and Automation*, Paris, France, 2020.
- [C4] Shushman Choudhury, **Kiril Solovey**, Mykel Kochenderfer, and Marco Pavone, “Efficient Large-Scale Multi-Drone Delivery Using Transit Networks.” In *International Conference on Robotics and Automation*, **best multi-robot systems paper award (finalist)**, Paris, France, 2020. See **extensive media coverage** below.
- [C5] Michal Kleinbort, Edgar Granados, **Kiril Solovey**, Riccardo Bonalli, Kostas Bekris, and Dan Halperin, “Refined Analysis of Asymptotically-Optimal Kinodynamic Planning in the State-Cost Space.” In *International Conference on Robotics and Automation*, Paris, France, 2020.
- [C6] **Kiril Solovey**, Lucas Janson, Edward Schmerling, Emilio Frazzoli, and Marco Pavone, “Revisiting the Asymptotic Optimality of RRT\*.” In *International Conference on Robotics and Automation*, Paris, France, 2020.
- [C7] Robin Brown, Federico Rossi, **Kiril Solovey**, Michael T. Wolf, and Marco Pavone, “Exploiting Locality and Structure for Distributed Optimization in Multi-Agent Systems.” In *European Control Conference*, **best students paper award (finalist)**, St. Petersburg, Russia, 2020.

- [C8] **Kiril Solovey**, Mauro Salazar and Marco Pavone, “Scalable and Congestion-aware Routing for Autonomous Mobility-on-Demand via Frank-Wolfe Optimization.” In *Robotics: Science and Systems*, Freiburg im Breisgau, Germany, 2019.
- [C9] Michal Kleinbort, **Kiril Solovey**, Zakary Littlefield, Kostas E. Bekris, and Dan Halperin, “Probabilistic completeness of RRT for geometric and kinodynamic planning with forward propagation.” In *International Conference on Robotics and Automation*, Montreal, QC, Canada, 2019.
- [C10] Rahul Shome, **Kiril Solovey**, Jingjin Yu, Dan Halperin and Kostas Bekris, “Fast, High-Quality Dual-Arm Rearrangement in Synchronous, Monotone Tabletop Setups.” In *Workshop on the Algorithmic Foundations of Robotics*, Universidad Politecnica de Yucatan, Merida, Mexico, 2018.
- [C11] **Kiril Solovey** and Michal Kleinbort, “The Critical Radius in Sampling-based Motion Planning.” In *Robotics: Science and Systems*, Carnegie Mellon University, PA, USA, 2018.
- [C12] Andrew Dobson, **Kiril Solovey**, Rahul Shome, Dan Halperin, and Kostas E. Bekris, “Scalable Asymptotically-Optimal Multi-Robot Motion Planning.” In *International Symposium on Multi-Robot and Multi-Agent Systems*, **best paper award**, Los Angeles, CA, 2017.
- [C13] **Kiril Solovey** and Dan Halperin, “Efficient sampling-based bottleneck pathfinding over cost maps.” In *International Conference on Intelligent Robots and Systems*, Vancouver, BC, Canada, 2017.
- [C14] Aviel Atias, **Kiril Solovey** and Dan Halperin, “Effective Metrics for Multi-Robot Motion-Planning.” In *Robotics: Science and Systems*, MIT, MA, USA, 2017.
- [C15] **Kiril Solovey** and Dan Halperin, “Asymptotically-Optimal Bottleneck Pathfinding with Applications to Fréchet-Type Optimization.” In *European Symposium on Algorithms*, 76:1-76:16, Aarhus, Denmark, 2016.
- [C16] **Kiril Solovey**, Oren Salzman and Dan Halperin, “New Perspective on Sampling-Based Motion Planning via Random Geometric Graphs.” In *Robotics: Science and Systems*, University of Michigan, MI, USA, 2016.
- [C17] **Kiril Solovey**, Jingjin Yu, Or Zamir and Dan Halperin, “Motion Planning for Unlabeled Discs with Optimality Guarantees.” In *Robotics: Science and Systems*, Sapienza University of Rome, Italy, 2015.
- [C18] **Kiril Solovey** and Dan Halperin, “On the Hardness of Unlabeled Multi-Robot Motion Planning.” In *Robotics: Science and Systems*, **best paper award (finalist)**, **best student paper award**, Sapienza University of Rome, Italy, 2015. Also in *International Symposium on Computational Geometry, Young Researchers Forum*, Eindhoven, The Netherlands, 2015.
- [C19] Aviv Adler, Mark de Berg, Dan Halperin and **Kiril Solovey** (alphabetical order), “Efficient Multi-Robot Motion Planning for Unlabeled Discs in Simple Polygons.” In *Workshop on Algorithmic Foundations of Robotics*, p 1-17, Istanbul, Turkey, 2014. Also in *European Workshop on Computational Geometry*, Ein Gedi, Israel, 2014.
- [C20] **Kiril Solovey**\*, Oren Salzman\* and Dan Halperin (\* equal contribution), “Finding a Needle in an Exponential Haystack: Discrete RRT for Exploration of Implicit Roadmaps in Multi-Robot Motion Planning.” In *Workshop on Algorithmic Foundations of Robotics*, p 591-607, Istanbul, Turkey, 2014.
- [C21] **Kiril Solovey** and Dan Halperin, “ $k$ -Color Multi-Robot Motion Planning.” In *Workshop on Algorithmic Foundations of Robotics*, p 191-207, Cambridge, MA, USA, 2012.

