Mihai Sorin Dobre

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RESEARCH INTERESTS

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

INDUSTRIAL EXPERIENCE

Lead Research Scientist   May 2023 – present
Five AI/Bosch, UK

- 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), Multi-agent Reinforcement Learning, Imitation Learning; combining with classical approaches such as Iterative Best Response, Bayesian inference and Counterfactual simulation
- Implementing Machine Learning solutions for 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.
- Extending our research simulator to multi-agent problems and improving its efficiency via vectorisation, just-in-time compilation and hardware acceleration with JAX.
- 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   May 2020 – May 2023
Five AI, UK

- Lead the Interactive Prediction and Planning team; I 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   May 2018 – May 2020
Five AI, UK

- 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 single-agent driving simulator that has been used extensively to conduct research in reinforcement learning, interactive planning or prediction, robust planning and integrating prediction with planning.
- Organised and actively participated in various company-wide reading groups.

Software Developer on STAC project   Sep 2014 – Mar 2015 & Aug – Dec 2016
University of Edinburgh, UK

- 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.

Software Developer Intern on WebSphere Application Server   Jul 2011 – Aug 2012
IBM, Hursley, UK

SELECTED PUBLICATIONS

- Morris A*, Mihai D*, Stefano A, John R, and Subramanian R. Flash: Fast and light motion prediction for autonomous driving with bayesian inverse planning and learned motion profiles. In *IEEE IROS*, Kyoto, Japan, 2022
- Josiah H, Arrasy R, Elliot F, Francisco E, Mihai D, John R, Subramanian R, and Stefano A. Interpretable goal recognition in the presence of occluded factors for autonomous vehicles. In *IEEE IROS*, Prague, Czech Republic, 2021
- Stefano A, Cillian B, John W, Balint G, Francisco E, Mihai D, and Subramanian R. Interpretable goal-based prediction and planning for autonomous driving. In *IEEE 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 F, Ben K, Mihai D, Marco D, Emmanuel K, Daniel D, Bonnie W, and Federico F. Talking to myself: self-dialogues as data for conversational agents. *CoRR*, abs/1809.06641, 2018
- Ben K, Marco D, Mihai D, Daniel D, Joachim F, Federico F, Emmanuel K, Jianpeng C, and Bonnie L. W. 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
Cloud computing familiarity: AWS, Azure
Machine/Environment virtualisation: Docker, Conda
Scripting languages: Unix Shell; *Version control:* Git; *Document preparation:* LaTeX

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.