Jere Remes

Theoretical physicist with a cross-disciplinary background in quantum field theory, high-density QCD, and environmental modeling. Experienced in mathematical modeling and developing simulation frameworks for both fundamental and applied problems, from neutron stars to Arctic soil mechanics. Known for rapidly adapting to new fields. Seeking to advance research that bridges theory and real-world relevance in collaborative, future-focused environments.

Education

Ph.D., Particle Physics, University of Helsinki, Finland — Jan 2021
Doctoral dissertation: *Probing the QCD Phase Diagram via Holographic Models*
Supervisors: Kimmo Tuominen, Aleksi Vuorinen & Niko Jokela

M.Sc., Theoretical Physics, University of Helsinki — Sept 2015
Master's thesis: *A Model of Composite Dark Matter in Light-Front Holographic QCD*
Supervisor: Kimmo Tuominen
Minor: Mathematics

B.Sc., Theoretical Physics, University of Helsinki — Dec 2014
Bachelor's thesis: *Kvanttikitka (Quantum Friction)*
Supervisor: Esko Keski-Vakkuri
Minors: Mathematics, Physics

Research experience

Researcher, Geological Survey of Finland — Oct 2022 – Present
- Leading development of a coupled thermo-hydro-mechanical modeling framework integrating Amanzi-ATS with OpenGeoSys to simulate freeze-thaw cycles in sub-Arctic soils.
- First author in an upcoming publication on modeling of frost quakes.
- The project contributes to both fundamental geomechanics and applied infrastructure resilience in changing climate.

Postdoctoral Researcher, Universidad de Oviedo and Instituto de Ciencias y Tecnologías Espaciales de Asturias, Spain — Sept 2021 – Aug 2022
- Advanced the holographical framework for more complicated flavour structure in the high-density regime of the phase diagram, with improved fitting to lattice simulations.
- Successfully applied for funding for the project.

Doctoral Researcher, U. Helsinki and Helsinki Institute of Physics — Oct 2015 – Dec 2020
- Developed holographical frameworks to study thermalization in heavy-ion collisions and structure of neutron stars.
- Defended Ph.D. with opponent Prof. Umut Gürsoy (Utrecht U.)

Intern, U. Helsinki, Division of Elementary Particle Physics — May 2014 – Aug 2014

Intern, U. Helsinki, Division of Astronomy and Geophysics — Jun 2013 – Jul 2013

Publication list

Thermo-mechanical and thermo-hydrological modeling of ground freezing and its impact on frost quake occurrence – the Tähtelä case study, J. Remes, J. Okkonen, N. Afonin, E. Kozlovskaya, E.-R. Kokko, K. Moisio, C. B. Silbermann, T. Gerasimov, D. Naumov and T. Nagel *in preparation*

Robin boundary conditions and elastic properties for finite subdomain modeling, J. Remes *in preparation*

Neighbourhood watch in mechanics: non-local models and convolution, T. Nagel, T. Gerasimov, J. Remes and D. Kern. SIAM Review 67 (2025) 176 - 193

Holographic QCD in the NICER era, N. Jokela, M. Järvinen and J. Remes, Phys.Rev.D105 (2022), 086005, `arXiv:2111.12101 [hep-ph]`

Unified weak/strong coupling framework for nuclear matter and neutron stars, N. Jokela, M. Järvinen, G. Nijs and J. Remes, Phys.Rev.D103 (2021) 8, 086004, `arXiv:2006.01141 [hep-ph]`

Quasinormal modes and thermalization in Improved Holographic QCD, T. Alho, J. Remes, K. Tuominen, A. Vuorinen, Phys.Rev.D101 (2020) 10, 106025, `arXiv:2002.09544 [hep-ph]`

Holographic QCD in the Veneziano limit and neutron stars, N. Jokela, M. Järvinen and J. Remes, JHEP 1903 (2019) 041, `arXiv:1809.07770 [hep-ph]`

Skills

Science specialties: applied mathematics, numerical general relativity, string theory, holography, elementary particle physics, quantum field theory, non-equilibrium dynamics, QCD. Currently thermoelasticity, continuum mechanics, hydrology.

