József **Konczer**

Physicist, Researcher, Senior AI/ML Research Engineer.

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https://konczer.github.io/

Summary

Physicist, Researcher, Senior AI/ML Research Engineer. I am curious about the world, and my vocation is to construct theoretical and applied tools that can empower others by capturing and formalizing the describable aspects of the Universe. I like to see things from different angles and explore connections between fields and viewpoints. I am also interested in utilizing novel or less-known approaches to enhance efficiency and make innovation possible.

I am a Theoretical Physicist by training but drifted to Machine Learning and Software Development at Wolfram Research. Through the many bends of my professional path, I always balanced industrial and academic challenges and learned to navigate both to accomplish successful innovation and research projects. Seeking truth and producing value are both a source of motivation to me.

I have many interests, and I have the ability to connect seemingly distant fields. I am eager to explore interesting, new areas and align myself with meaningful projects.

(My latest Curriculum Vitae / Résumé at all times is available on OverLeaf.)

Experience

alphaXiv — *US (Remote)*

Reviewer — *Oct. 2024 –*

- Reading and Reviewing recent scientific papers from arXiv (mostly related to AI/ML topics),
- initiating and fostering scientific discourse on featured topics.
- Passionately supporting the mission of alphaXiv: making academia and science more open, accessible, and connected.

Engame Academy — *Budapest, Hungary (Remote)*

Mentor — *Sep. 2024 –*

- Online mentoring and profile building for pre-university students,
- by exploring various fields, fostering a curious mindset and guiding projects.

Imagination Technologies — *Kings Langley, UK*

Senior Research Engineer — *Apr. 2023 - Feb. 2024*

- Developing hardware-conscious AI/ML algorithms,
- using techniques such as Compression and Quantization (see our poster on Self-Compressed Nano GPT).
- As a member of the AI Research team.

Wolfram Research — *Champaign, Illinois, US (Remote)*

Consultant — *2020 - 2022*

- Designing and Developing functionalities related to Game Theory:
  - Introducing Game Theory (Wolfram Technology Conference 2021 presentation);
  - Presenting a Demo: Language Design in Wolfram Language [Game Theory] Part 1, Part 2.
- Member of the Machine Learning Group;
- Contributions to the Wolfram Function Repository:
  - MetropolisHastingsSequence: Metropolis-Hastings Markov chain Monte Carlo;
  - RichardsonExtrapolate.

HELORO s.r.o. — *Komárno, Slovakia*

Researcher — *2020 - 2023*

- Research and development in the field of Energetics;
- Intellectual Properties:
  - Utility Model: SK PUV 50018-2023, application accepted (valid from Jun. 2024),
  - Patent: SK PP 50015-2023, pending.
- Conference Publication:
  - Industrial Research and Development of Innovative Technologies for the Energy Sector.
- Popular article:
  - ATP Journal 10/2022 (in Slovak language).

Wolfram Summer School — *Online*

Teaching Assistant — *June - July 2020*

- Helping students in various computational based projects;
- Answering questions regarding Theoretical Physics and the Wolfram Physics Project.

Milestone Institute

Budapest, Hungary

Module leader

2018 - 2022

- Teaching and preparing course material for:
  - Data Science (in both Wolfram Mathematica and Jupyter Notebook). A few published final projects:
    - Predicting whether a mushroom is poisonous or edible using five variables,
    - Using basic attributes to predict stellar spectral classes,
    - Constructing universities dataset and showing some queries examples.
  - Chaos and Order, Mechanics, Thermodynamics, PAT-ENGAA preparation.

Milestone Institute

Budapest, Hungary

Mentor

2017 - 2020

- Mentoring, Coaching, Interdisciplinary education,
  - my experience distilled and extended in Open and Subjective Curriculum.

