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Inar Timiryasov

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As a theoretical physicist by training, my work applying AI across diverse scientific datasets—from particle physics to natural language and gravitational waves—has cultivated a deep intuition for the complexity and scaling of different modalities and their leverage by ML models. This drives my research, which has included developing PolarBERT (the first foundation model for Antarctic neutrino telescope data) and training sample-efficient large language models. I am committed to applying this blend of analytical rigor and hands-on AI expertise at DeepMind to pioneer new frontiers where advanced AI pushes the limits of our understanding of the natural world.

Work Experience

2025–present **Assistant Professor**, *Niels Bohr Institute, University of Copenhagen*

- Leading development of foundational models for leveraging multi-modal approaches in science, including 65 TB of data from Large Hadron Collider.
- Supervising a project studying how recent LLM techniques such as reinforcement learning in verifiable domains affect attention patterns.

2021–2024 **Senior Postdoctoral Researcher**, *Niels Bohr Institute, University of Copenhagen*

- Pioneered *PolarBERT*, the first transformer-based foundation model for IceCube neutrino telescope data. Pretrained on 50B tokens via self-supervision, PolarBERT demonstrates excellent sample efficiency for critical downstream scientific tasks.
- As part of the BabyLM challenges, proposed, implemented, and trained *BabyLlama*, the top-performing decoder-only language model by leveraging self-distillation. Our 2023 submission was adopted as the official baseline for the 2024 BabyLM challenge.
- Led teams to Gold and Silver medals in Kaggle competitions (G2Net Gravitational Waves, IceCube Neutrinos). Mastered rapid prototyping, exploratory data analysis, and iterative model development on large and noisy scientific datasets.

2016–present **Visiting Researcher**, *CERN*, Switzerland

Active member of the Search for Hidden Particles (SHiP), an international scientific collaboration. Lead the development of quantum Monte Carlo simulation demonstrating that SHiP can discover Majorana particles.

2016–2021 **Postdoctoral Researcher**, *École Polytechnique Fédérale de Lausanne*, Switzerland

Led a large-scale, computationally intensive project on the origin of matter in the Universe, resulting in a series of publications in the top physics journals. Transformed complex theoretical problems in non-equilibrium quantum field theory into computable models for simulation and analysis, leading to multiple publications in top-tier physics journals.
Taught *Group Theory* and *Classical Field Theory* to Master's students.

Technical Skills

AI/ML & LLMs: PyTorch, HF Transformers, Jax, vLLM, scikit-learn, Foundation Models, Fine-tuning, Inference, Self-supervised Learning, Knowledge Distillation

Programming:	Python, Wolfram Mathematica, Julia, C/C++
Data Science:	Pandas, NumPy, Matplotlib
Tools & HPC:	Linux, Git, bash/zsh, Slurm
Computational:	Markov Chain Monte Carlo, Stiff ODEs, Computer Algebra Systems (CAS)
Math:	Linear Algebra, Calculus, Statistics, Group Theory, Differential Geometry, Field Theory, Differential Equations, Information Theory
Physics:	Non-Equilibrium Quantum Field Theory, General Relativity, Particle Physics

Education

2013–2016 **PhD in Theoretical Physics**, *Lomonosov Moscow State University*
Developed numerical methods for new particle searches, contributing to the physics program of the planned SHiP experiment at CERN. Assisted in teaching courses on *Group Theory*, *Quantum Field Theory*, and *Advanced Numerical Methods*.

2007–2013 **Master's Degree in Physics**, *Lomonosov Moscow State University*
Graduated *Summa Cum Laude*. Average grade: 4.96 / 5.0.

Community Engagement and Leadership

Conference & Workshop Organization:	*HAMLET-PHYSICS* (Copenhagen, Aug 2024, 130 participants) – the first Nordic conference on applying ML in physics; *Geometric Deep Learning* Session at D3A Conference (Feb 2024); *SCIENCE Postdoc Day*, (Feb 2023 & May 2024, 150 participants); *Physics of the Early Universe* Online Workshop (June 2022, 1005 participants).
Peer Review:	*Phys.Rev.Lett.*; *Phys.Rev.D.*; *JCAP*; *JHEP*; *Int.J.Mod.Phys.A*; *JEPT*.
Teaching:	Master's course at EPFL: "*Group theory and classical gauge fields*".
Supervision:	Supervised and co-supervised 8 Master's students.
Certificate:	NVIDIA. *Model Parallelism: Building and Deploying Large Neural Networks*
Awards:	Russian National Olympiad in Astronomy and Space Physics 2007, 2nd prize

Publications

- *51 papers* (22 as a member of CERN collaborations)
- *2500+ citations*, H-index is 31 according to Google Scholar.

Selected papers

- Inar Timiryasov, Jean-Loup Tastet, Oleg Ruchayskiy *"PolarBERT: A Foundation Model for IceCube"*, NeurIPS 2024 Workshop: Machine Learning and the Physical Sciences. GitHub repository.
- Inar Timiryasov, Jean-Loup Tastet, *"Baby Llama: knowledge distillation from an ensemble of teachers trained on a small dataset"*, arXiv:2308.02019, **CoNLL–CMCL 2023, BabyLM Challenge** Shared Task. GitHub repository.
- Juraj Klarić, Mikhail Shaposhnikov, Inar Timiryasov, *"Uniting Low-Scale Leptogenesis Mechanisms"*, arXiv:2008.13771, Phys. Rev. Lett. 127 no. 11, (2021) 111802.