

# Soheil Eshghi

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Interests Optimal **dynamic** data-driven decision-making in complex networked systems

## Education

- 2011–15 PhD **University of Pennsylvania, Electrical & Systems Engineering**  
**Thesis: Optimal Control of Epidemics in the Presence of Heterogeneity**  
I showed how heterogeneity affects epidemic spread, and is critical to control efforts.  
Committee: **Saswati Sarkar**, S. Venkatesh, G. Pappas, V. Preciado, O. Milenkovic (UIUC)
- 2011–13 MSc **University of Pennsylvania, Electrical Engineering**
- 2006–10 BSc **Sharif University of Technology (IRI), Electrical Engineering**

## Appointments

- 2018–Current Postdoctoral Associate, **Yale School of Public Health**, New Haven, CT  
With Prof. Forrest Crawford, I work on developing mathematical models to improve vaccination schedules and contact-tracing policies in combating epidemics.
- 2016–2018 Postdoctoral Associate, **Yale Institute for Network Science**, New Haven, CT  
With Prof. Leandros Tassioulas, I developed tools to target strategic interventions in social groups for the IBM/ARL International Technology Alliance in Distributed Analytics and Information Sciences (DAIS ITA) and helped write grants to the ARL, ARO, and NIH.
- 2015–16 Postdoctoral Associate, **ECE Dept., Cornell University**, Ithaca, NY  
With Profs. Qing Zhao & Lang Tong, I derived optimal coordinated influence control policies for the ARL Network Science Collaborative Technology Alliance (NS-CTA) and co-wrote a book on charge scheduling of electric vehicles.
- 2011–15 Research Assistant, **ESE Dept., University of Pennsylvania**, Philadelphia, PA  
Under the supervision of Profs. Saswati Sarkar & Santosh Venkatesh, I conducted research on the optimal control of epidemics, with applications to epidemiology, network security, and delay-tolerant network message delivery.
- Summer 2014 Research Intern, **EM Dept., NEC Labs America (NECLA)**, Cupertino, CA  
With Dr. Rakesh M. Patil, I proposed optimal stochastic smart-grid management policies focused on pricing grid-scale batteries (1 paper, 1 patent application, 1 invention record).

## Awards

- Feb. 2017 **Third Place**, *Datahack*, Yale Institute for Network Science, New Haven, CT.
- Feb. 2016 **Fellowship (\$2,500)**, *NYC ASCENT*, Cornell University, Ithaca, NY.
- Mar. 2015 **Runner Up (\$5,000)**, *Fels National Public Policy Challenge*, Philadelphia, PA.
- Mar. 2015 **Winner (\$5,000)**, *Penn Public Policy Challenge*, Philadelphia, PA.
- Oct. 2010 **PhD Research Fellowship**, *University of Pennsylvania*, Philadelphia, PA.
- Jun. 2006 **Best combined result in Iranian national university entrance exam history:**  
○ 1<sup>st</sup>/600,000, Azad Math-Physics, ○ 15<sup>th</sup>/400,000, National Math-Physics,  
○ 1<sup>st</sup>/250,000, National Foreign Langs.

This led to awards from Iran's President, and Ministers of Education, and Higher Education, as well as a **scholarship** from the Iranian National Elite Foundation.

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## Entrepreneurial and volunteer experience

2014–16 **Founder and Advisor**, *SmartTrack*, Philadelphia, PA

- As part of a pro-bono student project at the University of Pennsylvania, and in collaboration with stakeholders, I helped develop an app-based solution for managing inventory (e.g., textbooks) for large, low-income school districts such as the School District of Philadelphia.
- We won the Penn Public Policy Challenge, and placed second nationally (\$5K prize each).
- Our work has been featured in numerous publications, including *Governing* magazine.
- We were one of 9 out of 300 teams accepted to EDSi accelerator at Penn.
- Our solution is being used in Camden public schools and Philadelphia charter schools.
- We have raised over \$125,000 in total.

2015–16 **VP of Education**, *Cornell Graduate Consulting Club*, Ithaca, NY

- I created & curated a 7 event series for 12 select participants to improve consulting skills.
- I led a team of 6 students to devise a marketing plan for a local mobile tourism startup.

