

Petter Säterskog

CONTACT INFORMATION

Petter Säterskog
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PROFESSIONAL EXPERIENCE

Karolinska Institutet, SciLifeLab, Stockholm, Sweden

*Postdoctoral researcher in Jean Hausser Lab
Department of Cell and Molecular Biology*

Since February 2021

- Development of statistical measures of the tumor micro-environment.
- Quantitative modeling of tumor growth in a mouse model of oligodendroglioma.
- PDE and agent-based simulations.
- I run simulations on SNIC (Swedish national infrastructure for computing) where my proposal received an allocation.
- Participation in workshop: [Physics and Computation in Immunology](#), Cargèse, Aug. 22 - Sep. 2, 2022.

Raysearch Laboratories, Stockholm, Sweden

Physicist/Software developer

August 2019 – Feb 2021

- Development of software for planning of radiation therapy.
- Reading and presenting articles on particle therapy in medical journals.
- Beam modeling using Python and Matlab.
- Writing efficient C++ and Cuda code for ion dose engine.
- Platform development in C#.
- Writing and testing of requirements.
- Several weeks of courses in C++, Cuda, C# and general software architecture design.
- I participated in the 2020 ESTRO particle therapy school in Trento, Italy.

NORDITA, Nordic Institute for Theoretical Physics, Stockholm, Sweden

Postdoctoral researcher

October 2017 – September 2019

- Joint position between the high-energy theory group and the condensed matter theory group.
- Theoretical research on quantum critical metals using field-theory methods and on odd-frequency pairing using determinant quantum Monte Carlo.

European Organization for Nuclear Research, Geneva, Switzerland

CERN Summer Student at CMS-BRM

June – August 2012

- Development, installation and analysis of results of a Bonner-sphere neutron spectrometer in the CMS experimental cavern at the LHC.
- I learnt how to set up and run particle transport simulations using FLUKA.
- Participation in lectures about CERN experiments.
- Participation in daily work by CMS-BRM.
- Reference, Moritz Guthoff, moritz.guthoff@cern.ch, CMS-BRM

Subatomic Physics, Chalmers University of Technology, Gothenburg, Sweden

Summer Employment

July – August 2011

- Extension of research done for Bachelor thesis, Path integral Monte Carlo simulations of many-body quantum mechanics on GPUs.
- Reference, Christian Forssén, christian.forssen@chalmers.se

EDUCATION

Ph.D. Theoretical Physics

Leiden University, The Netherlands

September 2013 – September 2017

- Adviser: Professor Koenraad Schalm
- Thesis title: *Quantum critical metals at vanishing fermion flavor number*
- Schools:
 - Solvay Doctoral School on “Quantum Field Theory, Strings and Gravity”, Brussels, Paris, Amsterdam, September – December 2013
 - DRSTP Postgraduate School: Statistical Physics and Theory of Condensed Matter, Doorn, The Netherlands, January 10 – 21, 2014
 - DRSTP Postgraduate School: Theoretical High Energy Physics, São Paulo, Brazil, January 26 – February 6, 2015
 - Mathematica Summer School on Theoretical Physics, Perimeter Institute, Waterloo, Canada, August 24 – 29 2015
 - 34th Jerusalem Winter School in Theoretical Physics, IAS, Jerusalem, Israel, December 27 – January 5, 2017
- Teaching Assistant: Black Holes and Gravitational waves, General Relativity, Effective Field Theory, Quantum Field Theory

M.S. and M.Eng. Physics and Astronomy

Chalmers University of Technology, Gothenburg

September 2012 – June 2013

Hong Kong University of Science and Technology, HK

September 2011 – June 2012

- Area of study: Theoretical Physics
- Thesis title: *Holographic Methods for Condensed Matter Physics*
- Adviser: Professor Ulf Gran
- One year exchange to **Hong Kong University of Science and Technology**
- GPA: 5.00/5.00
- Physics GRE: 990/990

