Bachir El Khadir

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Education

- **Princeton University**   Princeton, NJ
  Ph.D., Operations Research and Financial Engineering   September 2015 - Present
    - **Research interests:** Polynomial Optimization and its Applications to Control, Robotics, and Machine Learning
    - Expected Completion Date: May 2020

- **Ecole Polytechnique**   Paris, France
  B.S. and M.S. in Applied Mathematics and Computer Science   September 2012 - August 2015
    - Relevant courses: Stochastic Models in Finance, Statistical Learning and Non Parametric Estimation, Mathematical Aspects and Applications of Operations Research

Publications

- *Time-Varying Semidefinite Programs* (joint work with A. A. Ahmadi).
  Accepted with minor revision to Mathematics of Operations Research, 2019.
  Honorable mention in the 2019 INFORMS Optimization Society Student Paper Prize Competition.

- *Teleoperator Imitation with Continuous-time Safety* (joint work with J. Varley and V. Sindhwani).
  Robotics: Science and Systems, 2019.

- *On Algebraic Proofs of Stability for Homogeneous Vector Fields* (joint work with A. A. Ahmadi).
  IEEE Transactions on Automatic Control, 2019.

- *A Globally Asymptotically Stable Polynomial Vector Field with Rational Coefficients and no Local Polynomial Lyapunov Function* (joint work with A. A. Ahmadi).
  Systems & Control Letters, 2018.

- *On Sum of Squares Representation of Convex Forms and Generalized Cauchy-Schwarz Inequalities.*
  Submitted to SIAM Journal on Applied Algebra and Geometry.

- *Learning Dynamical Systems with Side Information* (joint work with A. A. Ahmadi).
  In preparation for submission.

Selected Talks

- Algebra and Geometry of Polynomials: Theory and Applications
  - Keynote Speaker at the Canadian Undergraduate Mathematics Conference   Queens University, Canada 2019.

- On Sum of Squares Representation of Convex Forms and Generalized Cauchy-Schwarz Inequalities
  - "Geometry of Real Polynomials, Convexity and Optimization" Workshop   Banff, Canada 2019
  - Annual Young Researchers Workshop   ORIE, Cornell, 2019

- Time-Varying Semidefinite Programs
  - Workshop on Verifiable Control-Oriented Learning on the Fly   Austing, TX 2019
  - Modeling and Optimization: Theory and Applications   Bethlehem, PA 2019
  - International Symposium on Mathematical Programming   Bordeaux, France 2018
  - AFOSR, Dynamics and Control Program Review   Arlington, VA 2018
  - INFORMS Annual Meeting   Houston, TX 2017
  - SIAM Annual Meeting   Pittsburgh, PA 2017

- On Algebraic Proofs of Stability
  - Multidisciplinary Optimization Seminar   Toulouse, France 2019
  - SIAM Conference on Applications of Dynamical Systems   Snowbird, UT 2019
  - "Optimal Power Flow Problem and Stability Assessment of Power Systems" Workshop   Paris, France 2018

- Imitation Learning with Stability Guarantees
  - Robotics: Science and Systems   Freiburg, Germany 2019
  - Google Brain Colloquium   New York, NY 2018

Awards

- School of Engineering and Applied Science Award for Excellence, Princeton University (2019)
- Honorable mention in the 2019 INFORMS Optimization Society Student Paper Prize Competition
- Best Poster Award of the Princeton Day of Optimization (2018)
- French Government's Major-Excellence Scholarship (2012)

Industry Experience

- **Google** New York, NY
  Google Brain Team - Intern *June 2018 - September 2018*
  - Developed a framework for imitation learning with stability guarantees
- **Susquehanna International Group** Philadelphia, PA
  Quant. Research - Intern *June 2016 - August 2016*
  - Collaborated with the Options Team to automate corrections to short term volatility predictions
- **JPMorgan** London, UK
  Quant. Research - Intern *Mars 2015 - August 2015*
  - Improved the accuracy of the Exotic Rates pricing system
  - Reduced the risk analysis software process time by a factor of **2.5**
- **Infosys** Hyderabad, India
  Software Engineer - Intern *June 2014 - August 2014*
  - Developed a web security scanner that analyzes the content (DOM elements) of a web page and monitors HTTP traffic to enhance the security against XSS and CSRF attacks

Professional Activities

- Session Organizer: "Polynomial Optimization" INFORMS 2019
- Volunteer in the Princeton Day of Optimization Princeton University 2019
- Reviewer for Mathematics of Operations Research
- Reviewer for Proceedings of the American Mathematical Society
- Volunteer Math Expert in the Julia Robinson Math Festival Princeton University 2017
- Assistant in Instruction Princeton University

  - Graduate-level course on Convex and Conic Optimization Spring 2017
  - Sophomore-level course on Fundamentals of Statistics Spring 2016
  - Junior-level course on Computing and Optimization for the Physical and Social Sciences Fall 2016 & 2017

Skills

Programming: Python, C++, Matlab, Julia

Languages: English (Highly proficient), French (Bilingual), Arabic (Bilingual)

Extracurricular Activities

- Head of IT staff of X-Projets (Junior enterprise of Ecole Polytechnique)
- Attended London Model United Nations conference and acted as a delegate from Turkey: Collaborated with a working group to create a comprehensive paper on Middle East crisis