

SYLEE BELTIUKOV

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Research Interests

My current research lies at the intersection of networking and machine learning, especially network transformers and foundations models. 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, datasets, and tools.

Education

University of California, Santa Barbara

Expected: August 2026

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, diverse and representative network infrastructures to collect data from, and creating large foundation models for network traffic.

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 high-quality pretrained transformer model working with network traffic data, *netFound* [1], that produces high-quality embeddings for different network tasks.
- Developed a novel data-collection tool, *netUnicorn* [3], that simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Created a university-based network measurements infrastructure, *PINOT* [2], that allows the collection of representative networking datasets from a real-world environment.
- Developed a model analysis tool, *Trustee* [4] to identify underspecification issues in existing black box ML models.

Student Researcher

June 2024 – September 2024

Google

Sunnyvale, California

- Developed a LLM-based approach for system logs analysis for hundreds of thousands of network devices in the Google production network.
- Proposed further research directions based on syslog analysis, including false positives identification, logs clusterization, and multi-step failure prediction.

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] Satyandra Guthula, **Roman Beltiukov**, Navya Battula, Wenbo Guo, and Arpit Gupta. netFound: Foundation Model for Network Security, 2024.
- [2] **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.
- [3] **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.
- [4] 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.

Honors & Awards

<i>Best Paper Honorable Mention, IETF Applied Networking Prize</i>	2023
<i>Winner, UCSB CS Department Summer Fellowship Award</i>	2023
<i>Track Winner, World IT Planet championship, Cloud Computing Track by Huawei</i>	2018
<i>Special Award, Institute of Bioinformatics, EPAM Systems</i>	2018
<i>Track Winner, World IT Planet championship, Cloud Computing Track by Huawei</i>	2017

Selected Projects

netFound

- netFound is a network traffic transformer model, allowing to utilize vast amount of unlabeled data to create powerful representations for different network tasks.
- Contribution: data processing, model and data scaling, training optimization, model dissection.
- Technologies: Python, Networking, LLM, Transformer models

netUnicorn

- netUnicorn simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Technologies: Python, REST API, PostgreSQL, Networking, Explainable AI
- Deployed in University of California, Santa Barbara and ETH Zurich

PINOT

- PINOT is a physical active measurement infrastructure deployed in the public university and provides a real-world view of the campus network.
- 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.