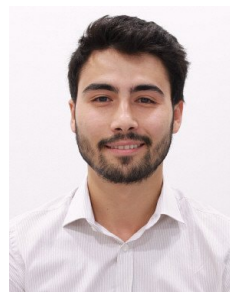


# Erdem Arinc Bulgur

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## SUMMARY

- Machine learning engineer in a Level-4 Autonomous Driving Platform company working on the development of the perception pipeline.
- Research topics include: Deep reinforcement learning, NLP, knowledge graph, computer vision.
- Experienced in machine learning and deep learning frameworks including PyTorch, Scikit-Learn and TensorFlow.

## WORK EXPERIENCE

### Adastec Corp.

*Machine Learning Engineer*

**Ann Arbor, Michigan**

*Jan 2021 - Present*

- Enhanced 3D-object detection performance in adverse weather conditions 15% by integrating an LSTM-based video segmentation model into the PointPainting object detection pipeline.

### Oden Institute at UT Austin

*Research Assistant*

**Austin, Texas**

*Aug 2018 - Jan 2021*

- Carried out PhD level research on deep reinforcement learning, inverse reinforcement learning, computer vision, knowledge graph and optimization.
- Please look at the second page of this resume to learn more about my academic projects.

### Max-Planck Institute for Intelligent Systems

*Research Intern*

**Stuttgart, Germany**

*Mar 2018 - Jun 2018*

- Slashed the time spent for microrobots' kinematic analysis 90% by developing a CNN-based image processing pipeline.

## EDUCATION

### The University of Texas at Austin

*M.Sc. in Aerospace Engineering*

**Austin, Texas**

*August 2018 - Dec 2020*

#### Courses.....

Statistical Machine Learning (ECE), Probability and Stochastic Processes (ECE), Large Scale Optimization (ECE), Verification and Synthesis of Cyber-Physical Systems (ASE), Automated Logical Reasoning (CS), Optimal Control (ASE).

### Bogazici University

*Bachelor of Science in Mechanical Engineering*

**Istanbul, Turkey**

*Sep 2013 - Jan 2018*

## SKILLS

- Languages:** Python, C++, Bash, SQL, Matlab, Arduino
- Frameworks:** TensorFlow, Pytorch, Scikit-learn, Docker, YOLO, AirSim, PX4, MAVROS, Prism Model Checker, SPOT LTL and Automata Manipulation Tool, SLUGS Reactive Synthesis Tool
- Softwares:** ROS, Unreal Engine, Siemens NX

## Publications

- M. Ghasemi, E.A. Bulgur and U. Topcu, "Task-Oriented Active Perception and Planning in Environments with Partially Known Semantics", *2020 International Conference on Machine Learning (ICML)*, Virtual Conference, 2020.
- E. A. Bulgur, H. Demircioglu and H. I. Basturk, "Light Source Tracking with Quadrotor by Using Extremum Seeking Control" *2018 Annual American Control Conference (ACC)*, Milwaukee, WI, 2018, pp. 1746-1751.

## ACADEMIC PROJECTS

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### **Trajectory Predictions by Variational Gaussian Process**

*July 2020 - December 2020*

- Developed an algorithm to make sparse gaussian process approximations for online streamed data which yields a 40 times speedup compared to the exact model for the trajectory prediction task.

### **Mastering Sabotage Games by Reinforcement Learning**

*April 2020 - December 2020*

- Designed a reinforcement learning algorithm based on Monte-Carlo tree search and graph neural network to solve the PSPACE complexity of the sabotage games and sped up the exact solution up to 5 times faster.
- Published the results at GandALF 2021.

### **Context Reasoning Using Deep Learning and Knowledge Graph**

*November 2019 - July 2020*

- Designed a new architecture using LSTM networks and a knowledge graph for grounding robot plans from natural language instructions with 70% accuracy.

### **D3D 3D Printing Drone**

*July 2019 - June 2020*

- Decreased overall test time, required for parameter tuning of an hexacopter, by orders of magnitude by programming an Offboard control algorithm integrating a safe parameter optimization algorithm on C++.

### **Simulation platforms**

*May 2019 - December 2020*

- I was the person in charge for performing visual simulations of the papers that my colleagues published in my research group. In particular, I standardized AirSim and another simulator designed by Army Research Lab as main platforms for the simulations. You can see some related projects below:
  - **Synthesis of Surveillance Strategies via Belief Abstraction:** Designed a new Unreal Engine environment and discretized it as a GridWorld. Implemented the belief abstraction strategy controller using the AirSim Python APIs for the surveillance task performed by the simulated drone.
  - **Active Perception and Planning:** Integrated the state-of-art YOLOV3 and SegNet frameworks into AirSim to achieve object detection and semantic segmentation from the camera images. Constructed point clouds out of depth images.
  - **Gridworld-2-Unreal Pipeline:** Automatized Unreal Engine environment construction by building a pipeline which transforms a labeled GridWorld to an Unreal Engine environment using the Unreal Engine Python scripting APIs.

### **Policy Adaptation between Similar Environments**

*Mar 2019 - June 2019*

- Designed a Domain Adversarial Neural Network to obtain a policy for an agent in a real-world setting by using the policy of an agent evaluated in a simulation environment which might be a coarser model of the real-world. Although the project did not finalize I gained a great experience while implementing recent papers in the literature as I was working with recent deep learning techniques and TensorFlow.

### **Accelerated Value Iteration by Anderson Acceleration**

*Jan 2019 – Mar 2019*

- Identified counter examples which classical methods for value iteration do not converge or are very slow to converge such that online implementation of them would be intractable. Presented a value iteration algorithm that utilizes Anderson acceleration method to address the aforementioned issue. The efficiency of the presented algorithm was further shown empirically through examples.

### **Extremum Seeking for Light Source Tracking**

*Jun 2017 – Sep 2017*

- I worked on a real-time optimization project which is an implementation of extremum seeking algorithm in the Control Laboratory. In the project, it is aimed that a quadrotor tracks the active light source by performing extremum seeking. During this project, I got familiar with the dynamics of a quadrotor, extremum seeking control theory and usage of many different hardware and software. At the end of the project, we published a conference paper at American Control Conference(ACC).