## BOOK CHAPTERS

- [B1] **Kiril Solovey**, “Complexity of Planning”, Section on “Motion Planning”, in the *Encyclopedia of Robotics*, Eds. Marcelo H. Ang Jr., Oussama Khatib, and Bruno Siciliano; Section Ed. Lydia E. Kavraki. Springer Press, 2020.

- [B2] Dan Halperin, Lydia Kavraki and **Kiril Solovey** (alphabetical order), “Robotics”, in the *Handbook of Discrete and Computational Geometry*, Eds. Jacob E. Goodman, Joseph O’Rourke, and Csaba D. Toth. CRC Press LLC, 2017.

## DISSERTATIONS

- [D1] **Kiril Solovey**, “Multi-Robot Motion Planning: Theory and Practice.” PhD thesis, *Tel Aviv University*, March 2018. Advisor: Dan Halperin.
- [D2] **Kiril Solovey**, “ $k$ -Color Multi-Robot Motion Planning.” Master’s thesis, *Tel Aviv University*, February 2013. Advisor: Dan Halperin.

## MEDIA COVERAGE

- **IEEE Spectrum:** Delivery Drones Could Hitchhike on Public Transit to Massively Expand Their Range, 2020.
- **BBC Digital Planet:** Algorithm activism – a new type of protest, 2020.
- **Venture Beat:** Stanford lab envisions delivery drones that save energy by taking the bus, 2020.
- **New Atlas:** Study suggests drones could quadruple their range – by taking the bus, 2020.
- **New Scientist:** Delivery drones could land on public transport to extend their range, 2019.

## RESEARCH VISITS

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- 2019** Advanced Controls Research Laboratory, Naira Hovakimyan, University of Illinois at Urbana-Champaign, IL, USA (one week)
- 2017** Microsoft Research, Theory Group, Yuval Peres, Redmond, WA, USA (two weeks).
- 2016** IEEE RAS Summer School on Multi-Robot Systems, National University of Singapore.
- 2015** Workshop on Geometric Problems on Sensor Networks and Robots, IBM Research, Yorktown Heights, NY, USA.
- 2014** Kavraki Lab, led by Lydia Kavraki, Rice University, Houston, TX, USA (three weeks).
- 2014** PRACSYS Group, led by Kostas Bekris, Rutgers University, Piscataway, NJ, USA (one week).

