

SUMMARY OF QUALIFICATIONS

- Ph.D. in Computer Engineering. Several publications on optimization-guided verification of autonomous systems.
- More than 7 years of work experience in software engineering, especially is in safety-critical software development.
- Hands on experience with **AWS** services such as AWS Lambda, DynamoDB, S3, SageMaker.
- Software development in **Python, C, C++**, and **MATLAB** and model-based development tools (**SCADE / Simulink**).
- Worked with real-time operating systems (**Integrity-RTOS, μ C/OS-II**). Robotic operating system (**ROS**).
- Requirements management (**DOORS**), issue tracking (**JIRA**), configuration management (**SVN, Git**), model-based software development (**SCADE / Simulink**) tools, robotics simulation tool (**Webots**).

EDUCATION

Ph.D. in Computer Engineering, Arizona State University (ASU), AZ, USA – GPA:3.91 (2019)

Dissertation: Search-based Test Generation for Automated Driving Systems: From Perception to Control Logic.

M.Sc. in Electronics Engineering, Middle East Technical University (METU), Ankara, Turkey (2007)

Thesis: Implementation and Simulation of MC68HC11 Microcontroller Unit Using SystemC for Co-Design Studies.

B.Sc. in Electronics Engineering, Hacettepe University, Ankara, Turkey (2004)

Capstone Project: Ultrasonic Signal Follower Robot. One of the 6 projects that represented Hacettepe University in the international computer expo CeBIT Eurasia 2004 and took place in national media.

PROFESSIONAL EXPERIENCE

Amazon – Software Development Engineer, Bellevue, WA (Apr. 2019 – current)

- Developing computer-vision models and cloud-based software for increasing the speed and efficiency in the fulfillment transportation execution.

Toyota Motor North America - Research & Development Intern, Ann Arbor MI (Sept. 2017 – Apr. 2018)

- Developed a simulation-based framework and a novel automatic test generation approach for verification and validation of autonomous driving systems using **Python, Matlab** and **Webots** robotics simulator.
- Published a research paper and a poster in international conferences on this work. Presented this work in the Toyota Research Institute of North America research expo as one of the select projects.
- Worked on a novel SMT-solver-based verification technique for proving safety properties of neural-network-based controllers. Published an academic paper on this work.

Wright Brothers Institute – Summer of Innovation Program, Dayton, OH (May 2017 – Aug. 2017)

- Applied research tools on system verification on an unmanned air vehicles autonomy system (UxAS) with US Air Force Research Labs (AFRL) using **C++** and **Matlab** and published a conference paper on this work.
- AFRL gained automated test generation ability which is expected to reduce test generation time significantly.

ASU – Graduate Research Associate, Tempe, AZ (Dec. 2013 – Feb. 2019)

- Developed novel verification approaches and tools in **Python** and **Matlab** for automatically generating test cases for Cyber-Physical Systems that reduce testing time and increase the probability of finding corner-case errors.
- Created a multi-core parallelization tool for Simulink models in **Matlab** to deliver a substantial decrease in the overall worst-case execution time. Implemented scheduling and synchronization mechanisms for μ C/OS-II **RTOS**.
- Published several conference papers and two journal articles on the research outcomes.
- Helped students as a teaching assistant for Introduction to Programming (C/C++) and Mobile Robotics classes.

Turkish Aerospace Industries (TAI) – Avionics Software Engineer, Ankara, Turkey (Sept. 2009 – Dec. 2013)

- Developed Level-A safety-critical and **DO-178B** certified software for Human-Machine Interface logic of C-130 aircraft onboard computer in **C** and by using model-based software development tool **Scade**.
- Turkish Air Force gained a fleet of modernized aircraft while saving millions of dollars with this project.

BOTT Computer Systems – Embedded Software Engineer, Ankara, Turkey (Dec. 2005 – December 2008)

- Developed software in **C** and **C++** for e-payment and access control systems for campuses with more than 100K users.
- Provided substantial improvement in the scalability (enabled nationwide deployment) of the product. Gained the company the ability to manage thousands of remote units and discard hundreds of remote computers by converting the systems and the embedded software from DOS and RS-232 based systems to Linux systems with LAN connections.

