↓ +45 (50) 26 90 72
➢ inar.timiryasov@nbi.ku.dk
Iminar.github.io
in inar-timiryasov
✓ ITimiryasov
♥ Ininar
(③) Inar Timiryasov



# Inar Timiryasov

My academic background is in theoretical physics, where I applied advanced numerical tools to solve complex problems. Initially, I employed machine learning and neural networks as tools to analyze physical phenomena. Now, my focus has shifted to a deep interest in comprehending the intricacies of AI. I am particularly drawn to the challenges of interpreting and responsibly improving Large Language Models.

## AI/ML Experience

#### Training Large Language Models

Participated in the BabyLM challenge, focusing on training LLMs on a small dataset. I proposed, implemented, and trained models featuring various architectural choices (local attention, RopE, SwiGLU nonlinearity), and used techniques like sharpness-aware minimization and knowledge distillation. The model I developed ranked in the top 5% and was the best decoder model in the "small-strict" task.

#### **Deep-learning for Physics**

- Leading the development of a Bert-style foundational model on particle physics data, focusing on fine-tuning for specific tasks.
- Mentoring students and heading the ML components in "New Physics searches with automated anomaly detection". Two ongoing projects involving gravitational wave data and particle collider data from CERN.

#### Kaggle Expert

Participated in two Kaggle Competitions, where I initiated and led the teams

- G2Net Detecting Continuous Gravitational Waves: Gold Medal, ranking in the top 1%.
- *IceCube Neutrinos in Deep Ice*: Silver Medal, ranking in the top 2%.

### Academic Experience

2021-present **Senior Postdoctoral Researcher**, *Niels Bohr Institute, University of Copenhagen* Developing AI models for applications in particle physics. Implemented an effective method to reinterpret LHC data analysis pipelines, extending them to new phenomena.

#### 2016-present Visiting Researcher, CERN

An active member of the Search for Hidden Particles (SHiP) collaboration that pioneered application of *Generative Adversarial Networks* to particle physics modeling.

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

Transformed complex theoretical problems into computable models and used advanced numerical tools to analyze them. Taught *group theory* and *classical field theory* courses to Masters's students. Supervised and co-supervised 8 Master's students, guiding thesis projects and research.

# Technical Skills Languages: Python, Julia, Wolfram Mathematica, C/C++ AI/ML: PyTorch, Transformers, scikit-learn, PyTorch Lightning, Keras, JAX Data Science: Pandas, NumPy, Matplotlib, PyArrow Tools: Linux, bash/zsh, Git, HPC (Slurm, Lustre) Numerical Markov Chain Monte Carlo, Stiff ODEs, Computer Algebra, Lattice Methods for Methods: PDEs Mathematics: Statistics, Tensor Algebra, Real and Complex Analysis, Differential Geometry, Field Theory, Group Theory, Differential Equations, Information Theory Education 2013 – 2016 PhD in Theoretical Physics, Lomonosov Moscow State University Developed numerical methods for searches for new particles. My results became a part of 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. Academic Service Conference 1-2 February 2024, organizing a session on *Geometric Deep Learning* at the "Danish organization: Digitalization, Data Science and Al" conference. 23 February 2023, organized SCIENCE Postdoc Day 2023 at the University of Copenhagen, with 150 attendees. 13-17 June 2022, organized an online workshop Physics of the Early Universe, with 1005 registered participants. Peer Review: Referee for top high-energy physics journals: Phys.Rev.Lett.; Phys.Rev.D.; JCAP; JHEP; Int.J.Mod.Phys.A.; JEPT Publications $\circ$ 41 papers (13 as a member of the SHiP collaboration) in the high-energy physics database inSPIRE-hep. ○ *1500+ citations*, H-index is 26 according to Google Scholar.

- Selected O Inar Timiryasov, Jean-Loup Tastet, "Baby Llama: knowledge distillation from an ensemble of teachers trained on a small dataset", arXiv:2308.02019, Accepted to CoNLL-CMCL 2023, BabyLM Challenge Shared Task.
  - Juraj Klarić, Mikhail Shaposhnikov, Inar Timiryasov, "Uniting Low-Scale Leptogenesis Mechanisms", arXiv:2008.13771, Phys. Rev. Lett. 127 no. 11, (2021) 111802.

SHiP Collaboration, "Fast simulation of muons produced at the SHiP experiment using Generative Adversarial Networks,", arXiv:1909.04451, JINST 14 (2019)P11028.