## TALKS AND PRESENTATIONS

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### INVITED TALKS

- “Large-scale multi-robot systems: from algorithmic foundations to smart-mobility applications.”
  - Institute for Dynamic Systems and Control, ETH Zurich, Switzerland, December, 2020.
  - Electrical and Computer Engineering Department, University of British Columbia, Vancouver, BC, Canada, November, 2020.
  - University of Toronto Robotics Institute, ON, Canada, November, 2020.
  - Center on Mathematical Sciences and Applications, Harvard University, Cambridge, MA, November, 2020.
  - School of Computing Science, Simon Fraser University, Burnaby, BC, Canada, November, 2020.

- “Autonomous-vehicle routing for social good,” Center for Automotive Research at Stanford (CARS), Stanford, CA, November, 2020.
- “Task Allocation and Routing for Massive Smart-Mobility Systems.”
  - *Autonomous Systems Lab*, Electrical and Computer Engineering Department, University of Waterloo, ON, Canada, September 2020.
  - *CITRIS People and Robots Initiative and Design of Robotics and Embedded systems, Analysis, and Modeling Seminars*, UC Berkeley, CA, September 2020.
  - *Computer Science Colloquium*, Ariel University, Israel, August 2020.
  - *IDM-Lab*, Computer Science Department, University of Southern California, Los Angeles, CA, August 2020.
  - *Kavraki-Lab*, Computer Science Department, Rice University, Houston, TX, July 2020.
  - *Workshop on Heterogeneous Multi-Robot Task Allocation and Coordination, Robotics: Science and Systems*, Corvallis, OR, USA, July 2020.
- “Algorithms for Large-Scale Multi-Robot Routing in Transportation”, Robotics Seminar, University of Illinois at Urbana-Champaign, IL, USA, November 2019.
- “Scalable and Congestion-aware Routing for Autonomous Mobility-on-Demand via Frank-Wolfe Optimization.”
  - Computer Science Colloquium, Rutgers University, New Brunswick, NJ, USA, August 2019.
  - Computational Geometry Seminar, School of Computer Science, Tel Aviv University, Israel, July 2019.
  - TASP Seminar, Technion, Haifa, Israel, July 2019.
  - ILIAD Lab, Department of Computer Science, Stanford University, CA, USA, February 2019.
- Guest lecturer at AA274, “Principles of Robotic Autonomy”, Department of Aeronautics and Astronautics, Stanford University, CA, USA, March 2019.
- “The critical radius in sampling-based motion planning.”
  - Foundations of Robotics Seminar, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, USA, October 2017.
  - Autonomous Systems Laboratory, Department of Aeronautics and Astronautics, Stanford University, CA, USA, October 2017.
  - School of Computer Science, University of British Columbia, Vancouver, BC, Canada, September 2017.
- “Introduction to Sampling-Based Robot Motion Planning”. Theory Group, Microsoft Research, Redmond, WA, USA, April 2017.
- “Applications of Random Geometric Graphs in Robot Motion Planning.”
 

*Workshop on Random Geometric Graphs and their Applications in Complex Networks*, Banff, Alberta, Canada, November 2016.
- “Recent Progress in Multi-Robot Motion Planning.”
  - Courses “Introduction to Robotics” and “Multi-Robot Systems”, Computer Science Department, Bar Ilan University, Ramat Gan, Israel, April 2015.
  - Group Seminar at Kavraki Lab, Rice University, Houston, TX, USA, September 2014.
  - Group Seminar at PRACSYS Group, Rutgers University, Piscataway, NJ, USA, September 2014.

