

# 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 AI, quantum & data. Experience managing and analyzing data using Python (NumPy, SciPy, pandas, scikit-learn), Apache Spark (SparkSQL, MLlib), TensorFlow, Postgres, MATLAB, MATHEMATICA and developing algorithms and software for near-term quantum hardware. Extensive experience with advanced mathematics, statistics and applied machine learning, as well as presenting and visualizing complex concepts to diverse audiences.

## PROFESSIONAL DEVELOPMENT

**Member of Technical Staff (Fellow)** 06/2018 - present  
*OpenAI, San Francisco, CA*

- Basic research of algorithms for safe Artificial General Intelligence.

**Research Scientist and Software Engineer** 04/2017 - 05/2018  
*Rigetti Quantum Computing, Berkeley, CA*

- Prototyping and demonstrating applications for near-term quantum devices, such as Quantum Machine Learning and Combinatorial Optimization Problems.
- Developing and maintaining an OCaml-based simulator of a quantum processing unit.
- Managing, coordinating and actively participating in a small research team for near-term applications.
- Engaging with customers; estimating benefits using quantum computations and translating problems to quantum algorithms.

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

- Architect of 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  $\sim 10\times$  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

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

University of Kaiserslautern, Germany

## TECHNICAL SKILLS

- Programming languages: Python, Java, Apache Spark, Scala, SQL and Shell scripting. Familiarity with OCaml, Cyton/C, TensorFlow, Hadoop HDFS, AWS S3 and R.
- Experience with mathematical and statistical Python libraries such as pandas, scikit-learn, NumPy and SciPy, TensorFlow, Keras, Owl, and software such as MATLAB and MATHEMATICA.
- Advanced mathematics and physics toolset paired knowledge of software best practices and applied machine learning ideally suited to tackle bleeding-edge challenges in AI and Deep Learning.

## SELECTED SCHOLARSHIPS AND AWARDS

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).

## 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.