

# ESEN YEL

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## RESEARCH INTERESTS

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The main objective of my research is to achieve safe, generalizable, and trustworthy autonomy for systems under uncertainty. My research uses concepts from reachability analysis, machine learning, verification, motion planning, and transfer learning to develop safe planning and runtime monitoring techniques.

## EDUCATION

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<b>University of Virginia</b> Ph.D., Systems Engineering Dissertation: <i>Online predictive monitoring and proactive planning for safe autonomous robot operations</i>	Charlottesville, VA 2021
<b>Bogazici University</b> M.S., Electrical and Electronics Engineering Thesis: <i>Appearance based self localization and navigation using place memory</i>	Istanbul, Turkey 2016
B.S., Electrical and Electronics Engineering	2014

## RESEARCH EXPERIENCE

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<b>Stanford University</b> Position: Postdoctoral Scholar Affiliations: Stanford Intelligent Systems Lab (SISL), Stanford Center for AI Safety Advisor: Mykel Kochenderfer <ul style="list-style-type: none"><li>Lead and contribute to industry-sponsored research projects on safety validation, probabilistic safe planning, and transfer learning for autonomous vehicles under uncertainty</li><li>Mentor graduate and undergraduate students on research projects</li><li>Lead and contribute to proposal writing and grant application processes</li></ul>	Stanford, CA 2021 – Present
<b>University of Virginia</b> Position: Graduate Research Assistant Affiliations: Autonomous Mobile Robots Lab, Link Lab Advisor: Nicola Bezzo <ul style="list-style-type: none"><li>Developed assured runtime monitoring and replanning techniques for systems under disturbances</li><li>Developed online replanning techniques for autonomous systems under unforeseen faults</li><li>Developed self-triggered scheduling techniques to decrease sensing computation</li></ul>	Charlottesville, VA 2016 – 2021
<b>Bogazici University</b> Position: Graduate Research Assistant Affiliations: Intelligent Systems Lab (ISL) Advisor: H. Işıl Bozma <ul style="list-style-type: none"><li>Developed appearance-based self-localization and navigation approaches for mobile ground robots</li></ul>	Istanbul, Turkey 2014 – 2016

## AWARDS

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<b>Rising Stars in Electrical Engineering and Computer Science</b>	2022
<b>Link Lab Outstanding Graduate Research Award</b> Link Lab, University of Virginia	2021

*“This award was established as a way for faculty to recognize Link Lab students who have demonstrated excellence in research during the academic year.”*

**RSS Pioneers Workshop Participant**

2021

*“RSS Pioneers brings together a cohort of the world’s top early-career researchers.”*

**Link Lab Student Seminar Award**

2020

Link Lab, University of Virginia

*“The Link Lab Graduate Seminar provides a prestigious honor and award for a PhD student to showcase the highest quality research happening at Link Lab conveying impact and relevance in the CPS field”*

**Travel Awards**

IEEE/RSJ International Conference on Intelligent Robots and Systems

2019

IEEE International Conference on Robotics and Automation PhD Forum

2018

**Ruthie Oxford Memorial Award, Promising Graduate Student**

2018

University of Virginia, Department of Systems and Information Engineering

**Dean’s High Honor List**

2014

Bogazici University, School of Engineering

## PUBLICATIONS

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### Under Review and Preprint

- A. Yildiz, E. Yel, A. Corso, K. Wray, S. Witwicki and M. Kochenderfer, “*Experience filter: Transferring past experiences to unseen tasks or environments*”, 2022.
- M. Toyungyernsub, E. Yel, J. Li, and M. Kochenderfer, “*Predicting future spatiotemporal occupancy grids with semantics for autonomous driving*”, 2022.
- N. Rober, S. M. Katz, C. Sidrane, E. Yel, M. Everett, M. J. Kochenderfer, and J. P. How. “*Backward reachability analysis of neural feedback loops: Techniques for linear and nonlinear systems*”, arXiv preprint arXiv:2209.14076, 2022