## CONFERENCE AND WORKSHOP TALKS

- “Revisiting the Asymptotic Optimality of RRT\*.”  
*International Conference on Robotics and Automation*, 2020.
- “Scalable and Congestion-aware Routing for Autonomous Mobility-on-Demand via Frank-Wolfe Optimization.”  
*Robotics: Science and Systems*, Freiburg im Breisgau, German, 2019.
- “The Critical Radius in Sampling-based Motion Planning.”  
*Robotics: Science and Systems and RSS Pioneers*, Carnegie Mellon University, PA, USA, 2018.
- “Efficient sampling-based bottleneck pathfinding over cost maps”  
*International Conference on Intelligent Robots and Systems*, Vancouver, BC, Canada, September 2017.
- “Asymptotically-Optimal Bottleneck Pathfinding with Applications to Fréchet-Type Optimization.”  
*European Symposium on Algorithms*, Aarhus, Denmark, August 2016.
- “New Perspective on Sampling-Based Motion Planning via Random Geometric Graphs.”  
*Robotics: Science and Systems*, Ann Arbor, MI, USA, June 2016.
- “On the Hardness of Unlabeled Multi-Robot Motion Planning.”
  - *Robotics: Science and Systems*, Rome, Italy, July 2015.
  - *International Symposium on Computational Geometry, Young Researchers Forum*, Eindhoven, The Netherlands, June 2015.
- “Motion Planning for Unlabeled Discs with Optimality Guarantees.”  
*Robotics: Science and Systems*, Rome, Italy, July 2015.
- “Efficient Multi-Robot Motion Planning for Unlabeled Discs in Simple Polygons.”
  - *Workshop on Algorithmic Foundations of Robotics*, Istanbul, Turkey, August 2014.
  - *European Workshop on Computational Geometry*, Ein Gedi, Israel, March 2014.
- “Finding a Needle in an Exponential Haystack: Discrete RRT for Exploration of Implicit Roadmaps in Multi-Robot Motion Planning.”  
*Workshop on Algorithmic Foundations of Robotics*, Istanbul, Turkey, August 2014.
- “Pebbles, Manifolds and Multi-Robot Motion Planning .”  
*Computational Geometry Learning Research Workshop*, Berlin, Germany, December 2012.
- “ $k$ -Color Multi-Robot Motion Planning.”
  - *Workshop on Algorithmic Foundations of Robotics*, Cambridge, MA, USA, June 2012.
  - *Israeli Conference on Robotics*, Tel Aviv, Israel, November 2013.

## SERVICE

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### COMMITTEES AND ORGANIZATION

- Associate Editor, *International Conference on Intelligent Robots and Systems*, Prague, Czech Republic, 2021.
- Program Committee, *Robotics: Science and Systems*, Oregon State University, Corvallis, Oregon, 2020.
- Program Committee, *Workshop on the Algorithmic Foundations of Robotics*, Oulu, Finland, 2020.

- Publicity Chair and Session Chair, *International Symposium on Multi-Robot and Multi-Agent Systems*, Rutgers University, New Brunswick, NJ, USA, 2019.
- Program Committee, *RSS Pioneers*, Freiburg, Germany, 2019.

## JOURNAL REVIEWER

- Artificial Intelligence Journal
- Control Engineering Practice
- IEEE Robotics and Automation Letters
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Control of Network Systems
- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Robotics
- International Journal of Robotics Research
- Journal of Computational Geometry
- Journal of Field Robotics
- Robotica
- Robotics and Autonomous Systems

## CONFERENCE REVIEWER

- Conference on Robot Learning (CoRL)
- European Symposium on Algorithms (ESA)
- FUN in Algorithms (FUN)
- IEEE International Conference on Systems, Man, and Cybernetics (SMC)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- International Colloquium on Automata, Languages and Programming (ICALP)
- International Symposium on Computational Geometry (SoCG)
- International Workshop on the Algorithmic Foundations of Robotics (WAFR)
- Robotics: Science and Systems (RSS)

## REFERENCES

### RESEARCH

- Prof. Dan Halperin, School of Computer Science, Tel Aviv University, Israel, danha@post.tau.ac.il.
- Prof. Marco Pavone, Aeronautics and Astronautics Department, Stanford University, CA, pavone@stanford.edu.
- Prof. Kostas Bekris, Computer Science Department, Rutgers University, NJ, kostas.bekris@cs.rutgers.edu.
- Prof. Lydia Kavraki, Computer Science Department, Rice University, TX, kavraki@rice.edu.



- Prof. Naira Hovakimyan, Mechanical Science and Engineering Department, University of Illinois at Urbana-Champaign, IL, nhovakim@illinois.edu.

## TEACHING

- Prof. Ran Canetti, Computer Science Department, Boston University, MA, canetti@bu.edu.