

# József Konczer

PHYSICIST, RESEARCHER, SENIOR AI/ML RESEARCH ENGINEER.

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## 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 parts 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.

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

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

## Experience

### Imagination Technologies

SENIOR RESEARCH ENGINEER

*Kings Langley, UK*

*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

CONSULTANT

*Champaign, Illinois, US (Remote)*

*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.

RESEARCHER

*Komárno, Slovakia*

*2020 - 2023*

- Research and development in the field of Energetics
- Intellectual Properties:
  - Utility Model: SK PUV 50018-2023, application published
  - 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

TEACHING ASSISTANT

*Online*

*June - July 2020*

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

### Milestone Institute

MODULE LEADER

*Budapest, Hungary*

*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

MENTOR

*Budapest, Hungary*

*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  $\text{AdS}_5/\text{CFT}_4$  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
- 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
- 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 3<sup>rd</sup> year BSc students of Faculty of Electrical Engineering and Informatics
- as a teaching staff of Faculty of Natural Sciences

## Private Tutoring

Budapest, Hungary;

Komárom, 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

2013 -

- 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, Information Theory

## Selye János Gimnázium

Révkomárom (Komárom), Slovakia

FINAL EXAMINATION · EXCELLENT

1999 - 2007

# Skills

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

## Extracurricular Studies

<b>The University of Queensland</b>	<i>Online</i>
INTRODUCTION TO SOCIAL PSYCHOLOGY	2022
on edX	
<b>The Chinese University of Hong Kong</b>	<i>Online</i>
CLASSICS OF CHINESE HUMANITIES: GUIDED READINGS	2021
on Coursera	
<b>Stanford University &amp; The University of British Columbia</b>	<i>Online</i>
GAME THEORY II: ADVANCED APPLICATIONS	2021
on Coursera	
<b>Stanford University &amp; The University of British Columbia</b>	<i>Online</i>
GAME THEORY	2021
on Coursera	
<b>Princeton University</b>	<i>Online</i>
BUDDHISM AND MODERN PSYCHOLOGY	2016
on Coursera	

## Awards

2013	<b>1<sup>st</sup> place</b> , on NYIFFF physics team competition as a member of “TBA...” team	<i>Szigliget, Hungary</i>
2010	<b>3<sup>rd</sup> place</b> , on Rudolf Ortway Competition in Physics	<i>Correspondence Competition</i>
2007	<b>Bronze Medal</b> , at the 38 <sup>th</sup> International Physics Olympiad	<i>Isfahan, Iran</i>
2006	<b>Honourable Mention</b> , at the 37 <sup>th</sup> International Physics Olympiad	<i>Singapore</i>

## Communal Activity

<b>Eugene Wigner College for Advanced Studies</b>	<i>Budapest, Hungary</i>
FOUNDER AND PRESIDENT	2011 - 2013
<ul style="list-style-type: none"> <li>Eugene Wigner College for Advanced Studies is a Talent Nurturing and Extracurricular college associated to the Faculty of Natural Sciences of Budapest University of Technology and Economics.</li> </ul>	
<b>Science communication</b>	<i>Slovakia and Hungary</i>
SPEAKER	
<ul style="list-style-type: none"> <li>Gombaszögi Nyári Tábor: Mit tud a tudomány a világról, és azt honnan tudja?: (in Hungarian language), Gombaszög, Slovakia, 2023 <ul style="list-style-type: none"> <li>A performed experiment has been summarized in: Chill Jegyzőkönyv (in Hungarian language)</li> </ul> </li> <li>One week workshop titled: Reality and it's models; a guided tour into theoretical physics at S.U.N. festival, Csobánkapuszta, Hungary, 2016</li> </ul>	

## Media

<b>Popular article</b>	<i>ATP Journal</i>
Co-AUTHOR	2022
<ul style="list-style-type: none"> <li>ATP Journal 10/2022 (in Slovak language)</li> </ul>	
<b>Blog</b>	<i>Medium</i>
WRITER	2022 - PRESENT
<b>LinkedIn, Twitter (X), Mastodon</b>	<i>Social Media</i>
CONTENT CREATOR	2021 - PRESENT

## Publications

2024	<b>Statistical Games</b> , 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	<b>Industrial Research and Development of Innovative Technologies for the Energy Sector</b> , 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	<b>Strong coupling results in the <math>AdS_5/CFT_4</math> correspondence from the numerical solution of the quantum spectral curve</b> , Árpád Hegedűs and József Konczer; Journal of High Energy Physics; DOI:10.1007/JHEP08(2016)061; arXiv:1604.02346	JHEP
2014	<b>Finite volume form factors in the presence of integrable defects</b> , 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-	<b>AI for QFT</b> , Artificial Intelligence meets Quantum Field Theory on Queen Mary University of London	London, UK
2013-2017	<b>Holographic QFT Group</b> , MTA Lendület Holographic Quantum Field Theory Group	Budapest, Hungary
2011-	<b>Eugene Wigner College of Advanced Studies</b> , Founder and President for two years	Budapest, Hungary
2010-2011	<b>BME Student Body/Union</b> , Elected Educational officer at Faculty of Natural Sciences Students' Union	Budapest, Hungary
2009-	<b>Hungarian Nuclear Societies Young Generation Network</b> , Organiser in 2010	Hungary

## Conferences and International Courses

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