Lorenz Ennio Gärtner

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Education

Physics, MSc — *Very good, 1.09*

Ludwig Maximilians University, Munich, Germany — 2018 – 2020

- Developed thorough theoretical and experimental skills in various fields of physics. This especially enhanced my skills of reducing complex problems to a mathematical basis.
- Attained a thorough understanding of theoretical physics, particularly in **particle physics, quantum field theory, gravity and cosmology**.
- Contributed to **research level coding projects** and enhanced my teaching skills.
- Thesis topic: **On the back-reaction of quantum scalar fields on the de Sitter spacetime**
  - supervised by Prof. Dr. Ivo Sachs (chair Prof. Dr. Viatcheslav Mukhanov)
  - Investigated the structure of semi-classical gravity, vacuum ambiguity and backreaction in de Sitter space.
  - Presented, discussed and defended my work to the department.
  - Experienced the day to day practice in a scientific research department, participated in talks, conferences and discussions. Assisted in organising lectures.

Physics with Theoretical Physics, BSc — *First Class,* 86.7%

University of Manchester, Manchester, UK — 2015 – 2018

- Developed a solid foundation in theoretical physics.
- Acquired and analysed empirical data, interpreted the results and defended the findings in front of scientific committees.
- Final experimental project: **Matter / Antimatter asymmetries at the LHCb**
  - supervised by Prof. Chris Parkes, Dr. Fedor Bezrukov and Dr. Marco Gersabeck
  - Investigated CP violation in the beauty quark sector using advanced programming (C++, ROOT) and data analysis methods.
- Dissertation topic: **Quantum Teleportation**
  - supervised by Dr. Judith McGovern
  - Discussed the theoretical background of quantum teleportation, touching upon the fundamentals of quantum mechanics, the properties arising from the nature of superposition and the state of the art experimental projects.

Work experience

IAEA Fast Reactors Team: Fission-Fusion Synergies, Intern

Nuclear Power Technology Development Section, Division of Nuclear Power,
Department of Nuclear Energy, IAEA, Vienna, AT — *June 2021 – present*

- The International Atomic Energy Agency (IAEA) is at the heart of international relations and research regarding nuclear energy and security.
- Coordinating a project on investigating and addressing future challenges for fusion reactors by identifying possible synergies with our experience in fission reactors to enable a transfer of knowledge.
- Writing and reviewing scientific proposals and papers and preparing presentations.
- Planning and organizing conferences and meetings with international experts towards the final goal of a large collaborative publication of fission-fusion synergies.
- Developing and testing reactor simulations.

Simulations of circumstellar binary disks with Prof. Paola Caselli, Dr. Munan Gong, Dr. María José Maureira

Max Planck Institute for extraterrestrial Physics , Munich, DE — *April 2021 – present*

- Simulating the circumstellar disk around a binary star system with the ultimate goal of understanding particular empirical observations and understanding the limitations of our theoretical models. We are using the astrophysical magnetohydrodynamics code Athena++, with adaptive mesh refinement and applying it to the Class 0 system IRAS 16293-2422 A.
- Applying this code to our particular problem requires expertise in computational parallelization, mesh-grid computing as well as a thorough understanding of the physical background.

Background event classification for Belle II with Prof. Thomas Kuhr

Ludwig Maximilians University, Munich, DE *June – July* 2018

- Designed a neural network to classify simulated particle collision data, in the decay channel $B \to K^* \nu \bar{\nu}$. The goal of the project is to replace a computationally very expensive detector simulation, particle reconstruction and analysis.
- Independently taught myself the necessary skills to build very task specific and efficient neural networks.
- Engineered a completely new neural network,leading to an increase in classification accuracy by over 10%, compared to the best existing network for this task before.
- Find the report here.

redMaPPer Galaxy Cluster finding Algorithm with Dr. Eli Rykoff

SLAC (Stanford Linear Accelerator Center), Stanford, USA *June – July* 2017

- Introduced myself to new areas of physics and many advanced error analysis as well as programming techniques, necessary for galaxy cluster finding.
- Enabled the redMaPPer Python code to compute cluster richnesses and redshifts, account for masking effects and compute uncertainties.

Gravitational Lensing with Prof. Sarah Bridle

University of Manchester, Manchester, UK *July* 2016

- Deepened my understanding of gravitational lensing and coding independently.
- Modeled specific strong lenses, to a degree never done before.
- Extracted valuable information from computed models, to learn about these lenses.

Teaching experience

Teaching assistant

Ludwig Maximilians University, Munich, DE *Oct.* 2019 – *Sep.* 2021

- My taught courses at the LMU (all mandatory for bachelor and master students):
  - **Classical Mechanics (Bachelor)** with Prof. Dr. Ivo Sachs
  - **Electrodynamics (Bachelor)** with Prof. Dr. Armin Scrinzi
  - **Quantum Mechanics II (Master)** with Prof. Dr. Viatcheslav Mukhanov
    (Encompassed advanced topics in quantum mechanics and introduction to quantum field theory.)
- Held weekly tutorials in classes of 30-150 students (in English and German).
- Assisted in course organization, exercise preparation and discussion, supporting students, exam preparation and correction.
- Supplied a healthy learning environment to students and created an inclusive atmosphere.
- Collected frequent feedback from the students and adapted the teaching style dynamically.
- Holding a *LMU Tutor Plus certificate*, which is a qualification for teaching and applying methods to create a healthy and supportive working environment for students and teaching staff.

Awards

Franz Mandl Prize

University of Manchester, Manchester, UK *June* 2018

- The prize is awarded to the best BSc theoretical physics graduate of every year, for theoretical work carried out in the final year of the degree program.

Additional skills and interests

Languages	German (native), English (fluent); French, Italian (basic)
Coding Languages	Python, C/C++, Mathematica, Fortran, IDL
Tools and Packages	Latex, ROOT, Keras, Slurm
Sport	Climbing, Hiking, Cycling, Yoga

References

Prof. Dr. Ivo Sachs	Ivo@theorie.physik.uni-muenchen.de
Prof. Dr. Chris Parkes	Chris.Parkes@cern.ch
Prof. Dr. Thomas Kuhr	Thomas.Kuhr@lmu.de
Dr. Vladimir Kriventsev	V.Kriventsev@iaea.org