

# DENIS UZHVA

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## PROFILE

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Highly motivated mathematical programming PhD student at Saint Petersburg State University. I have over three years of experience as a **deep 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. During that period, I developed programming skills and gained experience in various software frameworks and APIs such as PyTorch, TensorFlow, or OpenCV, as well as strong background in applied mathematics: statistics, dynamics and control theory. Now my interests also encompass multi-agent technology (swarm robotics, IoT), stochastic programming (signal filtration and compression), and music production, aside from maths and programming.

## SKILLS

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- Programming languages: Python, MATLAB, R, C++, Java
- Frameworks and APIs: PyTorch, TensorFlow, NVIDIA CUDA, Keras, Scikit-learn, JADE, OpenCV
- Data visualization: Matplotlib, NetworkX
- Mathematics: Dynamics, Discrete Mathematics, Optimization, Geometry, Statistics
- Other: Git, LaTeX, Vim, Bash, Docker
- Music: Ableton Live, Bitwig Studio, VCV Rack, analog and acoustic instruments
- Soft skills: communication, advanced problem solving, adaptability, team leadership

## EDUCATION

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<b>St. Petersburg State University, Saint Petersburg</b> Ph.D. in Mathematics Department of Mathematics & Mechanics	<i>September 2021 - Present</i>
<b>St. Petersburg State University, Saint Petersburg</b> M.Sc. in Software engineering Department of Mathematics & Mechanics	<i>September 2019 - June 2021</i>
<b>St. Petersburg State University, Saint Petersburg</b> B.Sc. in High energy and elementary particles physics Department of Physics	<i>September 2015 - June 2019</i>

## EXPERIENCE

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<b>Junior Researcher</b> <b>Saint Petersburg State University</b>	<i>April 2023 - Present</i>
<ul style="list-style-type: none"><li>• Investigation and development of deep learning approaches for mechanics.</li><li>• Responsible for machine learning model development, data synthesis and validation.</li><li>• <b>Key achievement:</b> the developed reinforcement learning model can adequately predict solid body topology for desired durability.</li></ul>	

**Junior Researcher**

*October 2020 - Present*

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

- Investigation and development of new methods to control swarm robotic systems.
- Responsible for development of mathematical theory, which is able to describe multi-agent networks. Also responsible for the development of the software environment for network simulations.
- **Key achievement:** the developed theory successfully describes cluster synchronization phenomenon in networks of intelligent agents.

**Research Engineer**

*July 2021 - September 2021*

**Saint Petersburg State University**

- Investigation and development of algorithms for geophysical data compression.
- Responsible for development of a compression and reconstruction algorithms.
- **Key achievement:** the developed algorithm allows to compress geophysical data without much losses after reconstruction.

**Research Engineer**

*January 2021 - January 2023*

**Saint Petersburg State University**

- Investigation and development of image processing algorithms for low luminosity photography quality improvement.
- Responsible for the de-noising deep learning model development and modeling of noise for simulated data. Also responsible for algorithm implementation and deployment on GPUs.
- **Key achievement:** the developed deep learning compressed sensing approach performs superior image enhancement in comparison to the SOTA approaches.

**Research Assistant**

*September 2019 - December 2020*

**Saint Petersburg State University**

- Investigation and development of state-of-the-art machine learning methods to data analysis in the NA61/SHINE CERN physical experiment.
- Responsible for design of architecture and software implementation of ML models, as well as data preparation, augmentation and visualization.
- **Key achievement:** the developed models demonstrate superior accuracy in comparison with classical approaches such as decision trees and “cut-based analysis”.

## LANGUAGE SKILLS

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- Russian: native
- English: proficient
- Japanese: beginner

## CONFERENCES AND SCHOOLS

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**The 22nd IFAC World Congress 2023 (Yokohama, Japan)**

“Adaptive Distributed Cluster Flow Control for a Group of Autonomous Robots”

**61st IEEE Conference on Decision and Control 2022 (Cancún, Mexico)**

“Compressed Cluster Sensing in multi-agent IoT Control”

**XIV Multiconference on Control Problems 2021 (Divnomorsk, Russia)**

“Cluster Flow Control in Distributed Network Systems”

**Eighteenth Russian Conference on Artificial Intelligence 2020 (Moscow, Russia)**

“Invariance preserving control of clusters recognized in networks of Kuramoto oscillators”

**XIV Workshop on Particle Correlations and Femtoscopy 2019 (Dubna, Russia)**

“Convolutional neural network for centrality in fixed target experiments”

**NA61/SHINE CERN Analysis/Software/Calibration Meeting 2019 (Katowice, Poland)**

“Convolutions neural nets for centrality in Be+Be”

**Science And Progress 2018 (Saint Petersburg, Russia)**

“Investigation of Deep Learning methods for the classification of events in the NOvA experiment”

**JINR Summer Student Program 2018 (Dubna, Russia)**

“Investigation of Deep Learning methods for the classification of events in the NOvA experiment”

**MAIN 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