Programming: C/C++, Python, Java, JavaScript, Ruby

Typesetting, programs, etc: Git, LaTeX, Mathematica, Jupyter, Matlab, OGS

Languages: Finnish (native), English (fluent), Swedish (intermediate), Spanish, French, Russian (basic).

Grants & awards

Postdoctoral research grant, Finnish Academy of Sciences, 34.800e (2022) (declined)

Postdoctoral research grant, Finnish Cultural Foundation, 35.000e (2021)

Chancellor's Travel Grant, University of Helsinki 1.450e (2016)

Student grant, The Mathematics and Science Fund, University of Helsinki, 1.000e (2013)

Teaching assistant of the year at the Department of Physics, University of Helsinki (2019)

Talks

Modeling mechanical stress in freezing soils: sub-Arctic infrastructure, built environment and frost quakes, EGU General Assembly, Austria (2024)

On Frost Quakes and sub-Arctic roads: Maintaining Infrastructure in Changing Climate, Oak Ridge National Laboratory, USA (2023)

Holographic QCD and neutron stars in the NICER era, Oviedo HEP Theory Seminar, Oviedo, Spain (2021)

V-QCD and Neutron Stars, Helsinki Institute of Physics Seminar (2020)
Available online: https://bit.ly/2B44uSH

Holographic QCD in the Veneziano limit and neutron stars, Workshop on Holographic dense QCD and neutron stars, École normale supérieure, Paris, France (2017)

QCD Dynamics via Holography, Doctoral programme in Particle Physics and Universe Sciences meeting, Helsinki (2016)

Visits, conferences & courses

European Geological Union General Assembly, Vienna, Austria (4/2024)

Research visit, Technische Universität Bergakademie Freiberg, Germany (9/2023)

Research visit, Oak Ridge National Laboratory, USA (6/2023)

From holography to machine learning, Workshop, Helsinki, Finland (10/2022)

EuroStrings, Lyon, France (4/2022)

Iberian Strings, Gijón, Spain (3/2022)

Research visit, University of Utrecht, Netherlands (8/2019)

Elements of AI, Course, University of Helsinki and Reaktor (10/2018)

Fire and ice: Hot QCD meets cold and dense matter, Workshop, Saariselkä, Finland (4/2018)

Workshop on Holographic dense QCD and neutron stars, École normale supérieure, Paris, France (11/2017)

Black Holes and Emergent Spacetime, Nordita programme, Stockholm, Sweden (8-9/2016)

QCD MasterClass, Saint-Jacut-de-la-Mer, France (6/2016)

The Helsinki Workshop on Quantum Gravity, Helsinki, Finland (6/2016)

Summer school on Mathematical Physics, Lammi, Finland (5/2013)

Summer school on Cosmology, Espoo, Finland (5/2012)

TEACHING

Lecturer, University of Helsinki
Introduction to Mathematica (2020)

Teaching assistant, University of Helsinki
Mathematical methods for physics IIb (2017 – 2019)
Mathematical methods for physics IIa (2016 – 2019)
Vuorovaikutukset ja aine (2012)

Pedagogical training
University Pedagogy I & II, Grades 4/5 and 5/5 (2017)

CONF. POSTS

University of Helsinki, Faculty of Science.
Member of the teaching committee (2015 – 2017)

University of Helsinki, Department of Physics.
Member of the Department Council (2014 – 2015)

Oskillaatio – Helsingin yliopiston fysikaalisten tieteiden alumnit ry
Founding member
Member of Board (2024 –)

Association of Doctoral Students at the University of Helsinki
Vice auditor (2017)

Resonanssi ry (organization of physics students)
Vice auditor (2016, 2017, 2018)
Member of Board (2013)
Multiple posts (2012 – 2014)

HOBBIES

Literature, cinema, music and visual arts. I also dabble in woodworking, analog photography and philosophy, and multiple sports ranging from cycling to weightlifting and climbing.