Sami Alperen Akgün

Systems Design Engineering
University of Waterloo
Waterloo, ON

(+1) (226) 507-2151
sami.alperen.akgun@gmail.com

Research Interests: Robotics, Human-Robot Interaction, eXplanaible Artificial Intelligence

Education

2019 – Present | **University of Waterloo**, Waterloo, ON Canada
Department of Systems Design Engineering
Master of Applied Science
Supervisor: Prof. Kerstin Dautenhahn
Co-supervisors: Dr. Mark Crowley and Dr. Moojan Ghafurian
CGPA: 91.5/100.0

2014 – 2019 | **Middle East Technical University**, Ankara, Turkey
Department of Electrical and Electronics Engineering
Bachelor of Science, Control Field
CGPA: 3.84/4.00

Relevant Experience

Sept 19 – Present | **Social and Intelligent Robotics Research Laboratory**
University of Waterloo, ON, Canada
Graduate Researcher
• Developing natural interaction experience for robot-assisted search and rescue teams.
• MiRo & Husky robots are being programmed with ROS.

Sep 20 – Dec 20 | **SYDE/BME 411 - Optimization and Numerical Methods**
University of Waterloo, ON Canada
Teaching Assistant

May 20 – Aug 20 | **ECE 493 - Reinforcement Learning Course**
University of Waterloo, ON Canada
Teaching Assistant

Jan 20 – Jun 20 | **CARIZON**
Kitchener, ON, Canada
Volunteer Math and Science Tutor
• Pathways to Education Program is a national charitable organization breaking the cycle of poverty through education.

Mar 20 – Apr 20 | **The ACM CHI Conference on Human Factors in Computing Systems (CHI 2020)**
Volunteer External Reviewer
• Acted as an external reviewer for CHI Late-Breaking Works submission stream.

Jan 20 – Apr 20 | **Social and Intelligent Robotics Research Laboratory**
University of Waterloo, ON Canada
Graduate Research Assistant
• Writing a bridge for communication between YARP and ROS in C++ language
• Assistance & maintenance of robots and servers in the lab

Feb 19 – Jun 19 | **New Holland Agriculture**
Ankara, Turkey
Part Time Software Engineer
• Automating the process in Purchasing Department
• Python: Pandas, Scipy

Oct 18 – Jan 19 | **EE 314 - Analog Electronics Laboratory**
Middle East Technical University, Turkey
Teaching Assistant

July 18 – Sept 18 | **Personal Robotics Laboratory**
Imperial College London, United Kingdom
Research Intern
• Dataset of motion of real robots for 3D motion segmentation created.
• Kinematic structure correspondence code written in MATLAB and R transferred to C++ to use for real time imitation learning on iCub.
• The supervisor of the project was Prof. Yiannis Demiris.

June 17 – Sept 17 | **Distributed Artificial Intelligence Laboratory (DAI-Labor)**
The Technical University of Berlin, Germany
Research Intern
• Created simulation environment for human-robot collaboration for smart factory environment using MORSE simulator.
• Applied ROS meta-package TOASTER for spatial temporal reasoning.
• Implemented Partially Observable Markov Decision Process (POMDP) for robots in the simulation.

Publications

• Sami Alperen Akgun, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. Using Affective Expressions in Search and Rescue Operations toImprove Multi-Modal Human-Robot Interaction. Submitted to 2021 ACM/IEEE International Conference on Human-Robot Interaction (HRI 2021) Pioneers Workshop.

• Sami Alperen Akgun, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. Emotion Modelling for Robot to Human Communication in Search and Rescue contexts. Submitted to International Journal of Human-Computer Studies.

• Moojan Ghafurian, Sami Alperen Akgun, Mark Crowley, and Kerstin Dautenhahn. Recognition of a Robot's Affective Expressions under Conditions with Limited Visibility. Submitted to 2021 ACM/IEEE International Conference on Human-Robot Interaction (HRI 2021).

• Sami Alperen Akgun, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. 2020. Using Emotions to Complement Multi-Modal Human-Robot Interaction in Urban Search and Rescue Scenarios. In Proceedings of the 2020 International Conference on Multimodal Interaction (ICMI '20). Association for Computing Machinery, New York, NY, USA, 575–584.

• O. Ozdemir, S. A. Akgün, and U. Acikgoz. 2019. Mobile Robotic Platform Design for Mapping and Autonomous Navigation Research. In Turkish National Robotic Conference (ToRK 2019), Istanbul, Turkey.

• Çetinkaya, M., Akgun, S. A., Erkmen, A. M., & Erkmen, İ. (2018, October). Exact Kalman Filtering of Respiratory Motion. In 2018 6th International Conference on Control Engineering & Information Technology (CEIT) (pp. 1-6). IEEE.

Selected Projects

Jan – Apr 2020 | **Single-Robot Coverage Path Planning**
SYDE632 Optimization Methods Final Project
• Coverage path planning problem was converted to a Travelling Salesman Problem (TSP) using modified version of Boustrophedon Decomposition Algorithm.
• DFS, BFS, Hill Climbing, Genetic Algorithm, Simulated Annealing and Mutual Information Maximizing Input Clustering algorithms were applied to solve TSP optimization.

Jan – Apr 2020 | **Human Activitity Recognition Using Smartphone Data**
SYDE675 Pattern Recognition Final Project
• Extreme Gradient Boosting (XGBoost) classifier was employed with PCA in Python and 99.66% accuracy obtained for "Human Activity Recognition Using Smartphones" dataset.

