

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

## RESEARCH EXPERIENCE

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<b>Stanford University</b>	Stanford, CA
Position: Postdoctoral Scholar	2021 – Present
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>	
<b>University of Virginia</b>	Charlottesville, VA
Position: Graduate Research Assistant	2016 – 2021
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>	
<b>Bogazici University</b>	Istanbul, Turkey
Position: Graduate Research Assistant	2014 – 2016
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>	

## AWARDS

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

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

**Robotics: Science and Systems (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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### **Refereed Journal and Magazine Articles**

- 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*”, IEEE Open Journal of Control Systems, 2023 (Early Access).
- **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, 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, pp. 10836–10841.
- 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, pp. 10290–10296.
- 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, pp. 1202–1207.
- **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 (Not Peer-reviewed)

- 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>Guest Lectures</b>	Stanford University
Decision Making under Uncertainty	Winter 2023
• Gave two guest lectures on representation and inference.	
Advanced Topics in Sequential Decision Making	Winter 2022
• Gave a guest lecture on applications areas of partially observable Markov decision processes.	
<b>Pedagogical Training</b>	Summer 2022
Stanford Scientific Teaching Summer Institute	Stanford University
• Attended a 3-day workshop to explore the core principles of Scientific Teaching (inclusion and equity, active learning, assessment, and effective lesson planning).	
<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
• Teaching responsibilities included grading and leading lab and discussion sessions.	
<b>Undergraduate Student Assistantship</b>	Bogazici University
System Dynamics and Control (Assisted discussion sessions)	Spring 2014
Orientation to Electrical Engineering (Assisted lab sessions)	Fall 2013

## MENTORSHIP EXPERIENCE

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<b>Mentor for Graduate Student Research</b>	Stanford University
Dylan Asmar, Out-of-distribution detection	2022 – Present
Sydney Katz, Backward reachability for nonlinear systems	2022 – Present
Anil Yildiz, Transfer learning and validation for autonomous driving tasks	2021 – Present
Liam Kruse, Safe planning for autonomous vehicles	2021 – Present
Maneekwan Toyungyernsub, Occupancy grid prediction	2021 – Present
Alexandros Tzikas, Trajectory verification for autonomous driving	2022
Chelsea Sidrane, Backward reachability for nonlinear systems	2022
<b>Mentor for Stanford Undergraduate Research Fellowship (SURF)</b>	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.	
<b>Mentor for Undergraduate Students Research</b>	Stanford University
Ellie Talus, Trajectory verification for autonomous driving	2022
<b>Mentor for Capstone Project</b>	University of Virginia
Co-mentoring four undergraduate students on a robot navigation project	Spring 2021
<b>Mentor for Society of Women Engineers</b>	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)