OTHER PROJECTS

F1tenth Autonomous Driving Competition,

Developed the software for an autonomous driving 1/10 scale race car with LIDAR, Camera and IMU sensors in Python and ROS. Represented ASU in F1/10th autonomous driving competition, 2016. Finished the race in 3rd place.

ACADEMIC PUBLICATIONS (Google Scholar: <https://scholar.google.com/citations?user=WZKukMsAAAAJ>)

Search-based Test Generation for Automated Driving Systems: From Perception to Control Logic

Cumhur Erkan Tuncali, Ph.D. Dissertation, 2019

Rapidly-exploring Random Trees for Testing Automated Driving Systems,

(Best Paper Award!)

Cumhur Erkan Tuncali, Georgios Fainekos,

IEEE Intelligent Transportation Systems Conference, (ITSC 2019), Auckland, New Zealand, Oct. 27-31, 2019

Simulation-Based Adversarial Test Generation for Autonomous Vehicles with Machine Learning Components,

Cumhur Erkan Tuncali, Georgios Fainekos, Hisahiro Ito, James Kapinski,

IEEE Intelligent Vehicles Symposium (IV), 2018

Reasoning about Safety of Learning-Enabled Components in Autonomous Cyber-physical Systems,

Cumhur Erkan Tuncali, James Kapinski, Hisahiro Ito, Jyotirmoy V. Deshmukh,

Design Automation Conference (DAC), 2018

Poster: Sim-ATAV: Simulation-Based Adversarial Testing Framework for Autonomous Vehicles, (Best Poster Finalist)

Cumhur Erkan Tuncali, Georgios Fainekos, Hisahiro Ito, James Kapinski,

Hybrid Systems: Computation and Control (HSCC), 2018

Experience Report: Testing and Verification of the UxAS System,

Cumhur Erkan Tuncali, Bardh Hoxha, Guohui Ding, Georgios Fainekos, Sriram Sankaranarayanan,

NASA Formal Methods Symposium, Virginia, 2018

Functional Gradient Descent Optimization for Automatic Test Case Generation for Vehicle Controllers,

Cumhur Erkan Tuncali, Shakiba Yaghoubi, Theodore Pavlic, Georgios Fainekos,

13th Int. Conference on Automation Science and Engineering, (CASE 2017), Xi'an, China, Aug. 20-23, 2017

Utilizing S-TaLiRo as an Automatic Test Generation Framework for Autonomous Vehicles,

Cumhur Erkan Tuncali, Theodore Pavlic, Georgios Fainekos,

IEEE Intelligent Transportation Systems Conference, (ITSC 2016), Rio De Janeiro, Brazil, Nov. 1-4, 2016

Modeling Concurrency and Reconfiguration in Vehicular Systems: A Pi-Calculus Approach,

Joseph Campbell, Cumhur Erkan Tuncali, Peng Liu, Theodore Pavlic, Umit Ozguner, Georgios Fainekos,

12th Conference on Automation Science and Engineering, (CASE 2016), Fort Worth, Texas, USA, Aug. 21-24, 2016

Automatic Parallelization of Multirate Block Diagrams of Control Systems on Multicore Platforms,

Cumhur Erkan Tuncali, Georgios Fainekos, Yann-Hang Lee,

ACM Transactions on Embedded Computing Systems (TECS), vol. 16, no.15, 2016

Automatic Parallelization of Simulink Models for Multi-Core Architectures,

Cumhur Erkan Tuncali, Georgios Fainekos, Yann-Hang Lee,

12th International Conference on Embedded Software and Systems, (ICESS 2015), New York, USA, Aug. 24-26, 2015

SELECTED COURSES

PhD – Arizona State University:

- Real Time Embedded Systems
- Statistical Machine Learning
- Optimization
- Interaction Testing: Theory and Practice
- Introduction to Graph Theory
- Linear Systems Theory
- Nonlinear Control Systems
- Foundations of Algorithms
- Cyber Physical Systems
- Computer Systems I & II