Institute for Particle and Nuclear Physics, Wigner RCP, HAS

Budapest, Hungary

Assistant research fellow

2013 - 2016

- Performing numerical simulations in integrable quantum field theories;
- Understanding AdS/CFT;
- As a member of Holographic Quantum Field Theory Research Group,
  - in Wigner Research Centre for Physics,
  - belonging to the Hungarian Academy of Sciences.
- Paper resulted from collaboration:
  - Strong coupling results in the AdS_5/CFT_4 correspondence from the numerical solution of the quantum spectral curve.

Jagiellonian University

Kraków, Poland

Guest researcher

May 2015

- Gauge-string duality and its application bilateral project,
- on the Faculty of Physics, Astronomy and Applied Computer Science.
- Collaborating with Romuald A. Janik.

Tokyo Institute of Technology

Tokyo, Japan

Guest researcher

December 2013

- Japanese-Hungarian bilateral exchange project,
- on the Department of Physics, Tokyo Institute of Technology,
- Theoretical High Energy Group / Particle Physics Group.
- Collaborating with Katsushi Ito and Yuji Satoh.

Budapest University of Technology and Economics (BME)

Budapest, Hungary

Demonstrator

2009, 2012 fall

- Teaching Physics II (electrodynamics and modern physics) for 3rd year BSc students of Faculty of Electrical Engineering and Informatics,
- as a teaching staff of Faculty of Natural Sciences.

Private Tutoring

Budapest, Hungary; Komárno, Slovakia

Tutor in Physics, Mathematics, and Calculus for both High school and University students

2006 - 2016

Education

Eötvös Loránd University (ELTE)

Budapest, Hungary

PhD program in Theoretical Physics · Discontinued

2013 - 2017

- Topic: Integrable methods in the AdS/CFT correspondence;
- Supervisor: Dr. Zoltán Bajnok;
- Principal subjects: Particle physics, Integrable (Quantum Field) theories, conformal field theories, AdS/CFT duality;
- Doctoral Pre-Degree Certificate (Absolutorium) gained in 2017.

Budapest University of Technology and Economics (BME)

Budapest, Hungary

MSc in Theoretical Physics · Excellent with highest honours

2010 - 2013

- Thesis: Integrable methods in gauge and string theories,
  - which has been extended to a paper:
  - Finite volume form factors in the presence of integrable defects.
- Supervisor: Dr. Zoltán Bajnok;
- Principal subjects: Statistical physics, Particle physics.

Budapest University of Technology and Economics (BME) *Budapest, Hungary*

BSc in Physics · Excellent *2007 - 2010*

- Thesis: Fisher information in quantum mechanics;
- Supervisor: Prof. Dénes Petz;
- Principal subjects: Theoretical Physics, Quantum Information Theory, Quantum Metrology.

Selye János Gimnázium *Révkomárom (Komárno), Slovakia*

Final examination · Excellent *1999 - 2007*

Skills

Programming	Python, Wolfram Language, MATLAB, GNU Octave, LaTeX, HTML, bash, C, C++
Scientific Computing	Wolfram Mathematica, PyTorch, SageMath, Google JAX, Numpy, Scipy, Scikit Learn
DevOps	Anaconda, Git, CVS, Perforce
Graphic design	Inkscape, GIMP
OS	Linux, Mac OS and Windows user skills
Languages	Hungarian (native), English (full proficiency), Slovak (proficient), Czech (intermediate)
Other skills	diving (one ⋆ diver since 2013 at CMAS), paragliding, waveboarding, hobby drawing, driving licence since 2008

Extracurricular Studies

The University of Queensland *Online*

Introduction to Social Psychology *2022*

on edX

The Chinese University of Hong Kong *Online*

Classics of Chinese Humanities: Guided Readings *2021*

on Coursera

Stanford University & The University of British Columbia *Online*

Game Theory II: Advanced Applications *2021*

on Coursera

Stanford University & The University of British Columbia *Online*

Game Theory *2021*

on Coursera

Princeton University *Online*

Buddhism and Modern Psychology *2016*

on Coursera

Awards

2013 **1st place,** on NYIFFF physics team competition as a member of "TBA..." team *Szigliget, Hungary*