2014–15 **Co-chair**, *Penn Graduate Case Competition*, Philadelphia, PA

- I organized the logistics, client selection, case creation, and sponsorship with my team of 5 and MC'ed the event.
- We out-raised our max cost projections by 110% and increased diversity of participants.
- The winning proposal was implemented by client within 3 months.

2014 **Convener**, *Penn ESE PhD Student Colloquium*, Philadelphia, PA

Memberships IEEE (2008–Current), IEEE Control Systems Society (2014–Current)

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## Journal publications

### Published

- [6] Papakostas, D., **Eshghi, S.**, Katsaros, D., Tassiulas, L., *Distributed algorithms for multi-layer connected edge-dominating sets*, IEEE Control Systems Letters (L-CSS), 3(1), 31-36, 2019.
- [5] **Eshghi, S.**, Preciado, V.M., Sarkar, S., Venkatesh, S.S., Zhao, Q., D'Souza, R., Swami, A., *Spread, then target, and advertise in waves: optimal budget allocation across advertising channels*, IEEE Transactions on Network Science & Engineering, doi: 10.1109/TNSE.2018.2873281, 2018.
- [4] Katsaros, D., Papakostas, D., **Eshghi, S.**, Tassiulas, L., *Energy-efficient backbone formation in military multi-layer ad-hoc networks*, Ad Hoc Networks journal, 81, 17-44, 2018.
- [3] **Eshghi, S.**, Sarkar, S., Venkatesh, S.S., *Visibility-aware optimal contagion of malware epidemics*, IEEE Transactions on Automatic Control, 62(10), 5205-5212, 2017.
- [2] **Eshghi, S.**, Khouzani, M., Sarkar, S., Venkatesh, S.S., *Optimal patching in clustered epidemics of malware*, IEEE Transactions on Networking, 24(1), 283-298, 2016.
- [1] **Eshghi, S.**, Khouzani, M., Sarkar, S., Shroff, N., Venkatesh, S.S., *Optimal energy-aware DTN epidemic routing*, IEEE Transactions on Automatic Control, 60(6), 1554-1569, 2015.

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## Patents

- [1] Patil, R.M., Sharma, R., **Eshghi, S.**, *Optimal battery pricing and energy management for microgrids*, Patent no. 20160093002, Application no. 14/845412, Pending.

