**Denis Osipychev**

**Contact**

**Information**

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**Professional**

**Area**

Autonomous systems architecture and hierarchical solutions for artificial intelligence.

Data-driven decision making, control policy optimization, deep reinforcement learning.

Machine learning, generative modeling, and data analytics for cyberphysical systems.

Behavior modeling, human-in-the-loop, cooperative multi-agent systems.

**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 with a focus on hierarchical architecture, reasoning and risk assessment for autonomous agents.

Architecting, prototyping, and consulting a broad range of AI projects at Boeing and research agencies (DARPA, AFRL).

* Learning-based planning and control for fighter-jet dogfight (DARPA ACE, ADT)

Developed surrogate domain, end-to-end deep-learning agent, training procedures, and evaluation metrics

* Assurances for mission critical components of learning-based systems (DARPA AA)

Developed autonomous capabilities for unmanned landing, take-off, on ground taxiing, in-air collision avoidance.

Produced evaluation metrics for regression, classification, policy models

* Local path-planning, dynamic collision avoidance, and navigation for airport taxiing

Prototyped and integrated trajectory planner for dynamic environment

* Defense against deception and adversarial attacks on cyber-physical systems

Coordinated cybersecurity work for robust AI/ML agents

* Synthetic data generation for visual perception system

Developed active learning framework, synth data generation, training.

* Defect analysis and process optimization for composite manufacturing

Architected sequence optimization for fiber placement process

***University of Illinois at Urbana-Champaign, Urbana, Illinois USA 2016 – 2018***

*Research Assistant at Coordinated Science Laboratory (CSL)*

Decision-making algorithms for modern agricultural swarm-robotics.

Precision agriculture. Reinforcement learning for multi-agent optimization.

* Policy optimization for agricultural swarm robotics
* Distributed cooperative policy planning for mission control system (AFRL)

***Oklahoma State University, Stillwater, Oklahoma USA 2014 – 2016***

*Graduate Research Assistant at Advanced Technology Research Center (ATRC)*

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

Human-activity recognition, behavior modeling and classification.

* 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

“Collision avoidance for autonomous cars based on human intention”

***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”.

**Skills**

Experience in agile software development and integration of complex cyber-physical systems, simulation of physical and control processes, data analysis and visualization, GUI

Algorithms and methods:

* Policy optimization (deep RL-agents on Pytorch), task-optimization (Q-learning, genetic algorithms, graph search), and utility optimization (SGD, elastic bands)
* Regression, classification, GAN models on Pytorch libraries
* Dynamics simulations and surrogates (multi-agent systems, vehicle dynamics, robotics, computer games)

Integration platforms:

* ROS-based robotics, full scale autonomous cars/airplanes, software/hardware in the loop simulations, Gazebo.

Languages: Python, C++, JavaScript

**Interests**

Robotics, model rocketry, Futurama.