

ROMAN BELTIUKOV

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Research Interests

My current research lies at the intersection of networking, security, and machine learning. I am interested in developing credible ML-based artifacts and data representations for different networking and security problems, and democratizing 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

Advisor: 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 the 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 the collection of representative networking datasets from a real-world environment.
- Developed a model analysis tool, *Trustee* [3] to identify underspecification issues in existing black box ML models.

On-Device Machine Learning Researcher

March 2020 – September 2021

Huawei

St.Petersburg, Russia

- Developed and implemented a solution for the optimization of communication paths between smartphones and cloud services, that was deployed for pilot testing in China.
- Created a forward erasure correction code for data loss prevention optimized for mobile traffic and networks.
- Researched different congestion control protocols, such as BBR and internal company alternatives.
- Researched on-device ML model optimization and inference.

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.

Selected Publications

- [1] **Beltiukov, Roman**, Sanjay Chandrasekaran, Arpit Gupta, and Walter Willinger. Pinot: Programmable infrastructure for networking. In Proceedings of the Applied Networking Research Workshop, pages 51–53, 2023.
- [2] **Beltiukov, Roman**, Wenbo Guo, Arpit Gupta, and Walter Willinger. In Search of NetUnicorn: A Data-Collection Platform to Develop Generalizable ML Models for Network Security Problems. In Proceedings of the 2023 ACM SIGSAC Conference on Computer and Communications Security, CCS '23, page 2217–2231, New York, NY, USA, 2023. Association for Computing Machinery.

- [3] 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.
- [4] **Beltiukov, R.** Optimizing q-learning with k-fac algorithm. In Analysis of Images, Social Networks and Texts (Springer), Cham, 2020.

Invited Talks

In Search of netUnicorn: A Data-Collection Platform to Develop Generalizable ML Models for Network Security Problems

UC Santa Barbara (05/22), The University of Chicago (10/22), ACM SIGMETRICS Workshop on Measurements for Self-Driving Networks (06/23)

Honors & Awards

Winner , UCSB CS Department Summer Fellowship Award	2023
Finalist , Junction Hackathon, "Mobility Track", QOCO	2018
Track Winner , World IT Planet championship, Cloud Computing Track by Huawei	2018
Special Award , Institue of BioInformatics, EPAM Systems	2018
Track Winner , World IT Planet championship, Cloud Computing Track by Huawei	2017
Challenge winner , Junction Hackathon, "Robots and Learning Machines track", Eficode	2017

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.
- Deployed in University of California, Santa Barbara

Trustee

- Decision tree -based framework for explainable AI in networking.
- Best Paper Honorable Mention & IETF/IRTF Applied Networking Prize (ANRP)
- Contribution: public ML models dissection and verification, experiments reproducibility

Technical Skills

Machine Learning	Classic Machine Learning, Time Series, Deep Learning, Explainable AI, PyTorch, Reinforcement Learning
Programming	Python, Rust, SQL, C/C++, LaTeX
Other	Computer Networks, Clouds (Azure, AWS, GCP), Docker, Linux (Debian-based) systems, Virtual Machines (Hyper-V, Xen), Databases, Spark, Git

Volunteering

Queer Trans Community of University of California, Santa Barbara

Events organizing, community building and moderation.