## Conference publications

### Published (Peer-Reviewed Conferences)

- [13] Papakostas, D., **Eshghi, S.**, Katsaros, D., Tassiulas, L., *Energy-aware distributed edge domination of multilayer networks*, 2019 American Control Conference  
**ACC-19**
- [12] **Eshghi, S.**, Maghsudi, S., Restocchi, V., Salisbury, E., Stein, S., Tassiulas, L., *Efficient influence maximization Under partial network visibility*, 2019 IEEE Infocom Workshop on the Communications and Networking Aspects of Social Networks  
**CAOS-19**
- [11] Papakostas, D., **Eshghi, S.**, Katsaros, D., Tassiulas, L., *Distributed algorithms for multi-layer connected edge-dominating sets*, 2019 IEEE Conference on Decision and Control  
**CDC-18**
- [10] **Eshghi, S.**, Tassiulas, L., *Whistleblowing games in networks*, 2019 IEEE Conference on Decision and Control  
**CDC-18**
- [9] **Eshghi, S.**, Tassiulas, L., *Innovation, cheating, and whistleblowing - a game theoretic perspective*, 2018 Annual Conference on Information Sciences and Systems  
**CISS-18**
- [8] Bellamy, R., Colombo, G., **Eshghi, S.**, de Mel, G., Giammanco, C., Morris, R., Rand, D.G., Turner, L.D., Whitaker, R.M., Williams, G.R., *A computational framework for modelling inter-group behaviour using psychological theory*, 2018 SPIE Security + Defense  
**SPIE S+D-18**
- [7] **Eshghi, S.**, Williams, G.R., Colombo, G.B., Turner, L.D., Rand, D.G., Whitaker, R.M., Tassiulas, L., *Social group stability and fracture*, 2017 Annual Allerton Conference on Communication, Control, and Computing  
**Allerton-17**
- [6] Stein, S., **Eshghi, S.**, Maghsudi, S., Tassiulas, L., Bellamy, R.E., Jennings, N.R., *Heuristic algorithms for influence maximization in partially observable social networks*, 2017 International Workshop on Social Influence Analysis  
**SocInf-17**
- [5] **Eshghi, S.**, Williams, G.R., Colombo, G.B., Turner, L.D., Rand, D.G., Whitaker, R.M., Tassiulas, L., *Mathematical models for social group behavior*, 2017 Workshop on Dist. Analytics InfraStructure and Algorithms for Multi-Org. Federations  
**DAIS-17**
- [4] Stein, S., **Eshghi, S.**, Maghsudi, S., Tassiulas, L., Bellamy, R.E., Jennings, N.R., *Influence maximisation in partially observable social networks*, 2017 Workshop on Dist. Analytics InfraStructure and Algorithms for Multi-Org. Federations  
**DAIS-17**
- [3] Mott, D., Kelley, T., Giammanco, C., **Eshghi, S.**, Zhang, Y., *A framework for modelling the effect of emotion on uncritical reasoning*, 2017 Workshop on Knowledge Systems for Coalition Operations  
**KSCO-17**
- [2] **Eshghi, S.**, Patil, R.M., *Optimal battery pricing and energy management for microgrids*, 2015 American Control Conference  
**ACC-15**
- [1] Khouzani, M., **Eshghi, S.**, Sarkar, S., Shroff, N., Venkatesh, S.S., *Optimal energy-aware epidemic routing in DTNs*, 2012 IEEE/ACM International Symposium on Mobile Ad Hoc Networking and Computing (**Acceptance rate = 20%**)  
**Mobihoc-12**

### Published (Posters & Invited Conferences)

- [7] **Eshghi, S.**, Khuda Bukh, W.R., Kenah, E., Rempala, G.A., Crawford, F.W., *Dynamic surveillance and contact-tracing policies for outbreaks*, 2019 INFORMS Annual Meeting, (Accepted).  
**INFORMS-19**
- [6] Restocchi, V., Brede, M., Stein, S., Hill, L., **Eshghi, S.**, *Dynamic competitive opinion control: theory, simulations, and experiments*, 2019 International Conference on Complex Networks and their Applications, Poster  
**ComNet-19**

- [5] **Eshghi, S.**, Tassiulas, L., *Efficient dynamic centrality metrics for election advertising - a case study*, 2017 Yale Day of Data, Poster  
YaleDoD-17
- [4] **Eshghi, S.**, Maghsudi, S., Restocchi, V., Stein, S., Tassiulas, L., *Heuristic algorithms for influence maximization in partially observable social networks*, 2017 International Conference on Complex Networks and their Applications, Poster  
ComNet-17
- [3] **Eshghi, S.**, Preciado, V.M., Sarkar, S., Venkatesh, S.S., Zhao, Q., D'Souza, R., Swami, A., *Spread, then target, and advertise in waves: optimal capital allocation across advertising channels*, 2017 Information Theory and Applications Workshop  
ITA-17
- [2] **Eshghi, S.**, Sarkar, S., Venkatesh, S.S., *Visibility-aware contagion of malware epidemics*, 2015 Information Theory and Applications Workshop  
ITA-15
- [1] Khouzani, M., **Eshghi, S.**, Sarkar, S., Venkatesh, S.S., *Optimal patching in clustered epidemics of malware*, 2012 Information Theory and Applications Workshop  
ITA-12

