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 2019

- **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
- 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

- 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