

# Efe Yamac Yarbasi

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## Summary

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Versatile Aerospace Engineer with a PhD from Georgia Tech, offering a decade of applied research and practical experience in systems engineering, data and uncertainty analysis, robotics, and various multi-disciplinary projects.

## Education

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| <b>Georgia Institute of Technology, Atlanta, GA</b><br>PhD in Aerospace Engineering – Aug 2023<br>MS in Aerospace Engineering – Aug 2018 | <b>Aug 2016 – Sep 2023</b>  |
| <b>Bogazici University, Istanbul, Turkey</b><br>MS in Mechanical Engineering   | <b>Jan 2013 – June 2016</b> |
| <b>Middle East Technical University, Ankara, Turkey</b><br>BS in Mechanical Engineering  | <b>Sep 2007 – Sep 2012</b>  |

## Professional Experience

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**Georgia Institute of Technology | Graduate Research Associate** **Aug 2016 – Aug 2023**  
[Aerospace Systems Design Laboratory \(ASDL\)](#) 

**Research:** Worked with and led multi-disciplinary groups to conduct research funded by various organizations. Interacted directly with sponsors from both government and industry.

- **NATO STO – Applied Vehicle Technologies 297 | Development of a Framework for Validation of Computational Tools for Analysis of Air and Sea Vehicles: (2018-2022)**
  - Worked as the leading graduate researcher for an international team of experts to develop a systems engineering (SE) based process to identify a validation database for next-generation vehicle platform simulations.
  - Advanced the field of SE/MBSE by dissecting and analyzing the interplay of coupled constituent physics in computational tools, assessing their accuracy and applicability for various intended uses. This effort was integral to my Ph.D. research, culminating in my dissertation.
  - Extended this work in my dissertation by creating a novel framework for pinpointing critical uncertainties in complex systems. The methodology emphasized the integration of system-level sensitivity analysis and targeted physical experiment designs to effectively reduce uncertainties, thereby enhancing the predictive accuracy and minimizing program risk.

*Skills: systems engineering, uncertainty quantification, verification & validation, computer simulations, Monte Carlo methods, advanced sensitivity analysis, configuration analysis*
- **Georgia Tech | Smart Energy Campus Program: (2016-2023)**

Spearheaded key initiatives within [Georgia Tech's Smart Energy Campus Program](#), a multi-year, multimillion-dollar project aimed at transforming the campus into a data-rich living laboratory. My leadership role involved steering teams of graduate and undergraduate students and contributing significantly to grant proposal writing and project planning:

  - **Building Energy & Water Model Development:** Created physics-based models using MATLAB Simulink/Simscape and Dymola based in ISO/ASHRAE standards. These models were pivotal in enhancing the energy performance assessment and schedule optimization of campus buildings.
  - **Data Analysis & Fault Detection:** Processed and refined data obtained from unstructured data sources. Developed data-driven models and APIs for efficient data retrieval from open-source weather databases and established a streamlined data storage pipeline on a cloud server.
  - **Developed AI-based predictive models** for [the Kendeda Building](#) (KB), an innovative *net-zero energy* building. My role encompassed the initial design phase through to operationalization, focusing on the integration of historical and real-time data to develop a Digital Twin of the building, optimizing its energy performance and operational efficiency.

Skills: *data analytics and visualization (python-pytorch/xgboost/pandas/pyplot/scikit-learn), modeling (MATLAB/Simulink/Simscape, Modelica), SQL, spark, optimization, control theory (MPC/Optimal)*

• **Georgia Tech – ASDL | Text Mining Project: (2018)**

- Undertook a pioneering project to analyze the laboratory's publication output using advanced topic modeling and text mining techniques.
- Successfully identified distinct research groups and clusters within the laboratory by processing and analyzing a large dataset of academic publications.
- Developed algorithms and utilized machine learning tools to extract meaningful patterns and trends, providing valuable insights into the lab's research focus and evolution over time.

Skills: *data analysis (python,R), visualization, text mining, topic modeling*

• **Modular Unmanned Air Vehicle Design/Build/Test: (2016-2017)**

As a team of graduate students, we developed and demonstrated a methodology for rapidly designing an optimally performing modular UAV from component databases. Performed hardware tests, compatibility checks and developed a component performance library.

Skills: *Hardware-in-the-Loop (HiL) testing, trade-off studies, sizing and synthesis, design of experiments, CAD (SolidWorks)*

**Teaching:** Worked as a Teaching Assistant and/or grader for classes listed below:

- Undergraduate classes: *Aerodynamics, Senior Aircraft Design*
- Graduate classes: *Aircraft Design I&II, Advanced Design Methods*

**Bogazici University | Graduate Research & Teaching Assistant**

**Aug 2016 – Aug 2023**

Haptics and Robotics Laboratory [🔗](#)

**Research:** Worked on various multi-disciplinary robotics projects with a focus on medical robotics and continuum robots.

• **Design of a Flexible Endoscopy Robot to Perform Colonoscopy:**

Developed the concept for a compliant continuum robot to be used in surgical operations. Collaborated with experts from Bogazici University Department of Biomedical Devices and Acibadem University School of Medicine, created requirements and ensured compliance. I was the primary author of the grant proposal that received ~\$750k from TUBITAK (Scientific and Technological Research Council of Turkey)

• **Design of an Endoscopy Robot for Endoscopic Vessel Harvesting:**

Developed the concept for a medical device to perform endoscopic vessel harvesting.