### Refereed Journal and Magazine Articles

- E. Yel\*, S. Gao\*, N. Bezzo, “*Meta-learning-based proactive online planning for UAVs under degraded conditions*”, (\*equal contribution), Robotics and Automation Letters (RA-L), 2022, vol. 7, no. 4, pp. 10320–10327.
- E. Yel, T. X. Lin, N. Bezzo, “*Computation-aware adaptive planning and scheduling for safe unmanned airborne operations*”, Journal of Intelligent and Robotic Systems, 2020, vol. 100, no. 2, pp. 575–596.
- E. Yel, T. Carpenter, C. di Franco, R. Ivanov, Y. Kantaros, I. Lee, J. Weimer, N. Bezzo, “*Assured runtime monitoring and planning: Towards verification of neural networks for safe autonomous operations*”, Robotics and Automation Magazine, Special Issue on Deep Learning and Machine Learning in Robotics, June 2020, vol. 27, no. 2, pp. 102–116.

### Refereed Conference Papers

- M. Toyungyernsub, E. Yel, J. Li, M. Kochenderfer, “*Dynamics-aware spatiotemporal occupancy prediction in urban environments*”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022 (in press).
- M. Cleaveland, E. Yel, Y. Kantaros, I. Lee, N. Bezzo, “*Learning enabled fast planning and control in dynamic environments with intermittent information*”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022 (in press).

- L. Kruse, E. Yel, R. Senanayake, M. Kochenderfer, “Uncertainty-aware online merge planning with learned driver behavior”, IEEE International Conference on Intelligent Transportation Systems (ITSC), 2022.
- E. Yel, N. Bezzo, “A meta-learning-based trajectory tracking framework for UAVs under degraded conditions”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021, pp. 6884–6890.
- E. Yel, N. Bezzo, “GP-based runtime planning, learning, and recovery for safe UAV operations under unforeseen disturbances”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020, pp. 2173–2180.
- E. Yel and N. Bezzo, “Fast run-time monitoring, replanning, and recovery for safe autonomous system operations”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019, pp. 1661–1667.
- E. Yel, T. X. Lin and N. Bezzo, “Self-triggered adaptive planning and scheduling of UAV operations”, IEEE International Conference on Robotics and Automation (ICRA), 2018, pp. 7518–7524.
- T. X. Lin, E. Yel and N. Bezzo, “Energy-aware persistent control of heterogeneous robotic systems”, Annual American Control Conference (ACC), 2018, pp. 2782–2787.
- E. Yel, T. X. Lin and N. Bezzo, “Reachability-based self-triggered scheduling and replanning of UAV operations”, NASA/ESA Conference on Adaptive Hardware and Systems (AHS), 2017, pp. 221–228.

#### Refereed Workshop Papers

- E. Yel and N. Bezzo, “Reachability-based adaptive UAV scheduling and planning in cluttered and dynamic environments”, ICRA Workshop on Informative Path Planning and Adaptive Sampling, Brisbane, 2018.
- E. Yel and H.I. Bozma, “Verifying the recognized place through localization”, IROS Workshop on Intropective Methods for Reliable Autonomy, Vancouver 2017.

#### Other Papers

- G. Glaubit, K. Kleeman, N. Law, J. Thomas, S. Gao, R. Peddi, E. Yel, N. Bezzo “Fast, safe, and proactive runtime planning and control of autonomous ground vehicles in changing environments”, IEEE Systems and Information Engineering Design Symposium (SIEDS), 2021.
- E. Yel, T. X. Lin and N. Bezzo, “Reachability-based self-triggered UAV motion planning”, International Symposium on Aerial Robotics, Philadelphia, PA, 2017.

