

# DENIS UZHVA

## Machine Learning Engineer | Data Scientist

@ denis.uzhva@yahoo.com

t.me/DenisUzhva

denisuzhva.github.io

github.com/denisuzhva

## Profile

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A PhD student with **4+ years** of experience as a **machine learning engineer** and **data scientist** for scientific and industrial applications: from physical experiments data analysis at CERN to development of image processing and computer vision tools for smartphone photography. Looking into new opportunities to challenge and improve my skills in business applications for mutually profitable outcomes.

## Skills

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- Python, SQL
- ML/DL: PyTorch, TensorFlow, Scikit-learn, OpenCV
- DS/DE: Pandas, Matplotlib, Seaborn, Apache Spark
- NLP: NLTK, LLM
- Mathematics: Statistics, Optimization
- Git,  $\LaTeX$ , Docker
- Soft skills: communication, advanced problem solving, team leadership

## Education

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Ph.D. (Computer Science and Cybernetics)

**Saint Petersburg State University**

2021–Present

M.Sc. (Software Engineering)

**Saint Petersburg State University**

2019–2021

B.Sc. (Physics)

**Saint Petersburg State University**

2015–2019

## Languages

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- Russian: native
- English: proficient
- Japanese: elementary

## Experience

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Machine Learning Engineer, Researcher

**Saint Petersburg State University**

January 2021 – Present

- Developed **deep learning** and noise simulation models for night photography enhancement.
- Investigated and implemented **machine learning** compression and reconstruction algorithms for geophysical data encoding.
- Developed **reinforcement learning** models for solid body topology prediction, based on desired body durability.
- Conducted statistical **A/A and A/B tests** for the developed machine learning systems.
- *Key achievements*: the investigated and developed ML/DL systems outperform conventional and state-of-the-art approach by a significant margin; the developed geophysical data compression tool outperforms ZIP and RAR 3 times.

Research Engineer

**Institute for Problems in Mechanical Engineering of the RAS**

October 2021 – Present

- Developed mathematical theory for efficient multi-agent networks control.
- Responsible for the development of the software environment for network simulations.
- Developed **deep learning** models for efficient multi-agent system encoding.
- *Key achievements*: the developed **scalable machine learning systems** successfully encode **big data** emerging in large-scale networks by compressing it approximately 300 times with 0.3% data loss.

Machine Learning Engineer, Research Assistant

**Saint Petersburg State University**

September 2019 – December 2020

- Implemented state-of-the-art machine learning methods for **data analysis** in the CERN physical experiments.
- Responsible for design of architecture and software implementation of machine learning models, as well as **data augmentation, feature generation and visualization**.
- *Key achievement*: the developed models demonstrate superior accuracy 92.8% in comparison with classical approaches such as decision trees and “cut-based analysis”, which achieve 86.7%.

## Publications

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- "Adaptive Distributed Cluster Flow Control for a Group of Autonomous Robots", The 22nd IFAC World Congress, 2023
- "Compressed Cluster Sensing in multi-agent IoT Control", 61st IEEE Conference on Decision and Control, 2022
- "Cluster Control of Complex Cyber-physical Systems", Cybernetics and Physics, 2021
- "Cluster Flows and multi-agent Technology", Mathematics, 2021
- "Invariance preserving control of clusters recognized in networks of Kuramoto oscillators", Artificial Intelligence, 2020
- "Convolutional neural network for centrality determination in fixed target experiments", Physics of Particles and Nuclei, 2020

## Conferences

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### 22nd IFAC World Congress

📅 July 2023 📍 Yokohama, Japan

"Adaptive Distributed Cluster Flow Control for a Group of Autonomous Robots"

### 61st IEEE Conference on Decision and Control

📅 December 2022 📍 Cancún, Mexico

"Compressed Cluster Sensing in Multi-Agent IoT Control"

### 18th Russian Conference on Artificial Intelligence

📅 October 2020 📍 Moscow, Russia

"Invariance Preserving Control of Clusters Recognized in Networks of Kuramoto Oscillators"

### NA61/SHINE CERN Analysis/Software/Calibration Meeting 2019

📅 May 2019 📍 Katowice, Poland

"Convolutional Neural Network for Centrality in Fixed Target Experiments"

### Science And Progress

📅 November 2018 📍 Saint Petersburg, Russia

"Investigation of Deep Learning Methods for the Classification of Events in the NOvA Experiment"

## Hackathons and Olympiads

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### iVision

#### 2nd place

📅 January 2022 📍 Saint Petersburg, Russia

- Our team has developed a car accident detection system, which predicts accident occurrences by video fragments.
- The proposed machine learning model predicts car accidents with 70% accuracy, which is the second-best result.

## Projects

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### Text improvement engine (NLP) | 🤖

📅 October 2023

NLTK BERT

- A tool that analyses a given text and suggests improvements based on the similarity to a list of "standardised" phrases.
- Pre-processes input text with NLTK: make lowercase, lemmatize, expand, etc.
- Considers context with the help of BERT LLM.

### Diffusion model for generative music | 🤖

📅 November 2022

PyTorch TorchAudio

- Generates raw audio signals in short chunks.
- Preserves context with up to 5 minutes with a WaveNet-like dilated transformer.

### Compressed sensing blockchain | 🤖

📅 March 2022

NumPy Matplotlib Scikit-learn

- Exploits compressed sensing with measurement matrix sampled from a PRNG with a seed based on previous blocks.
- Resists injection-type attacks.

### iVision hackathon qualification solution | 🤖

📅 January 2022

OpenCV PyTorch Pandas

- Linear classifier and RNN for the hackathon qualifying stage.
- Achieves 40% accuracy.

### Image processing Telegram bot | 🤖

📅 May 2020

OpenCV Flask DeepAPI

- Telegram bot with an arsenal of image processing techniques.
- Features: color inversion; contrast, brightness and saturation adjustment; AI upscaling and colorization; etc.