Ivan Kharitonov

ML/research engineer ipkharitonov@gmail.com +79167857111 LinkedIn GitHub

M.S. in Electrical Engineering with a specialization in Machine Learning. Over 8 years in programming, 6 years in Data Science, and 4 years in Autonomous Vehicles. Led a research team for 2 years, completing over 15 projects. Teaching assistant in Reinforcement Learning and Deep Learning in Audio courses. Active in autosport and cycling.

Experience

Senior research engineer — **Next Step Fusion info** — May 2023-present

ML-based plasma control

Responsibilities: Research and development of ML-based plasma control systems. Applied reinforcement learning to obtain policies for controlling plasma parameters. Additionally, conducted research on the optimization of plasma states and further device development.

Results: Developed a continuous control RL pipeline to maintain plasma shape. Conducted testbed experiments. Modeled the power supply system and integrated it into the simulation.

Tech: **Python, RL, black-box optimization, Bayesian methods, surrogate models, uncertainty estimation**

Research engineer — **Sberautotech self-driving info** — Aug 2020-May 2023

Motion trajectory prediction

Responsibilities: Led a team (5 ppl) in developing an ML-based agent trajectory prediction project pipeline, overseeing testing and code reviews. Organized weekly research paper review seminars, incorporating ideas from these sessions into final models.

Results: Improved metrics for trajectory predictions by 33% in average, and up to 72% in special cases. Gathered an in-house dataset with 50k scenes, analyzed and filtered data. Developed DL models for predicting agent trajectories by incorporating HD maps and addressing uncertainty through a multi-modal distribution. Deployed model in ROS2 node on self-driving car with average inference time 64ms per frame.

Tech: **python, cpp, pytorch, DL, transformer, CVAE, GAN, CNN, pointnet**

Model based multi-object tracking / Sensor fusion

Responsibilities: Research algorithms for multi-object tracking and develop a project pipeline for the task.

Results: Established a baseline for model-based tracking by implementing a state-of-the-art algorithm for multi-object tracking. Also developed a simulator for this task with motion and measurement models, and created test scenarios. Collaborated with a team and shared key concepts related to the task.

Tech: **Poisson multi Bernoulli mixture, Kalman filter, random finite set, hypothesis tree**

3D Object detection

Responsibilities: Research algorithms for 3D object detection and develop first baseline fot this task.

Results: Established the initial baseline for 3D object detection using point-cloud data. Trained a model that runs in a ROS2 node on a self-driving car, with an average processing time of 80ms per frame, allowing the self-driving software to understand the presence of objects.

Tech: **python, pytorch, ML, DL, Computer Vision, point cloud, LIDAR, ROS2**

Software engineer — **Contracted work and other** — Nov 2017 - Aug 2020

Multiple object tracking toolbox (github)

Results: Created an open-source Python library for multiple object tracking, implementing the Poisson Multi-Bernoulli Mixture Filter, that is state of the art. This stands as one of the few public implementations.

Race telemetry toolbox

Results: Created a service for annual racecar championships that enhances competitive fairness by analyzing and visualizing car and track data. It generates essential metrics to guide the calibration of weight, tyre, chassis, and powertrain settings for each vehicle.

Tech: **python, pandas, geopandas, shapely, PyProj, Docker, CI - Github Actions**

End-to-end optical character recognition (OCR) (github)
Results: Worked in a 3-person team, guided by Yandex researchers (Yandex School of Data Analysis project), to enhance text recognition using the EAST model and a text alignment module. We innovated by training detection and recognition simultaneously, improved OCR model efficiency. Our model outperformed others on the ICDAR dataset.
Tech: **python, PyTorch, NLP, Computer Vision, OCR**

Space junk simulator (*project at the Yandex School of Data Analysis* - github)
Results: Engineered a parallel-computed simulator to model space debris motion and behavior using dynamic principles. Forecasted space debris and satellite trajectories for collision detection. Integrated RL methods for optimal satellite control and collision avoidance.
Tech: **cpp, python, RL, CUDA, simulation, Runge-Kutta methods**

Research Engineer **Central Scientific Research Automotive Institute - info** Nov 2015 – Nov 2017

Camera-based object detection (Shuttle project)
Results: Developed object detection models for a self-driving shuttle bus. Built dataset, designed metrics, trained, and deployed the model on the shuttle.
Tech: **python, CAFFE, Computer Vision, CNN, Object detection, Image/Video Processing, ROS**

Automatic transmission control system (Aurus project)
Results: Developed and deployed an advanced hydraulic actuator controller, yielding a 1.2x improvement in quality metrics and up to 40% reduction in system setting time. Implemented automated calibration procedures for parameters on the testbench, resulting in a significant calibration time improvement of up to 70%
Tech: **MATLAB, Simulink, optimal control, model reference control, Laplace transform**

Engineer **Bauman Moscow State Technical University** Mar 2013 – Aug 2015

Results: Developed hardware and software for an FSAE racecar (info), including a high-accuracy localization module with 10 cm precision, reducing costs by 5x. Designed an F1-inspired steering wheel with an LCD display, earning positive judge reviews and securing sponsorships for new equipment.
Tech: **python, real-time kinematic, QT, ARM, Arduino, Motec, STM32, CAN bus, Linux**

Education

Bauman Moscow State Technical University - M.S. in Electical Engineering 2008 – 2014
Yandex School of Data Analysis - Computer Science 2017 – 2019
Data Mining in Action course (open ML course at the Moscow Institute of Physics and Technology) 2016
Automonous Vehicle workshop at FSG by Waymo - certificate 2020
School **Control, Information, Optimization** Yandex **school on generative models** info 2019-2021

Activities

Teaching Assistant on Reinforcement Learning course in HSE and YSDA	2019 - present
Teaching Assistant on Deep Learning in Audio course in Higher School of Economics	2023 - present
Mentor Provide guidance to a student who is working on a bachelor's thesis.	2022 - 2023
design judge [Autonomous Driving] Formula Student UK 2020, Germany 2021,	2019 - 2023
Formula One Grand prix Sochi Scrutineering F1/F2/F3	2020-2021
Deep Hack RL 2017, Kaspersky DS hackaton 2017, Flatland	2015 - present

Skills

Python, C++, MATLAB, MLOps [DVC, Spark, hydra], DevOps [docker, CI/CD - github actions/gitlab-CI, xpra], Robotics [ROS2, LIDAR, Self-Driving], PyTorch, ML, DL, NLP, GANs, GNN, Signal Processing, Point Clouds, Time Series, Image/Video Processing, MCTS, Kalman filtering, GNSS, RTK, Object detection, Probabilistic modelling, Control, Linear/non-Linear control, Engineering tools [Altium Designer, Solidworks, LabView, Simulink, Vector software (CANape)], Reinforcement Learning, Computer Vision