

# Johannes S. Otterbach, Ph.D.

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## PROFILE

Self-motivated Ph.D.-level Physicist with a curious, analytical mind and a passion for all things quantum, data & AI. Experience managing and analyzing data using Python (NumPy, SciPy, pandas, scikit-learn), Apache Spark (SparkSQL, MLlib), TensorFlow, Postgres, MATLAB, MATHEMATICA and familiarity with building control software for quantum hardware. Extensive experience with advanced mathematics, statistics and machine learning, as well as presenting and visualizing complex concepts to diverse audiences.

## PROFESSIONAL DEVELOPMENT

**Research Scientist and Software Engineer** 04/2017 - present  
*Rigetti Computing, Berkeley, CA*

- Prototyping and demonstrating applications for near-term quantum devices, such as Quantum Machine Learning and Combinatorial Optimization Problems.
- Building benchmarking libraries for quantum processors and quantum control software for custom hardware.
- Managing and maintaining software automation tools.

**Senior Data Scientist** 12/2016 - 03/2017  
**Data Scientist** 08/2015 - 11/2016  
*LendUp, San Francisco, CA*

- Architect for new machine learning model scoring service with ability to serve models developed in several different languages and frameworks.
- Implemented Python variants of various learning algorithms, such as Generalized Additive Models and Constrained Linear Models.
- Contributed to key algorithms to generate model insights and auditability for regulatory compliance.
- Supported Data Scientists with ad-hoc and production algorithms for feature analysis and selection. Provided dashboards and automated reports for business stakeholders.
- Developed and deployed several models for credit underwriting, including models for new products.
- Analysed and integrated new data sources into production systems to increase data redundancy.

**Infrastructure Quality Engineer (Machine Learning)** 4/2014 - 7/2015  
*Palantir Technologies, London, UK (until 1/2015) and Palo Alto, CA*

- Analyzed TB-sized, disparate customer-dataset and implemented new propensity model pipeline using Apache Spark, surfacing previously unknown churn indicators.
- Solidified and scaled end-to-end PySpark ETL-machine learning pipeline, resulting in a ~5x increase in handled data-scale and ~5x decrease of training time.
- Reduced feature engineering development times by 3x through creating new featurization prototypes in quick iterations with product and data-science teams.
- Deployed, debugged and maintained complex, distributed software stacks, containing Apache Spark, Hadoop HDFS and IPython Notebook servers, on cloud-based AWS systems. Optimized the stacks for best computational performance and stability.
- Developed CometD-based user-scale testing and analytics framework resulting in a ~10x improvement in handled users.

**Postdoctoral Research Fellow (Theoretical Quantum Physics)** 9/2011 - 3/2014  
*Harvard Quantum Optics Center, Cambridge, MA*

- Studied phase diagrams of strongly interaction 1D cold atom systems with numeric and analytic tools.

- Simulated the time-evolution of models with spatial and temporal randomness using Markov processes and ensemble theory, creating insights into highly correlated states of matter.
- Explained and matched experimental observations to theoretical models using fitted statistical simulations and analytic solutions.
- Presented research results to general as well as expert audiences through invited seminars, conferences, talks and posters.
- Collaborated, influenced and contributed to research projects with international teams.

## EDUCATION

**Ph.D. in Physics**, *GPA: 4.0 with distinction*, 10/2011

Theoretical Quantum Optics Group of Prof. Dr. M. Fleischhauer  
University of Kaiserslautern, Germany

- Title of Dissertation: *Single- and Many-Body Phenomena of Dark-State Polaritons*
- Internship at the Institute of Atomic and Subatomic Physics, Vienna, Austria, Spring 2011
- Research internship at Harvard University, Cambridge, MA, Spring 2010

**B.S./M.S. in Physics**, *GPA: 3.93*, 5/2008

University of Kaiserslautern, Germany

- Study abroad program at University of Uppsala, Sweden, Spring 2007

## TECHNICAL SKILLS

- Programming languages: Python, Java, Apache Spark, Scala, SQL and Shell scripting. Familiarity with OCaml, Cython/C, TensorFlow, Hadoop HDFS, AWS S3 and R.
- Experience with mathematical and statistical Python libraries such as pandas, scikit-learn, NumPy and SciPy, Owl, and software such as MATLAB and MATHEMATICA.
- Advanced mathematics and physics toolset paired broad knowledge of cold-atom based quantum systems, ideally suited to tackle quantum-information processing challenges.

## SELECTED SCHOLARSHIPS AND AWARDS

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| Prize Fellowship of the Harvard Quantum Optics Center   | 2011-2013 |
| 2011 Award of the Friends of the University of Kaiserslautern for an outstanding scientific performance as a Ph.D. student in physics | 6/2012    |
| Foundation of German Business scholarship   | 2005-2008 |

## SELECTED PUBLICATIONS

20 in total with 200+ citations. Complete list available upon request.

1. J. S. Otterbach et. al., *Unsupervised Machine Learning on a Hybrid Quantum Computer*, arxiv:1712.05771.
2. A. V. Gorshkov, J. Otterbach, E. Demler, M. Fleischhauer, M. D. Lukin, *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, Phys. Rev. Lett. 105, 060502 (2010)
3. J. Otterbach, M. Moos, D. Muth, M. Fleischhauer, *Wigner Crystallization of Single Photons in Cold Rydberg Ensemble*, Phys. Rev. Lett. 111, 113001 (2013).
4. E. G. Dalla Torre, J. Otterbach, E. Demler, V. Vuletic, M. D. Lukin, *Dissipative Preparation of Spin Squeezed Atomic Ensembles in a Steady State*, Phys. Rev. Lett. 110, 120402 (2013).

## LANGUAGE SKILLS

German: Native speaker. English: Fluent. Swedish and French: Basic

## ACTIVITIES

Avid boulderer and climber. Enjoys slacklining and a good game of Ultimate Frisbee with friends.  
Good food or an outdoor trip are always welcome.