Sept – Dec 2019 | **Development of Leader Following, Boids Inspired Algorithm Using ROS**
ECE750 Embodied Intelligence Final Project
• Boids inspired leader following multi-robot system was implemented in Stage simulator using ROS.

2018 – 2019 | **Mobile Robotic Platform Design and Implementation for 2D Map Extraction**
Bachelor Thesis
• Designed and built a robotic platform from scratch (including LIDAR sensor) for 2D simultaneous localization and mapping (SLAM).
• Connected ARM based hardware to Robot Operating System (ROS) middleware and used ROS navigation + SLAM stack.
• Won "Advanced Hardware Design Award" among 52 graduation projects within METU EEE department.
• Awarded as "second best research project" in the competition organized by The Scientific and Technological Research Council of Turkey (Tubitak).
• Supervisor of the project was Prof. Mustafa Mert Ankarali.

2018 – 2019 | **Respiratory Motion Tracking**
METU EEE Mechatronics, Robotics and Control Laboratory
• A novel Exact Kalman Filter which outperforms Extended Kalman Filter and Uncented Kalman Filter was developed to track respiratory motion.
• The supervisor of the project was Prof. Aydan Erkmen.

Jan 19 – Jun 19 | **Vehicle Following (Spacing Control) Using Model Predictive Control**
EE498 Control System Design and Simulation Final Project
• MPC algorithm was implemented in Matlab and system modeled in Simulink.

2015 – 2018 | **Retinal Image Segmentation and Classification of a Retinal Disease**
METU EEE STAR Project
• Conventional image processing techniques and convolutional neural networks (CNN) were employed to segment vessels in retina images.
• Classification of Retinopathy of Prematurity (ROP) was done with 96% accuracy using CNN.
• The supervisor of the project was Prof. Ilkay Ulusoy.

Sept 18 – Dec 18 | **Closed Loop Air Pressure Control**
EE407 Process Control Laboratory Final Project
• PID controllers were implemented using Arduino.

Jan 18 – June 18 | **FPGA Based Oscilloscope using Verilog Language**
EE314 Digital Electronics Laboratory Final Project

2016 – 2017 | **Human Action Recognition and Control of Robotic Manipulator**
IEEE METU Robotics and Automation Society
• Human action recognition with RGB-D video input was achieved using openNI2 and NITE libraries under ROS framework.
• Recognized actions were used to control 4 DOF robotic arm with an end effector.

Sept 17 – Dec 17 | **Frequency Modulated Continuous Wave Based Distance Measuring System**
EE313 Analog Electronics Laboratory Final Project
• System designed in ISIS electronic simulator and implemented in real life.

Jan 17 – Jun 17 | **Design and Implementation of Sound Controlled Vehicle**
EE214 Electronic Circuits Laboratory Final Project

Sept 16 – Dec 16 | **Design and Implementation of Analog Air Conditioner System**
EE213 Electronic Circuits Laboratory Final Project

Technical Skills

Skill Type	Applications
Neural Networks	TensorFlow , KERAS
Robotics	ROS, YARP, MORSE and Gazebo Simulations
Computer Vision	openCV, NITE, openNI2, MATLAB Image Processing Toolbox
Microcontroller Programming	ARM (TI, ST, mbed), Arduino, Microchip PIC, Raspberry Pi
Programming Languages	C, C++, Python, MATLAB & Simulink
PCB Design	Eagle, ARES
Electronic Simulation	ISIS, LTSpice
Technical Drawing	Solidworks, Keycreator
Organizing Tools	Git, LaTeX

Professional Development

Time	Course Name	Course Provider
2021 Winter	CS50: Introduction to Computer Science	Edx – Harvard University
2020 Winter	Reinforcement Learning Course by David Silver	DeepMind
2017 - 2018 Fall	Deep Learning for Self-Driving Cars	MIT Courseware
2017 Summer	Machine Learning Taught by Andrew Ng	Coursera – Stanford University
2016 – 2017 Fall	Machine Learning for Data Science and Analytics	Edx – Columbia University
2015 – 2016	Fundamentals of Digital Image and Video Processing	Coursera – Northwestern University
2015 Summer	Embedded Systems: Shape the World	Edx – The University of Texas

Scholarships & Awards

2019 – 2021 **Graduate Research Scholarship (GRS)**
University of Waterloo

2019 – 2021 **International Master's Award of Excellence (IMAE)**
University of Waterloo

January 2020 **University of Waterloo Grad Scholarship**
University of Waterloo, Systems Design Engineering

June 2019 **Second Best Research Project**
University Students Research Projects Competition, Tubitak

June 2019 **Advanced Hardware Design Award**
METU EEE Capstone Project Fair

Apr 17&Oct 19 **METU EEE Bülent Kerim Altay Prize**
This award is given to students who get full GPA (4.0) for one semester.

December 2017 **Travel Funding for KAIST EE Camp**
Selected as a visiting student for Korean Advanced Institute of Science and Technology (KAIST) Electrical and Electronics (EE) Department Camp

2016 Fall **METU EEE Best Electrical Circuits 1 Laboratory Project**
Highest score for Electrical Circuits Laboratory Final Project

2015 – 2019 **Anadolu Foundation – Success Scholarship**

2015 – 2019 **Rönesans Holding Scholarship**

2015 – 2018 **Türk Metal Union – Success Scholarship**

2014 – 2015 **Vehbi Koç Foundation – Outstanding Success Scholarship**

Additional Information

LinkedIn	https://www.linkedin.com/in/sami-alperen-akgun/
Github	https://github.com/samialperen
Personal Blog	https://samialperen.github.io/