B.S. Engineering Physics

Chalmers University of Technology, Gothenburg

September 2008 – June 2011

- Thesis title: *GPU Implementation of the Feynman Path-Integral Method in Quantum Mechanics*
- Adviser: Professor Christian Forssén, Subatomic Physics
- GPA: 5.00/5.00

PUBLICATIONS

- [1] P. Säterskog, “Instabilities of quantum critical metals in the limit $N_f \rightarrow 0$ ”, *SciPost Phys.* **10**, 067 (2021)
- [2] P. Säterskog, “A framework for studying a quantum critical metal in the limit $N_f \rightarrow 0$ ”, *SciPost Phys.* **4**, 015 (2018)
- [3] P. Säterskog, B. Meszena, K. Schalm, “Two-point function of a $d = 2$ quantum critical metal in the limit $k_F \rightarrow \infty$, $N_f \rightarrow 0$ with $N_f k_F$ fixed”, *Phys. Rev. B* **96**, 155125 (2017)
- [4] B. Meszena, P. Säterskog, A. Bagrov, K. Schalm, “Non-perturbative emergence of non-Fermi liquid behaviour in $d = 2$ quantum critical metals”, *Phys. Rev. B* **94**, 115134 (2016), **Editors’ Suggestion**
- [5] I. Arefeva, A. Bagrov, P. Säterskog, K. Schalm, “Holographic dual of a time machine”, *Phys. Rev. D* **94**, 044059 (2016)

TALKS

- [6] “Fluctuations in a growing tissue”. [Nordita Soft Matter Seminar](#), Stockholm, Sweden, **March 13, 2023**.
- [7] “Modeling the development of brain tumors in mice”. [KTH Life Science Day, KTH Royal Institute of Technology](#), Stockholm, Sweden, **November 28, 2022**.
- [8] “A generative model of a tumor microenvironment”. [SciLifeLab Seminar](#), Solna, Sweden, **October 14, 2021**.
- [9] “Instabilities of 2d quantum critical metals in the $N_f \rightarrow 0$ limit”. [Conference: APS March Meeting 2019](#), Boston, USA, **March 7, 2019**.
- [10] “Instabilities of $d = 2$ quantum critical metals in the $N_f \rightarrow 0$ limit”. [Workshop: Bounding Transport and Chaos in Condensed Matter and Holography](#), Stockholm, Sweden, **September 13, 2018**.
- [11] “Instabilities of $d = 2$ quantum critical metals in the $N_f \rightarrow 0$ limit”. [Stockholm University and KTH Royal Institute Technology joint Condensed Matter Seminar](#), Stockholm, Sweden, **February 6, 2018**.
- [12] “Boson-dominated quantum critical metals at Lorentz symmetric point”. [Stockholm University and KTH Royal Institute Technology joint Mathematical Physics Seminar](#), Stockholm, Sweden, **November 6, 2017**.
- [13] “Boson-dominated quantum critical metals at the Lorentz-symmetric point”. [Workshop: Many-Body Quantum Chaos, Bad Metals and Holography](#), Stockholm, Sweden, **October 4 – 6, 2017**.
- [14] “The exact spectrum of a $d = 2$ quantum critical metal in the limit $k_F \rightarrow \infty, N_f \rightarrow 0$ with $N_f k_F$ fixed”. [Condensed matter group meeting, Radboud University](#), Nijmegen, The Netherlands, **February 16, 2017**.
- [15] “Non-Perturbative Two-Point Functions of a Quantum Critical Metal”. [Condensed Matter Seminar, Perimeter Institute](#), Waterloo, Canada, **November 4, 2016**.
- [16] “Non-Perturbative Two-Point Functions of a Quantum Critical Metal”. [Condensed matter seminar, Harvard University](#), Cambridge, MA, **November 7, 2016**.
- [17] “Non-Perturbative Two-Point Functions of a Quantum Critical Metal”. [Quantum matter seminar, UC Berkeley](#), Berkeley, CA, **December 1, 2016**.
- [18] “Non-Perturbative Two-Point Functions of a Quantum Critical Metal”. [Condensed matter group meeting, Stanford University](#), Stanford, CA, **November 30, 2016**.
- [19] “Non-Perturbative Two-Point Functions of a Quantum Critical Metal”. [Workshop: Applications of Gauge/Gravity Duality 2016](#), Gothenburg, Sweden, **October 3 – 5, 2016**.

