

EDUCATION

- **PhD in Electrical and Computer Engineering** Aug 2017 - June 2024
University of Maryland, College Park College Park, MD
- **MSc in Electrical and Computer Engineering** Aug 2017 - May 2022
University of Maryland, College Park College Park, MD
- **BSc in Electrical and Electronics Engineering** Sep 2013 - Jun 2017
Bilkent University Ankara, Turkey

TECHNICAL SKILLS

- **Quantitative Background**
Reinforcement Learning, Time Series Analysis, Deep Learning, Game Theory, Optimization, Functional Analysis
- **Programming Languages and Tools**
Python, MATLAB, PyTorch, Tensorflow, NLTK

EXPERIENCE

- **University of Illinois at Urbana-Champaign** Urbana, IL
Postdoctoral Research Assistant (Supervisor: Prof. Tamer Başar) Aug 2024 - Current
 - ▷ Designed model-free reinforcement learning algorithms that identify optimal policies in partially observable environments. Applied to market making problems in over-the-counter markets, using deep learning techniques.
 - ▷ Developed multi-agent reinforcement learning algorithms that find Nash equilibria in symmetric games, addressing notorious convergence challenges where earlier methods prove ineffective.
- **University of Maryland, College Park** College Park, MD
Graduate Research Assistant (Advisor: Prof. Nuno C. Martins) May 2019 - Jun 2024
 - ▷ Developed methods with provable sample complexity bounds to estimate agents' reward functions from time series data in many-agent environments.
 - ▷ Constructed algorithms that learn Nash equilibria in large-scale games featuring graph-structured strategies.
 - ▷ Collaborated with the University of California, Berkeley's PATH program to develop a traffic simulation tool. Applied it to optimize electric vehicle charging station locations in real-world road networks.
 - ▷ Derived error bounds for stochastic approximation methods in large-scale symmetric games.
 - ▷ Designed decentralized learning algorithms that provably converge to Nash equilibria under multi-stage tasks and fluctuating revision rates.

Graduate Teaching Assistant Aug 2017 - May 2019

 - ▷ Assisted teaching the graduate-level optimal control course. Topics included dynamic programming, optimization in Banach spaces, gradient and Newton-Raphson methods, and Pontryagin's maximum principle.
 - ▷ Assisted teaching the senior-level control systems course. Topics included the root locus method, Bode diagrams, Nyquist plots, state-space methods for linear systems, and sampled-data systems.
 - ▷ Assisted teaching the sophomore-level signal processing course. Topics included sampling, linear transformations, orthogonal projections, Fourier transform, and discrete-time linear filters.
- **Johns Hopkins University Applied Physics Laboratory** Laurel, MD
Intern Jun 2023 - Aug 2023
 - ▷ Created a toolbox for optimizing hyperparameters in H_2 , H_∞ , and LQR controllers. Applied to a state-of-the-art flight system.

PAPERS

- **Journal Publications**

- [1] **Semih Kara** and N. C. Martins, “Learning Nash equilibria in large populations with constrained strategy switching,” *IEEE Control Systems Letters*, vol. 8, pp. 1265–1270, 2024. DOI: 10.1109/LCSYS.2024.3408102.
- [2] **Semih Kara** and N. C. Martins, “Excess payoff evolutionary dynamics with strategy-dependent revision rates: Convergence to Nash equilibria for potential games,” *IEEE Control Systems Letters*, vol. 7, pp. 1009–1014, 2023. DOI: 10.1109/LCSYS.2022.3229962.
- [3] **Semih Kara** and N. C. Martins, “Pairwise comparison evolutionary dynamics with strategy-dependent revision rates: Stability and δ -passivity,” *IEEE Transactions on Control of Network Systems*, vol. 10, no. 4, pp. 1656–1668, 2023. DOI: 10.1109/TCNS.2023.3237485.

- **Conference Publications**

- [1] **Semih Kara**, N. C. Martins, and M. Arcak, “Population games with Erlang clocks: Convergence to Nash equilibria for pairwise comparison dynamics,” in *2022 61st IEEE Conference on Decision and Control (CDC)*, 2022, pp. 7688–7695.
- [2] Ö. Yavuz, **Semih Kara**, O. Tokel, I. Pavlov, and F. Ö. İlday, “Doppler effect on nanopatterning with nonlinear laser lithography,” in *2017 European Conference on Lasers and Electro-Optics and European Quantum Electronics Conference*, Optica Publishing Group, 2017, CM.6_5.
- [3] Ö. Yavuz, **Semih Kara**, O. Tokel, I. Pavlov, and F. Ö. İlday, “Doppler effect on structure period of nonlinear laser lithography,” in *APS March Meeting Abstracts*, ser. APS Meeting Abstracts, vol. 2017, Mar. 2017, K36.014.

- **ArXiv Preprints**

- [1] **Semih Kara** and N. C. Martins, *Differential equation approximations for population games using elementary probability*, 2023. arXiv: 2312.07598 [cs.GT].

- **Work in Progress Near Completion**

- [1] **Semih Kara** and N. C. Martins, *Multi-agent inverse reinforcement learning in large population games*.
- [2] Y. Sönmez, **Semih Kara**, C. Kızılkale, M. Arcak, and A. Kurzhanskiy, *Optimal electric vehicle charger placement*.

AWARDS AND SCHOLARSHIPS

- *Twice received the Outstanding Teaching Assistant Award from the Department of Electrical and Computer Engineering at the University of Maryland, College Park, for outstanding performance as teaching assistant in the Optimal Control (ENEE 664) and Control Systems (ENEE 460) courses.*
- *Awarded the Merit Scholarship by Bilkent University for exceptional academic performance.*

COMMUNITY INVOLVEMENT

- *Reviewer for IEEE Transactions on Automatic Control, IEEE Control Systems Letters, IEEE Conference on Decision and Control, IEEE American Control Conference, and European Control Conference.*
- *Provided free physics and mathematics tutoring for students from a low-income area of Ankara, Turkey.*