

# 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 1.5 years, completing over 15 projects. Teaching assistant in Reinforcement Learning and Deep Learning in Audio courses. Active in autosport and cycling. Applying for a Global Talent Visa in the UK

## Experience

RESEARCH ENGINEER

Sberautotech self-driving [info](#)

Aug 2020-present

### Motion trajectory prediction

*Responsibilities:* Lead 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:* Improve metrics for trajectory predictions by 33% in average, and up to 72% in special cases. Gather in-house dataset with 50k scenes, analyze and filter data. Developed DL models for predicting agent trajectories by incorporating HD maps and addressing uncertainty through 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 for 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](#))

*Responsibilities:* 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

*Responsibilities:* 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](#))

*Responsibilities:* Working in the 3-ppl team and guided by Yandex researchers (project at the Yandex School of Data Analysis), enhance text recognition from images using the EAST model and a text alignment module. Our innovation involved training the detection and recognition stages simultaneously.

*Results:* By integrating text detection and recognition into an end-to-end model, we improved efficiency in OCR deep learning models. Evaluation on the ICDAR dataset revealed superior performance, confirming the effectiveness.

*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, leveraging dynamic principles, to accurately model space debris motion and behavior. This tool forecasts space debris and satellite trajectories, assisting in the detection of potential collisions. Additionally, it is designed to employ RL methods for the optimal control of satellites, specifically to address 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](#))

*Responsibilities:* Develop object detection models for the self-driving shuttle bus.

*Results:* Developed dataset, model and metrics. Trained and deployed a model for object detection on the shuttle bus.

*Tech:* **python, CAFFE, Computer Vision, CNN, Object detection, Image/Video Processing, ROS**

## Transmission control system ([Aurus project](#))

*Responsibilities:* Develop and deploy control system for automatic transmission.

*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

## Localization module and telemetry module

*Responsibilities:* Develop and assemble hardware and software for a racecar at FSAE team (international engineering competition) - [info](#).

*Results:* Developed a high-accuracy localization module leveraging affordable GNSS receivers, resulting in a 10 cm accuracy and a five-fold cost reduction. Designed an F1-inspired steering wheel with an LCD display. This effort culminated in positive judge reviews at a design event and attracted sponsorships for acquiring new equipment, thereby laying a solid foundation.

*Tech:* **python, real-time kinematic, QT, ARM, Arduino, Motec, STM32, CAN bus, Linux**

## Education

<b>Bauman Moscow State Technical University</b> - M.S. in Electrical Engineering	2008 – 2014
<b>Yandex School of Data Analysis</b> - Computer Science	2017 – 2019
<b>Data Mining in Action</b> course (open ML course at the Moscow Institute of Physics and Technology)	2016
<b>Autonomous Vehicle workshop at FSG by Waymo</b> - <a href="#">certificate</a>	2020
Summer school <b>Control, Information, Optimization</b>	
Yandex autumn school on generative models <a href="#">info</a>	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 <a href="#">UK</a> 2020, <a href="#">Germany</a> 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, Lab-View, Simulink, Vector software (CANape)], Reinforcement Learning, Computer Vision