CONFERENCE
POSTERS

- [20] “Quantitative modeling of tumors”. In: *Physics and Computation in Immunology 2022*, Cargese, France, August 22 – September 2, 2022.
- [21] “ $N_f \rightarrow 0$ limit of a quantum critical metal”. In: *Advanced School and Workshop on Correlations in Electron Systems - from Quantum Criticality to Topology 2018*, ICTP, Italy, August 6 – 17, 2018.
- [22] “ $N_f \rightarrow 0$ limit of a quantum critical metal”. In: *Symposium Trends in Theory 2017*, Dalfsen, The Netherlands, May 11 – 12, 2017.
- [23] “Critical Fermions in Quenched Approximation”. In: *Quantum Matter 2016*, Benasque, Spain, June 26 – July 08, 2016.

[24] “Critical Fermions in Quenched Approximation”. In: *Physics@Veldhoven 2016*, Veldhoven, The Netherlands, January 19–20, 2016.

[25] “Bloch-Nordsieck model and critical fermions”. In: *Symposium Trends in Theory 2015*, Dalfts, The Netherlands, May 28 – 29, 2015.

SOFTWARE SKILLS Programming Languages (5000+ lines):

- C, C++, C#, Java, Python, Rust

Numerical and Symbolic Analysis:

- Software: Mathematica, MATLAB
- Python libraries: NumPy, SymPy, Matplotlib, Keras
- C libraries: GSL, GMP, FFTW
- GPU interfaces: OpenGL, GLSL, OpenCL, CUDA, TensorFlow

Tools:

- Unix, Git, L^AT_EX
- Computing infrastructure: Google Compute Engine, Slurm
- Particle Transport Code: FLUKA

AWARDS

2008 International High School Competitions

- 76th place and bronze medal in *International Biology Olympiad*, Mumbai, India

2008 National High School Competitions (Sweden)

- 2nd place in National Physics Competition
- 2nd place in National Biology Competition
- 7th place in National Programming Competition

HOBBY PROJECTS

Independent App Development: AI Thermometer, 2018-2019

- Single-handedly designed and developed an [Android](#) and [iOS](#) app that listens to the sound of pouring water and uses machine learning to estimate the water temperature.
- Video: <https://youtu.be/KNVJfs7zBwY>
- Training was done on cloud GPUs on Google Compute Engine using TensorFlow and Python code for processing and augmenting training samples.
- The apps are written in Java and Swift for the two platforms and the common inference code is written in C.
- I also programmed an Arduino microcontroller for a semi-automatic pouring setup that measures water temperature and time-stamps audio recordings from different types of smartphones which allowed me to quickly generate large datasets of audio from water of different temperatures being poured into different vessels.

Independent App Development: Cell Lab, 2014-2018

- Single-handedly designed and developed the Android app “[Cell Lab: Evolution Sandbox](#)”
- Currently ~ 4 200 000 installs
- Translated to 7 languages by volunteers.
- The app is written in Java with GLSL code for graphics.

VOLUNTEERING SERVICE

“[Vänsterpartiet Västra Södermalm](#)”, a Swedish political party.

- Board member since 2020
- Chairman 2021, 2022, 2023
- 700 local party members and an electorate of 60,000 people.

[THE Port - Humanitarian Hackathon at CERN](#), 2015–2016

- “We combine creative minds from CERN and non-profit organisations in interdisciplinary teams to work on humanitarian technology related benefits to society.”

- Teams of 8 people are presented with a problem and after 6 weeks of preparations they get together at CERN in Geneva to come up with a prototype.
- My team and I worked on developing a better design for food drop bags used by the ICRC and UNMISS in South Sudan.
- After initially positive drop tests we continued work on our prototype together with the ICRC.
- ICRC video about our project: <https://youtu.be/5vZqVgcldZQ>