Skills: *Mechanical design, prototyping, CAD, robotics, motion control, motion planning, control theory*

**Teaching:** Prepared and graded computational and hands-on projects for the students. Gave tutorials on MATLAB and Simulink. Organized recitations and problems solving sessions. Substituted for the instructor if they were unable to attend. Held office hours. Oversaw senior design projects.

- Undergraduate classes: *Dynamics, Mechatronics, Modeling and Control, Mechanisms*
- Graduate classes: *Advanced Dynamics, State-Space Control Theory, System Modeling and Identification*

**Bosch Thermotechnology, Krnov, Czechia | Intern**

**Jul-Sep 2011**

- Engaged in the design and production planning of industrial boilers.
- Focused on optimizing sheet metal bending processes in the workshop.
- Developed guidelines to minimize manufacturing errors for design teams.

**Bosch Thermotechnology, Manisa, Turkey | Intern**

**Jul-Aug 2010**

- Involved in quality control checks for copper pipes and heat exchangers.
- Worked on streamlining workflow processes for improved efficiency.

**Awards**

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- NASA Aeronautics University Design Challenge 2017. Honorary Mention in Supersonic Transport Category
  - Development of a Colonoscopy Robot Actuated by Extend able Balloons, 2015. ~\$750k granted by The Scientific and Technological Research Council of Turkey (TUBITAK)
  - Anne Robinson Clough International Student Fund, 2020

## Publications and Patents

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### Doctoral Dissertation

- Yarbasi, E. Y., "A Methodology for Identifying Experiments for Uncertainty Mitigation in Complex Multi-Disciplinary Design", Georgia Institute of Technology, 2023

### Master's Thesis

- Yarbasi, E. Y., "Design and evaluation of a continuum robot with extendable balloons", Bogazici University, 2016

### Patent

- A Medical Device for Colonoscopy (EP3261517B1, WO2016137417A1)

### Journal Paper

- Yarbasi, E. Y., & Samur, E. (2018). Design and evaluation of a continuum robot with extendable balloons. *Mechanical Sciences*, 9(1), 51-60.

### Archival Conference Papers - Technical Reports

- Yarbasi, E.Y., Bagdatli, B. & Mavris, D. (2023). A Systems Engineering Based Model Selection Approach for Complex, Multi-Disciplinary Physics Problems. *AIAA SciTech Forum*
- Yarbasi, E.Y., Bagdatli, B. & Mavris, D. (2023). System-Level Identification of Critical Uncertainties to Enable Validation Experiment. *33rd Conference of the International Congress of the Aeronautical Sciences*
- Taylor, N. J., Mavris D. N., Yarbasi, E. Y., & Bagdatli, B. (2022). Chapter 6 - A Process for Identifying Requirements for Physical Referent Data to Support Computational Model Validation. *NATO STO AVT-297 Technical Report - In press*
- Yarbasi, E. Y., Bagdatli, B., & Mavris D. N., (2022). Chapter 7 - Demonstration of the Framework on a Military Mobility Transport Case Study. *NATO STO AVT-297 Technical Report - In press*
- Lewe, J., Yarbasi, E. Y., Oh, S., Kim, H., Brooks, J, Duncan, S., Hong, S., Jung, Y., Gassman, J., Koti, R. & Mowinski, T. Operating and Certifying a Net Positive Energy Building During a Pandemic, *2022 Building Performance Analysis Conference and SimBuild, Chicago, IL*
- Brooks, J., Lewe, J. H., Yarbasi, E. Y., Robertson, W., Kim, H. W., Duncan, S. J., & Mavris, D. (2021). Cistern Thermal Energy Storage Study for Potential Use within Net Positive Energy and Water Buildings. *In AIAA Propulsion and Energy 2021 Forum*
- Oh, S., Lewe, J. H., Yarbasi, E. Y., Brooks, J., Duncan, S. J., & Mavris, D. N. (2020). A Scalable Intra-Network Building Heat Exchange Model for District Cooling Systems. *In AIAA Propulsion and Energy 2020 Forum*
- Lewe, J. H., Duncan, S. J., Song, K., Oh, S. H., Solano, H. D., Yarbasi, E. Y., ... & Mavris, D. N. (2017). A comprehensive energy monitoring environment for district energy grid systems. *In 15<sup>th</sup> International Energy Conversion Engineering Conference*

### Poster Presentation

- Yarbasi, E. Y., & Samur, E. (2015). Design and evaluation of a continuum robot with extendable balloons. Presented at *Soft Robotics Workshop at International Conference on Robotics and Automation (ICRA), Seattle, WA, 2015*

## Skills

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**Skills** Systems engineering, data analysis, uncertainty analysis, robotics, dynamics

**Software** MATLAB, Simulink/Simscape, Python, Dymola, Tableau, R, Arduino, SQL, JMP, Linux, C++, MS Office

**CAD** SolidWorks, OpenVSP

**Languages** English, Turkish, German (Intermediate)