2010 **3rd place,** on Rudolf Ortvay Competition in Physics *Correspondence Competition*

2007 **Bronze Medal,** at the 38th International Physics Olympiad *Isfahan, Iran*

2006 **Honourable Mention ,** at the 37th International Physics Olympiad *Singapore*

Communal Activity

Eugene Wigner College for Advanced Studies *Budapest, Hungary*

Founder and President *2011 - 2013*

- Eugene Wigner College for Advanced Studies is a Talent Nurturing and Extracurricular college associated with the Faculty of Natural Sciences of Budapest University of Technology and Economics.

Science communication *Slovakia and Hungary*

Speaker

- Gombaszögi Nyári Tábor: Mit tud a tudomány a világról, és azt honnan tudja?: (in Hungarian language), Gombaszög, Slovakia, 2023.
  - A performed experiment has been summarized in: Chill Jegyzőkönyv (in Hungarian language).
- One week workshop titled: Reality and it's models; a guided tour into theoretical physics at S.U.N. festival, Csobánkapuszta, Hungary, 2016.

Media

Popular article — *ATP Journal*
Co-Author — *2022*
- ATP Journal 10/2022 (in Slovak language)

Blog — *Medium*
Writer — *2022 - PRESENT*

LinkedIn, Twitter (𝕏), Mastodon — *Social Media*
Content Creator — *2021 - PRESENT*

Publications

2024	**Statistical Games**, József Konczer; (Mathematical exploration of a few prototypical games in which central concepts from Statistics and Probability theory naturally emerge); arXiv:2402.15892	*arXiv*
2023	**Industrial Research and Development of Innovative Technologies for the Energy Sector**, Marek Pípa, Attila Kment, František Janíček, József Konczer, Jozef Konczer, Tomáš Potásch, Ignác Havran, Botond Sánta, Lajos Csonka; 2023 23rd International Scientific Conference on Electric Power Engineering (EPE); DOI:10.1109/EPE58302.2023.10149262	*Brno, Czech Republic*
2016	**Strong coupling results in the AdS_5/CFT_4 correspondence from the numerical solution of the quantum spectral curve**, Árpád Hegedűs and József Konczer; Journal of High Energy Physics; DOI:10.1007/JHEP08(2016)061; arXiv:1604.02346	*JHEP*
2014	**Finite volume form factors in the presence of integrable defects**, Z. Bajnok, F. Buccheri, L. Hollo, J. Konczer, G. Takacs; Nuclear Physics B; DOI:10.1016/j.nuclphysb.2014.03.010; arXiv:1312.5576	*Nuclear Physics B*

Memberships

2023-	**AI for QFT**, Artificial Intelligence meets Quantum Field Theory on Queen Mary University of London	*London, UK*
2013-2017	**Holographic QFT Group**, MTA Lendület Holographic Quantum Field Theory Group	*Budapest, Hungary*
2011-	**Eugene Wigner College of Advanced Studies**, Founder and President for two years	*Budapest, Hungary*
2010-2011	**BME Student Body/Union**, Elected Educational officer at Faculty of Natural Sciences Students' Union	*Budapest, Hungary*
2009-	**Hungarian Nuclear Societies Young Generation Network**, Organiser in 2010	*Hungary*

