

ROMAN BELTIUKOV

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Research Interests

My current research lies at the intersection of networking, security, and machine learning. Specifically, I am interested in developing credible ML-based artifacts for different networking and security problems, and democratizing a network research by creating public measurement infrastructures and tools.

Education

University of California, Santa Barbara

Expected: August 2025

Doctor of Philosophy (Ph.D.), Computer Science

Adviser: Arpit Gupta.

I have been working on democratizing networking research in the era of AI/ML, and developing credible ML artifacts for networking problems. Specifically, I have been working on fundamentally redesigning the ML pipeline for networking, enabling development of credible and explainable ML models, and a diverse and representative network infrastructure to collect data from.

Peter the Great St.Petersburg Polytechnic University

August 2019

Master of Science (M.S.), Computer Science

Peter the Great St.Petersburg Polytechnic University

August 2017

Bachelor of Science (B.S.), Computer Science

Professional Experience

Graduate Research Assistant

January 2021 – Present

University of California Santa Barbara

Santa Barbara, California

- Developed a novel data-collection tool, *NetUnicorn*, that simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Created a university-based network measurements infrastructure, *PINOT*, that allows collection of representative networking datasets from real-world environment.
- Developed a model analysis tool, *Trustee* [1] that aims to identify underpecification issues in existing blackbox ML models.

On-Device Machine Learning Researcher

March 2020 – September 2021

Huawei

St.Petersburg, Russia

- Team: Network services for mobile devices
- Researched onboard machine learning techniques, including better neural network distillation, pruning, and mobile device inference optimization strategies
- Developed an ML-based network connection optimization system for Android devices
- Developed a custom Forward Error Correction algorithm for Huawei mobile devices.
- Developed a system for user network performance using both on-device and operator information.

Junior Reinforcement Learning Researcher

October 2019 – June 2020

JetBrains Research

St.Petersburg, Russia

- Reproduced and adapted several approaches to domain-specific tasks.
- Researched how to improve the usage of the Prioritized Experience Replay for World Models approach.

Python tutor

September 2018 – September 2020

Higher School of Engineering

St.Petersburg, Russia

- Participated as an instructor of Python professional education program.
- Developed several Python courses (from scratch) for a diverse group of participants.
- Wrote a task book for Python learners with tasks of different complexity.
- Served as a member of the thesis defense committee for the Python education program for three years in a row.

Selected Publications

- [1] A. S. Jacobs, **R. Beltiukov**, W. Willinger, R. A. Ferreira, A. Gupta, and L. Z. Granville. Ai/ml and network security: The emperor has no clothes. In ACM CCS, LA, USA, 2022.
- [2] **Beltiukov, R.** Optimizing q-learning with k-fac algorithm. In Analysis of Images, Social Networks and Texts (Springer), Cham, 2020.

Presentations

netUnicorn: A Unified and Modular Data-Collection Platform for Developing Credible ML Models for Networking

Universities: UC Santa Barbara (05/22), The University of Chicago (10/22)

Awards

<i>Finalist, Junction Hackathon, "Mobility Track", QOCO</i>	<i>2018</i>
<i>Track Winner, World IT Planet championship, Cloud Computing Track by Huawei</i>	<i>2018</i>
<i>Special Award, Institute of BioInformatics, EPAM Systems</i>	<i>2018</i>
<i>Track Winner, World IT Planet championship, Cloud Computing Track by Huawei</i>	<i>2017</i>
<i>Challenge winner, Junction Hackathon, "Robots and Learning Machines track", Eficode</i>	<i>2017</i>

Selected Projects

netUnicorn

- NetUnicorn simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Provides abstractions and infrastructure interaction for developers of data collection pipelines and measurement experiments.
- Contribution: system architecture, platform backend, team leading.
- Technologies: Python, REST API, PostgreSQL, Networking, Explainable AI
- Deployed in University of California, Santa Barbara.

PINOT

- PINOT is a physical active measurement infrastructure deployed in the public university and provides a real-world view of the campus network.
- Democratizes networking research by allowing researchers to easily collect diverse and representative datasets from a real user perspective.
- Contribution: system architecture, backend services, physical deployment, team leading.
- Technologies: Python, REST API, PostgreSQL, SaltStack
- Deployed in University of California, Santa Barbara

Tortilla

- Tortilla is an Apache Guacamole based project developed to give users access to their virtual machines located on Hyper-V hosts.
- Provides a console through RDP/SSH and uses HTML5 to work in modern web browsers.
- Contribution: system architecture, system controller, SCVMM API access, team leading.
- Technologies: Python, C#, REST API, Java, SCVMM, HTML5
- In production since 2018.

digestbot

- Bot for Slack that finds most popular messages in channels and creates digests of them.
- Developed for ODS.ai community Slack of 50 000+ participants.
- Contribution: system architecture, backend, UI, CI/CD, team leading.
- Technologies: Python, PostgreSQL, Slack API
- Worked in 2020-2022. Currently on pause.

Technical Skills

Machine Learning

Reinforcement Learning, Classic Machine Learning, Deep Learning, PyTorch

Programming

Python, C#, Rust, SQL, C/C++

Other

Docker, Virtual Machines (Hyper-V, Xen), Clouds (Azure, AWS, GCP, SCVMM), Databases, Spark, Linux (Debian-based) systems, Networking, Data Storage Systems, Git