Lukáš Hrdý

Curriculum Vitae

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Physics student at Charles University · computational physics, astrophysics & simulations

Research experience

02/2026 – **Kinetic Monte Carlo simulation of sapphire growth (SFG grant)**
Dept. of Surface and Plasma Science, Charles University
Supervisor: doc. RNDr. Pavel Kocán, Ph.D.
Atom-by-atom simulation of sapphire (α-Al_2O_3) thin-film growth by pulsed laser deposition, including dopants with tunable energetics.

09/2026 **STM & FM-AFM feedback-loop simulation**
KFPP Summer Student Project 2026
Supervisor: doc. RNDr. Pavel Kocán, Ph.D.
A teaching simulation of the feedback loop of a scanning tunnelling microscope and an atomic force microscope, controlled with sliders directly in the browser.
Launch the demo: lukashrdy11.github.io/afm-stm-demo
Source code: github.com/LukasHrdy11/afm-stm-demo

11/2023 – 01/2025 **Optimizing arrival-position reconstruction of gamma-ray showers**
Astronomical Institute, Czech Academy of Sciences
Supervisor: Ing. Mgr. Jakub Juryšek, Ph.D.
Optimizing source-position reconstruction for the SST-1M Cherenkov telescopes with the DISP method: Random Forest models for the DISP norm and sign, trained on Monte Carlo shower simulations.

01/2024 – 11/2024 **Numerical methods for quantum-mechanical systems**
Open Science internship, Institute of Physics, Czech Academy of Sciences
Supervisor: Ing. Martin Schäfer, Ph.D.
A program describing the deuteron as a proton–neutron bound state with both s-wave and d-wave components, computing its properties from the wave function.

01/2023 – 11/2023 **Photometric atlas of variable stars**
Open Science internship, Astronomical Institute, Czech Academy of Sciences
Supervisor: Mgr. Jan Štrobl

09/2022 – 06/2023 **Program for predicting positions of celestial bodies**
SOČ – physics, Zlín Observatory
Supervisor: Ing. Vratislav Zíka
My own program predicting positions of planets and comets from orbital elements, including parabolic and hyperbolic orbits.

Education

2025 – **Faculty of Mathematics and Physics, Charles University – Physics (Bc.)**

2017 – 2025 **Gymnázium Zlín – Lesní čtvrť (grammar school)**

06/2022 **Planetum astronomy course – foundations of modern astronomy & astrophysics, Štefánik Observatory, Prague**

Awards

11/2024 **Open Science conference: 2nd place**
Quantum mechanics in the study of nuclei and exotic mesons

06/2024 **Zlín Region award for gifted students**

06/2023 **SOČ (student research competition) – physics: 3rd place**
Computing positions of celestial bodies

06/2023 **Physics correspondence seminar (FYKOS), Charles University: 2nd place**

2022 – 2024 **Czech Astronomy Olympiad**
6th (2024, cat. AB), 2nd (2023, cat. CD), 8th (2022, cat. CD)

2022 – 2024 **Active participation in IWAA international workshops**
International Workshop on Astronomy and Astrophysics

04/2023 **Goethe-Institut "Bystré hlavy" competition**
Won a two-week language stay in Obertauern, Austria

Other projects

2025 **AI assistant for quantum physics**
Personal project
Distilling knowledge from a RAG system over scientific papers into a Mistral-7B language model: a RAG "teacher" generates a synthetic Q&A dataset used to fine-tune the model with QLoRA.

2026 **Software for clinical practice**
Rakathon 2026 and collaboration with physicians
Experience developing AI software for deployment in medicine, with an emphasis on patient-data protection and running models locally. Took part in the Rakathon 2026 hackathon.

Outreach

03/2024 – **YouTube channel "Kosmické okénko – Lukáš Hrdý"**
Public popular-science lectures (Zlín Observatory)

2024 – **Leader at the Zlín Observatory astronomy camp (every summer)**
Among other things, we observe variable stars with the kids and reduce their light curves.

2021 – 2025 **Running the astronomy club (Zlín Observatory)**
Beginner and advanced courses, weekend events

2024 – **Board member, Zlín Astronomical Society**

2024 **Talk at "Zvaž vědu!" (Brno)**
SOČ, the Astronomy Olympiad and Open Science

Skills

Programming	Python (NumPy, SciPy, Numba, pandas, matplotlib), C#, Pascal
Machine learning	scikit-learn (Random Forest), PyTorch, Hugging Face Transformers, PEFT/QLoRA, RAG
Tools	Git, Linux, HPC / Slurm, LaTeX, Jupyter
Astro data	Astronomical data processing (photometry, spectroscopy); CCD photometry of variable stars (observing practicum, Valašské Meziříčí, 08/2022)
Video	Video editing and running a YouTube channel

Languages

Czech	native
English	C1 (CAE certificate)
German	C1 (DSD II certificate)

Erasmus – two-week stay at a German grammar school in Marienberg (2023)

One-week practical course at TU Chemnitz, Germany – Physical technologies (02/2023)

Schnupperwoche at TU Chemnitz – university orientation week

Schnupperwoche at Hochschule Osnabrück – university orientation week