# Sami Alperen Akgün

Systems Design Engineering
University of Waterloo
Waterloo, ON

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**Research Interests:** Robotics, Human-Robot Interaction, explainable 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 Theory and Automation
**CGPA: 3.84/4.00**

## Relevant Experience

### 1. Professional Experience

July 21 – Sept 21
**Tellext**
Vancouver (Remote), ON, Canada
***Robotics Integration Engineer***
• Responsible for sensor fusion, autonomous navigation & teleoperation of a security robot with ROS
• Collaborating with control, electrical, software and mechanical team members for successful integration

Sept 19 – Aug 21
**Social and Intelligent Robotics Research Laboratory**
University of Waterloo, ON, Canada
***Graduate Researcher***
• Conducted research on robot-assisted search and rescue and HRI projects
• Developed algorithms for MiRo, Husky & QT robot using ROS with Python/C++

May 21 – Aug 21
**SYDE 252 - Signals and Systems**
University of Waterloo, ON Canada
***Teaching Assistant***

Jan 21 – Apr 21
**SYDE 352 - Introduction to Control Systems**
University of Waterloo, ON Canada
***Teaching Assistant***

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 – 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
• Set up the robots and servers in the lab and created tutorial documents

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.

**2. Service & Leadership**

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.

**3. Course Work**

| Time | Course Name | Course Provider |
|---|---|---|
| 2021 | CS50: Introduction to Computer Science | Edx – Harvard University |
| 2020 | Reinforcement Learning Course by David Silver | DeepMind (Online) |
| 2020 | Pattern Recognition & Optimization Methods | University of Waterloo |
| 2019 | Embodied Intelligence & Social Robotics | University of Waterloo |
| 2019 | Nonlinear Control Systems & Control System Design and Simulation | Middle East Technical University |
| 2018 | Process Control & Discrete Time Systems & Digital Signal Processing | Middle East Technical University |
| 2018 | Feedback Systems & Signals and Systems | Middle East Technical University |
| 2017 | Deep Learning for Self-Driving Cars | MIT Courseware |
| 2017 | Machine Learning Taught by Andrew Ng | Coursera – Stanford University |
| 2016 | Machine Learning for Data Science and Analytics | Edx – Columbia University |
| 2016 | Fundamentals of Digital Image and Video Processing | Coursera – Northwestern University |
| 2016 | Computer Aided Engineering Graphics | Middle East Technical University |
| 2015 | Embedded Systems: Shape the World | Edx – The University of Texas |
| 2015 | Introduction to C Programming | Middle East Technical University |

# Manuscripts in Preparation, or Under Review

• Sami Alperen Akgun, Hamza Mahdi, Shahed Saleh, and Kerstin Dautenhahn. A Systematic Literature Review of The History of Social Robots — Past, Present and Future. Under review.

• Sami Alperen Akgun, Hamza Mahdi, Shahed Saleh, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. Design and Implementation of Affective Expressions for Appearance Constrained Robots. In preparation.

• Sami Alperen Akgun, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. Emotion Modelling for Robot to Human Communication in Search and Rescue contexts. Under review: IEEE Transactions on Affective Computing.

## Publications

• Austin Kothig, John Munoz, Sami Alperen Akgun, Alexander M. Aroyo, and Kerstin Dautenhahn. 2021. Connecting Humans and Robots Using Physiological Signals - Closing-The-Loop in HRI. In 30th IEEE International Conference on Robot and Human Interactive Communication, RO-MAN 2021, Vancouver, BC, Canada, August 8 - 12, 2021

• Moojan Ghafurian, Sami Alperen Akgun, Mark Crowley, and Kerstin Dautenhahn. 2021. Recognition of a Robot's Affective Expressions under Conditions with Limited Visibility. In 18th International Conference promoted by the IFIP Technical Committee 13 on HCI (INTERACT 2021)

• Sami Alperen Akgun, Moojan Ghafurian, Mark Crowley, and Kerstin Dautenhahn. 2021. Integrating Affective Expressions into the Search and Rescue Context in order to Improve Non-Verbal Human-Robot Interaction. In Workshop on Exploring Applications for Autonomous Non-Verbal Human-Robot Interactions at HRI 2021, March 8th 2021, Virtual, 4 pages

• 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.

• Oguz Ozdemir, Sami Alperen Akgun, and Ugur 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

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.

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.

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.

2016 – 2017 **Human Action Recognition and Control of Robotic Manipulator**
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## 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 |

## Scholarships & Awards

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|---|---|
| 2019 – 2021 | **Graduate Research Scholarship (GRS)**<br>University of Waterloo |
| 2019 – 2021 | **International Master's Award of Excellence (IMAE)**<br>University of Waterloo |
| January 2020 | **University of Waterloo Grad Scholarship**<br>University of Waterloo, Systems Design Engineering |
| June 2019 | **Second Best Research Project**<br>University Students Research Projects Competition, Tubitak |
| June 2019 | **Advanced Hardware Design Award**<br>METU EEE Capstone Project Fair |
| Apr 17&Oct 19 | **METU EEE Bülent Kerim Altay Prize**<br>This award is given to students who get full GPA (4.0) for one semester. |
| December 2017 | **Travel Funding for KAIST EE Camp**<br>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**<br>Highest score for Electrical Circuits Laboratory Final Project |
| 2015 – 2019 | **University Success Scholarships** |
| 2015 – 2018 | **Türk Metal Union – Success Scholarship** |
| 2014 – 2015 | **Vehbi Koç Foundation – Outstanding Success Scholarship** |