

Denis Osipychhev

Contact Information

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Professional Area

Autonomous systems architecture and hierarchical artificial intelligence.
Hybrid decision-making systems, control policy optimization, deep reinforcement learning.
Machine learning under constraints, generative modeling, and synthetic data generation.

Professional Experience

Boeing Research & Technology, Huntsville, Alabama USA *2018 – present*

AI Software Engineer at Center for Applied Simulation and Analytics (CASA)

Research in general autonomy, intelligent systems, and decision-making focusing on autonomous reasoning, and risk assessment for mission planning.

Consulting, architecting, and prototyping a broad range of AI activities:

- Learning-enabled planning and control for fighter-jet dogfight
Developed a surrogate domain, training procedure, and evaluation metrics
- Synthetic data generation for visual perception pipeline
Designed data distribution matching and transfer learning pipeline
Architected active learning framework with synth data generation
- Assurance guarantees for learning-enabled hybrid systems
Developed evaluation metrics for regression, classification, policy models
Architected hybrid deep learning solution for mission critical components
- Local path-planning, collision avoidance, and navigation for airport taxiing
Architected and integrated trajectory planner for dynamic environment
- Defect analysis and process optimization for composite manufacturing
Architected sequence optimization for fiber placement process
- Defense against deception and adversarial attacks on cyber-physical systems
Coordinated cybersecurity work for robust AI/ML agents mission planning

University of Illinois at Urbana-Champaign, Urbana, Illinois USA

2016 – 2018

Research Assistant at Coordinated Science Laboratory (CSL)

Decision-making algorithms for modern agricultural robotics. Reinforcement learning for multi-agent optimization. Precision agriculture.

- Distributed decentralized cooperative policy planning for Capture the Flag problem
- Policy optimization for a swarm of agricultural robots

Oklahoma State University, Stillwater, Oklahoma USA

2014 – 2016

Graduate Research Assistant at Advanced Technology Research Center (ATRC)

Decision-making algorithms for autonomous driving vehicles and human-in-the-loop systems.

Human-activity recognition, behavior modeling and classification. Learning from demonstration, imitation learning for robots.

- Model based collision avoidance for autonomous vehicles
- Navigation, path-planning and control of autonomous vehicle prototype

Education

University of Illinois at Urbana-Champaign, Urbana, Illinois USA

PhD candidate, Ag and Bio Engineering & Computational Science Engineering

Advisors: Drs. G. Chowdhary, H. Tran, M. West, A. Davis

Oklahoma State University, Stillwater, Oklahoma USA

M.S. in
Electrical and
Computer
Engineering,

Control Systems, 2015

Moscow Power Engineering Institute, Moscow, Russia

M.S. in Electronic Equipment, February, 2006

B.E. in Electronics, May, 2004

Publications

Fremont D., Chiu J., Margineantu D., Osipychev D., Seshia S., Formal Analysis and Redesign of a Neural Network-Based Aircraft Taxiing System with VerifAI. Submitted CAV 2020.

Osipychev D., Chowdhary G., Distributed Deep Policy Sharing for Competitive Adversarial Environment. 2018 Archived, NIPS Workshop "Deep Reinforcement Learning".

McAllister W., Osipychev D., Davis A., Agbots: Weeding a field with a team of autonomous robots. 2019 Elsevier.

McAllister W.*, Osipychev D.*, Chowdhary G., Davis A., Multi-Agent Planning for Coordinated Robotic Weed Killing. 2018 IROS conference.

Osipychev D., Tran D., Sheng W., Chowdhary G., Human intention-based collision avoidance for autonomous cars. 2017 American Control Conference (ACC).

Tran D., Du J., Sheng W., Tadesse E., Osipychev D., Sun Y., Bai H., A Human-Vehicle Collaborative Driving Framework for Driver Assistance. 2018 IEEE Intelligent Transportation Systems Transactions.

Tran D., Tadesse E., Osipychev D., et al., A collaborative control framework for driver assistance systems. 2017 ICRA conference.

Osipychev D., Tran D., Sheng W., Chowdhary G., Proactive MDP-based Collision Avoidance Algorithm for Autonomous Car. 2015 IEEE CYBER Conference.

Osipychev D., Tran D., Sheng W., Chowdhary G., Proactive MDP-based Collision Avoidance Algorithm for Autonomous Car. 2014 NIPS Workshop "From Bad Models to Good Policies".

Coding
Proficiency

Experience in agile software development and integration of the following:

- Deep RL-agents (incl. DDPG, GA3C, DQN, PG) on Tensorflow/Pytorch libraries
- Regression, classification, GAN models on Pytorch libraries
- Dynamics simulations and surrogates (multi-agent systems, vehicle dynamics, construction equipment, game-theory, computer games)
- Integration to real robotic systems (software/hardware in the loop, ROS, Gazebo)
- Task-optimization methods (Q-learning, genetic/evolutionary algorithms, graph search, RRT)
- Utility function optimization techniques (SGD, GD, potential fields, elastic bands, particle swarm, leap-frog)

Simulation of physical and control processes, visualization, and GUI

Languages: Python, C++, JavaScript