## Invited talks

- [1] **Dynamic surveillance and contact-tracing policies for outbreaks**  
2019 ○ **Yale University**, YINS Summer Seminar
- [2] **Dynamic control of spreading processes on networks**  
2019 ○ **Yale University**, YINS Colloquium
- [3] **Whistleblowing**  
2018 You scratch my back, and (maybe) I'll scratch yours: whistleblowing games on networks  
○ **Yale University**, YINS Summer Seminar
- [4] **Social Influence**  
2018 Decision-making tools for influence propagation in social systems  
○ **University of Michigan**, EECS (Communication & Signal Processing Seminar)  
Social influence maximization: a synthesis  
○ **Yale University**, YINS (Human Nature Lab)  
2017 Influence in social systems  
○ **Yale University**, YINS Summer Seminar
- [5] **Optimal control of epidemics in the presence of heterogeneity**  
2018 ○ **Yale University**, Public Health (Crawford Lab)  
2016 ○ **Harvard University**, Public Health (Ctr for Communicable Disease Dynamics)  
○ **Georgetown University**, Biology (Bansal Lab)  
○ **University of Georgia**, Biology (Rohani Lab)  
○ **Penn State University**, Biology (Ctr for Infectious Disease Dynamics)  
○ **Yale University**, YINS Summer Seminar  
○ **University of Pennsylvania**, ESE (Complex Systems Group)  
2015 ○ **Cornell University**, ECE  
2013 ○ **University of Pennsylvania**, ESE PhD Colloquium

## Computer skills

Proficient: C/C++ • R • MATLAB (Simulink, CVX, GPOPS, DIDO)

## Teaching certificates

- 2017 **Expressing Your Enthusiasm: an Oral Communication Workshop for STEM Graduate Students and Postdocs**, *Yale University*  
5-workshop series on effectively communicating research to a lay audience
- 2016 **Building Mentoring Skills for an Academic Career**, *Cornell University*  
6-workshop series exploring various aspects of mentoring relationships in academia
- 2014 **Course in College Teaching**, *University of Pennsylvania*  
Set of 10 hands-on teaching workshops focused on active learning and student engagement

## Teaching assistantships

- Cornell Markov Decision Processes (graduate), Digital Signal Processing
- Penn Fourier Analysis, Digital Signal Processing (graduate)
- Sharif EE Principles, Logic & Analog Circuits, Computer Structure, Microprocessors Lab

## Service

- PC Member:
  - AAAI-2020, PRIMA-2019, AAMAS-2019, AAAI-2019, AAMAS-2018
- Organizer:
  - Yale Law Doctoral Scholarship Conference (Network Theory and Policy track)
- | Journal   | <b>IEEE Transactions on:</b>   | <b>Other:</b>  |
|-----------|--|--|
| Reviewer: | <ul style="list-style-type: none"><li>Automatic Control (TAC)</li><li>Control of Networked Systems (TCNS)</li><li>Inf. Forensics &amp; Security (TIFS)</li><li>Information Theory (T-IT)</li><li>Mobile Computing (TMC)</li><li>Networking (ToN)</li><li>Network Science &amp; Eng. (TNSE)</li><li>Wireless Communications (TWC)</li></ul> | <ul style="list-style-type: none"><li>Automatica</li><li>PLOS Computational Biology</li><li>ASME J. of Dynamic Systems (J-DS)</li><li>IEEE Communication Letters</li><li>IEEE Control Systems Letters (L-CSS)</li><li>IEEE Access</li><li>Social Net. Analysis &amp; Mining (Springer)</li><li>Performance Evaluation (Elsevier)</li></ul> |
- Conferences: WiOpt'16, MIM'16, NetSciCom'17, IFAC World Congress'17, CDC '18, CDC '19

## Selected coursework – graduate

- Optimization Optimal Control, Dynamic Programming, Convex Optimization, Adv. Algorithms
- Probability Eng. Probability, Adv. Probability, Stochastic Processes, Random Process Models
- Economics Game Theory, Dynamic Games & Social Learning, Information Theory, Estimation
- Networks Dist. Dynamic Systems, Network Theory, EE Infrastructure, Green Buildings

## Selected coursework – undergraduate

- Control Linear Control Systems, Linear Algebra, Numerical Methods
- Mathematics Engineering Mathematics, Ordinary Differential Equations, Probability
- Signals Speech Processing, Digital Signal Processing & Lab, Signals & Systems
- Coding C++ Programming, Machine Language & Architecture, Microprocessors
- Networks Wireless Communication, Digital Communication & Lab, Traffic Control
- Energy Power Systems Analysis, Electrical Machines (I, II, & Lab), Fields and Waves

## References

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**Committee Chair**