

# Mihai Sorin Dobre

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## RESEARCH INTERESTS

- *Machine Learning*: (Multi-agent) Reinforcement Learning, Imitation learning, Deep Learning, Bayesian Methods, Planning and Decision Making
- Multi-agent Systems and Game Theory
- Computer Vision

## INDUSTRIAL EXPERIENCE

*Lead Research Scientist*  
Five AI/Bosch, UK

May 2023 – present

- Leading the Motion Planning and Prediction applied research team, providing technical guidance, establishing collaborations within Five AI, Bosch and academia, and line managing the team
- Researching a variety of topics in planning (e.g. multi-agent interactions, robustifying planners to handle distribution shifts and OOD data), and topics related to integrating planning with prediction
- Exploring state-of-the art techniques, such as Deep Learning (Graph Neural Networks, Transformers), Imitation Learning, Multi-agent Reinforcement Learning (including population-based methods); combining with classical approaches such as Iterative Best Response, Bayesian inference and Counterfactual simulation
- Implementing Machine Learning solutions for Online HD Map Reconstruction from raw sensor input (Camera and LiDAR) with the aim of Autolabeling the vast amount of self-driving data. Coordinating the team through an internal tender process.
- Guiding the engineering team on how to apply our algorithms and bring various machine learning methods to the vehicle stack deployed in the real world

*Senior Research Scientist in Motion Planning and Prediction*  
Five AI, UK

May 2020 – May 2023

- Lead the Interactive Prediction and Planning team; we explored multiple directions for handling interactions, such as a classical integration between a Monte Carlo Tree Search ego planner and sampling of prediction for other agents, or a multi-agent algorithm to simultaneously model interactions between all agents
- Researched prediction solutions, such as NNs with Bayesian inference for Goal Recognition
- Collaborated with other research teams to develop algorithms for handling occlusions, by combining an optimisation-based planner with various belief modelling techniques, e.g. particle filtering
- Developed an evaluation framework and metrics for assessing the performance of the prediction and planning components, comparing it with other implementations and informing future development by highlighting current limitations.

*Research Scientist in Motion Planning and Prediction*  
Five AI, UK

May 2018 – May 2020

- Designed and developed a high-level planner for the vehicle stack for decision making in complex situations, such as merging in roundabouts and overtaking in high traffic scenarios.

- Designed and developed an efficient multi-agent driving simulator that is being used extensively to conduct research in reinforcement learning, interactive planning or prediction, robust planning and integrating prediction with planning.
- Organised the Motion Planning and Prediction reading group, and actively participated in other company-wide reading groups.

*Software Developer on STAC project*  
University of Edinburgh, UK

Sep 2014 – Mar 2015 & Aug – Dec 2016

- Collaborated with Toulouse and Heriot-Watt Universities on developing a rule-based agent for the Settlers of Catan game and applying machine learning methods to learn negotiations (e.g. Deep Q-learning, Random Forest).
- Developed an evaluation system for running competitions and assessing the models. Collected the data and analysing the results. Maintaining the Java source code.

*Software Developer Intern on WebSphere Application Server*  
IBM, Hursley, UK

Jul 2011 – Aug 2012

## SELECTED PUBLICATIONS

- Morris Antonello\*, Mihai Dobre\*, Stefano V. Albrecht, John Redford, and Subramanian Ramamoorthy. Flash: Fast and light motion prediction for autonomous driving with bayesian inverse planning and learned motion profiles. *CoRR*, abs/2203.08251, 2022
- Josiah Hanna, Arrasy M Rahman, Elliot Fosong, Francisco Eiras, Mihai Dobre, John Redford, Subramanian Ramamoorthy, and Stefano Albrecht. Interpretable goal recognition in the presence of occluded factors for autonomous vehicles. In *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021
- Stefano V. Albrecht, Cillian Brewitt, John Wilhelm, Balint Gyevnar, Francisco Eiras, Mihai Dobre, and Subramanian Ramamoorthy. Interpretable goal-based prediction and planning for autonomous driving. In *IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, 2021
- Mihai Dobre and Alex Lascarides. POMCP with human preferences in settlers of catan. In *Proceedings of the Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE)*, Edmonton, Canada, 2018
- Joachim Fainberg, Ben Krause, Mihai Dobre, Marco Damonte, Emmanuel Kahembwe, Daniel Duma, Bonnie L. Webber, and Federico Fancellu. Talking to myself: self-dialogues as data for conversational agents. *CoRR*, abs/1809.06641, 2018
- Ben Krause, Marco Damonte, Mihai Dobre, Daniel Duma, Joachim Fainberg, Federico Fancellu, Emmanuel Kahembwe, Jianpeng Cheng, and Bonnie L. Webber. Edina: Building an open domain socialbot with self-dialogues. *CoRR*, abs/1709.09816, 2017

## EDUCATION

*PhD, Informatics*

2013 – 2018

Low-resource learning in complex games

University of Edinburgh, UK

Supervisors: Alex Lascarides, Subramanian Ramamoorthy

*BSc (Hons) Robotics with Artificial Intelligence (1st class)*

2009 – 2013

University of Bradford, UK

Final year project: Modelling a Hide and Seek Game under Uncertainty

## SELECTED COMPUTING SKILLS

*Languages:* Python (and Scientific Computing, e.g. NumPy, pandas etc), C++, Java, SQL

*Libraries and Frameworks:* Torch, TensorFlow, JAX, RLLib, ROS

*Scripting languages:* Unix Shell; *Version control:* Git; *Document preparation:* L<sup>A</sup>T<sub>E</sub>X

## AWARDS

- Best Student Paper Award for “Exploiting action categories in learning complex games”
- Best Overall Performance Award received for BSc degree (2013)

## PREVIOUS PROJECTS AND EXPERIENCE

- *Amazon Alexa Challenge 2017*: implemented a socialbot that is able to converse on popular topics. I was part of team Edina from University of Edinburgh.
- *Strategic Conversation (STAC)*: developed state-of-the-art models that combine linguistic theory, agent interaction and decision making.
- I was a teaching assistant on several courses at University of Edinburgh, e.g. Reasoning and Agents, Reinforcement learning, as well as at University of Bradford, e.g. Software Development - level 1. Each one of these modules involved preparing and presenting materials to over 100 of students, preparing and marking exams, and leading labs or tutoring sessions to aid the students understand the module.

## OTHER INTERESTS

Tennis: competed on the ITF World Pro Circuits, on Romanian and British Tour, and University team levels.