#### TEACHING EXPERIENCE/TRAINING

<b>Pedagogical Training</b>	Summer 2022
Stanford Scientific Teaching Summer Institute	Stanford University
<ul style="list-style-type: none"> <li>• Attended a 3-day workshop to explore the core principles of Scientific Teaching (inclusion and equity, active learning, assessment, and effective lesson planning).</li> </ul>	
<b>Guest Lecture</b>	Stanford University
Advanced Topics in Sequential Decision Making	Winter 2022
<b>Graduate Teaching Assistantship</b>	Bogazici University
System Dynamics and Control	Spring 2015, Spring 2016
Control Technology and Design	Fall 2015
Introduction to Electrical Engineering	Fall 2015
<ul style="list-style-type: none"> <li>• Teaching responsibilities included grading and leading lab and discussion sessions.</li> </ul>	

**Undergraduate Student Assistantship**  
 System Dynamics and Control (Assisted discussion sessions)  
 Orientation to Electrical Engineering (Assisted lab sessions)

Bogazici University  
*Spring 2014*  
*Fall 2013*

## MENTORSHIP EXPERIENCE

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**Mentor for Stanford Undergraduate Research Fellowship (SURF)** *Summer 2022*  
 Research mentor for an 8-week program to promote diversity within the engineering and science student body in the USA. I advised an undergraduate student on her research topic, monitored her research progress, and advised research alongside a graduate student. Student: Michelle Ho.

**Mentor for Graduate Student Research** *Stanford University*  
 Dylan Asmar, Out-of-distribution detection *Summer 2022 – Present*  
 Chelsea Sidrane, Backwards reachability for nonlinear systems *Winter 2022 – Present*  
 Sydney Katz, Backwards reachability for nonlinear systems *Winter 2022 – Present*  
 Alexandros Tzikas, Trajectory verification for autonomous driving *Winter 2022 – Present*  
 Anil Yildiz, Transfer learning and validation for autonomous driving tasks *Fall 2021 – Present*  
 Liam Kruse, Safe planning for autonomous vehicles *Fall 2021 – Present*  
 Maneekwan Toyungernsub, Occupancy grid prediction *Fall 2021 – Present*

**Mentor for Undergraduate Students Research** *Stanford University*  
 Ellie Talius, Trajectory verification for autonomous driving *Winter, Spring 2022*

**Mentor for Capstone Project** *University of Virginia*  
 Co-mentoring four undergraduate students on a robot navigation project *Spring 2021*

**Mentor for Society of Women Engineers** *University of Virginia, Spring 2017*  
 Graduate student mentor for undergraduate engineering students associated with the Society of Women Engineers. This mentorship program involved helping a student navigate her early engineering education and career.

## PRESENTATIONS

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Stanford SystemX 2021 Fall Conference, Poster *2021*  
 UVA Link Lab Student Seminars, Talk *2020*  
 UVA Link Lab Student Flash Talks, Talk *2020*  
 UVA ESE Graduate Symposium, Poster *2018, 2020*  
 ICRA PhD Forum, Poster *2018*  
 UVA ECE Student Research Session, Poster *2017*

## PROFESSIONAL SERVICE

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Member, Stanford Center for AI Safety Working Group *2022*  
 Co-chair, Learning for Dynamics & Control Conference (L4DC) *2022*  
 Program Committee Member, RSS Pioneers Workshop *2022*  
 Session Co-chair, IEEE/RSJ International Conference on Intelligent Robots (IROS) *2021*  
 Panelist, UVA Link Lab Academic Writing Panel *2021*  
 Co-organizer, UVA Systems Engineering Alumni Panel *2020*  
 Session Chair, IEEE Systems and Information Engineering Design Symposium *2019*

## REVIEW ACTIVITIES

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**Journals:**  
 IEEE Robotics and Automation Letters (RA-L)  
 Journal of Artificial Intelligence Research (JAIR)

Journal of Aerospace Information Systems  
IEEE Computer Magazine

**Conferences**

IEEE/RSJ International Conference on Intelligent Robots (IROS)  
Conference on Robot Learning (CoRL)  
IEEE Conference on Decision and Control (CDC)  
American Control Conference (ACC)  
IEEE International Conference on Robotics and Automation (ICRA)  
ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)  
IEEE International Conference on Intelligent Transportation Systems (ITSC)