Talks and writings

Dec. 2024	**Essay on uncertainty**, An in-progress writing about decision-making, uncertainty, probability and statistics. The mentioned topics are discussed in a broader context, focusing on the philosophical *why* rather than the mathematical *how*. The essay is accessible on GitHub.	*GitHub*
Nov. 2024	**Central European University**, Seminar talk on Statistical Games for the Budapest Computational Neuroscience Forum at the Center for Cognitive Computation at the Central European University (CEU). See the slides on GitHub and the recording CEU's Panopto.	*CEU, Budapest, Hungary*
Oct. 2024	**Carnegie Mellon University**, Seminar talk on Statistical Games for the Group of Aaditya Ramdas (Department of Statistics and Data Science & Machine Learning Department) at Carnegie Mellon University (CMU). Slides are available on GitHub.	*CMU, US, Online*
Aug. 2024	**Dominating mixed actions in random matrices**, A draft introducing a continuous generalization of the inclusion-exclusion principle and then using the principle to calculate decision-theoretic properties of Gaussian random matrices. Accessible on GitHub. (Based on this draft a collaboration started with a mathematician from Bristol University and the results will be developed to a joint paper.)	*GitHub*
May 2024	**Statistics Seminar at University of Bristol**, Seminar talk on Statistical Games at the Statistics Seminar at University of Bristol. Slides are available on GitHub.	*Bristol, UK*
May 2024	**Queen Mary University of London**, Talk on Statistical Games on the AI for QFT seminar. See the slides on GitHub and the recording on YouTube.	*QMUL, London, UK*

Conferences and International Courses

2024	**Stochastic Systems in Active Matter**, (SSDW06), A one-day workshop on the physics and mathematics of stochastic systems in the context of active matter, supported by the Isaac Newton Institute.	*Cambridge, UK*
2023	**Eastern European Machine Learning Summer School**, (EEML2023) Presented poster: Self-Compressed Nano GPT	*Košice, Slovakia*
2021	**Wolfram Virtual Technology Conference**, (WTC-2021), Online talk given: Introducing Game Theory	*Champaign, IL, US (Virtual)*
2021	**Eastern European Machine Learning Summer School**, (EEML2021), Joined the Project Group: DeepExplain	*Budapest, Hungary (Virtual)*
2021	**The Math(s) Fix Conference**, Agenda; Talks	*Online*
2018	**Crunch Conference**, Data Engineering and Analytics as technological representative of Wolfram Research	*Budapest, Hungary*
2018	**European Wolfram Technology Conference**, promo	*Oxford, UK*
2016	**Wolfram Summer School**, (WSS16) , Project summary in a Community post: Simulating the Universe (an alternative approach)	*Waltham, MA, US*
2015	**Young Researchers Integrability School**, one-week school on Integrabilty	*Durham, UK*
2014	**Summer School on String Theory and Holography**, on the subject of Gauge/Gravity Duality, followed by the Mathematica Summer School on Theoretical Physics	*Lisbon/Porto, Portugal*
2014	**Integrability in Low Dimensional Quantum Systems**, as Participant and Local Organizer, Presentation given: Finite volume form factors of the defect scaling Lee-Yang model	*Tihany, Hungary*
2014	**Finite-size Technology in Low Dimensional Quantum Systems (VII)**, as Participant and Local Organizer	*Budapest, Hungary*
2014	**Fizikus Doktoranduszok Országos Konferenciája**, (DOFFI), presentation titled: Egzaktul megoldható kvantumtérelméletek (in Hungarian language)	*Balatonfenyves, Hungary*
2013	**Wigner 111 Scientific Symposium**, Colourful & Deep	*Budapest, Hungary*
2013	**Spring School on Superstring Theory and Related Topics**, at ICTP	*Trieste, Italy*
2013	**Mathematica School in Theoretical Physics: Advanced Topics in Conformal Field Theory**, (MSSTP)	*Trieste, Italy*
2012	**Theoretical Physics School on Quantum Gravity**,	*Szeged, Hungary*
2012	**One week course Introduction to Symbolic Computation for Engineers**, (ATHENS programme 2012) at the Technical University of Madrid	*Madrid, Spain*
2011	**One week course On Quanta, Chaos and Daemons**, (ATHENS programme 2011) at ParisTech	*Paris, France*
2011	**Mini-Workshop on "Spin and Quantum Transport"**, at Humboldt-Universität zu Berlin	*Berlin, Germany*
2011	**PIME conference**, Participating in a workshop about Communicating with young people about Nuclear Energy	*Brussels, Belgium*
2010	**Information Geometry and its Applications III**, at Universität Leipzig	*Leipzig, Germany*