

Curriculum Vitae

Personal details

Name:	Oliver Gutsche
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Research Positions

09/2014 - Present	Scientist	Fermi National Accelerator Laboratory (Fermilab)
06/2009 – 09/2014	Application Physicist I	Fermi National Accelerator Laboratory (Fermilab)
06/2005 – 05/2009	Research Associate	Fermi National Accelerator Laboratory (Fermilab)
09/2001 – 02/2005	Doctoral Candidate	Deutsches Elektronen Synchrotron (DESY)

Education

2001-2005	University of Hamburg , <i>Doctor of Natural Sciences</i> , Hamburg, Germany
Thesis title	<i>Measurement of beauty quark cross sections in photoproduction with the ZEUS experiment at the electron proton collider HERA</i>
Advisors	Prof. Dr. Robert Klanner, Dr. Achim Geiser

1996 - 2001	University of Hamburg , <i>Diploma in Physics</i> , Hamburg, Germany
Thesis title	<i>Development of the trigger algorithm for the MONOLITH experiment</i>
Advisors	Prof. Dr. Robert Klanner, Dr. Achim Geiser

Overview

I am a particle physicist by heart. I am conducting **leading edge research at the energy frontier** to proof the validity of the Standard Model of Particle Physics or to find New Physics Beyond the Standard Model.

I have multiple years of experience in analyzing high-energy collisions at different particle colliders using a multitude of different techniques. I have **published many papers in leading journals** and am currently a member of the CMS collaboration. In my recent studies at the LHC, I have lead searches for evidence of physics beyond the Standard Model using top quarks, and contributed to searches for Supersymmetry and Dark Matter. One of my most noticeable publications is the **Observation of the Higgs Boson in 2012**.

I am a **leader in High-Energy Physics (HEP) computing** and have acquired deep knowledge and expertise in HEP software and computing. HEP requires massive amounts of computing hardware to analyze the petabytes of data recorded by the detector and simulated with Monte-Carlo techniques. I have deep experience in operating computing infrastructures providing access to several hundred-thousand computing cores and many tens of petabytes of disk space required to analyze the recorded detector signals and simulated collisions. I am an **expert in distributing and utilizing these massive amounts of resources across the world in separate data centers**. I am an expert architect and developer of the infrastructure enabling the distributed computing system.

I held many management positions within the CMS collaboration and at the Fermi National Accelerator Laboratory, supervising up to 60 individuals across many time zones. In September 2016, I was appointed **U.S.CMS Deputy Software and Computing Operations Program manager, overseeing a budget of \$16M** to enable analysis of particle collisions in the U.S. for the 2500 physicist strong CMS collaboration.

Assignments

U.S. CMS Software and Computing Operations Program

10/2016 - present	Deputy Operations Program manager
10/2016 - present	L2 manager for Software and Support in the Software and Computing Operations Program Execution Team
03/2014 – 09/2016	L2 manager for Operations in the Software and Computing Operations Program Execution Team

Fermi National Accelerator Laboratory - Scientific Computing Division

10/2016 - present	Deputy Head of the Scientific Services Quadrant
10/2014 – 09/2016	Assistant Head of the Scientific Computing Division for Science Operations and Workflows
10/2014 – 12/2014	Interim Department Head of the Scientific Data Processing (SDP) Department of the Scientific Services Quadrant
10/2013 – 09/2014	Deputy Department Head of the Scientific Data Processing (SDP) Department of the Scientific Services Quadrant
09/2012 – 09/2014	CMS Operations Group Leader in the Scientific Data Processing (SDP) Department of the Scientific Services Quadrant

CMS Collaboration - Offline & Computing Project

09/2015 – present	Focus Area Lead for Infrastructure and Resources
10/2014 – 08/2015	Member of the Offline & Computing Management Board
01/2012 – 09/2014	Computing Operations L2 Manager
07/2009 – 12/2011	Data Operations L2 Manager
01/2007 – 07/2009	Release Validation Manager

Scholarships and Awards

2013	CMS Young Researcher Prize
2008	Exceptional Performance Recognition Award of Fermilab
2003	German Academic Exchange Service scholarship for an academic stay at University College London (UCL), London (Great Britain)

Research Experience

CMS collaboration: 2005 – Present

I joined the CMS collaboration when I started my Research Associate position at Fermilab in 2005. My research focus has been the search for physics beyond the Standard Model at the LHC. Searching for new physics at the energy frontier

requires a clear signature to understand Standard Model backgrounds.

I was a founding member of an analysis group with members from Fermilab/UCSD/UCSB, focusing on final states with leptons. The approach proved to be successful; I was involved in early publications of the CMS experiment such as a measurement of the top quark cross section. With more data available, the focus shifted to new physics and beyond the Standard Model processes. We were leaders of the WW to dilepton analysis in the CMS Higgs discovery paper [7] and searches for SUSY in same-sign and opposite-sign dilepton as well as single lepton channels.

I have been supervising several Fermilab postdoctoral researchers. Together with Jacob Linacre, I first concentrated on exploiting the dilepton signature to search for pair production of a heavy top-like quark (t') using the complete 2011 dataset [6]. I continued studying the properties of top quarks exploiting angular distributions of the dilepton final state. At the Tevatron, top pair forward-backward asymmetry measurements showed deviations from the Standard Model. We were the first to use the dilepton final state to measure the top pair charge asymmetry at the LHC to further investigate the deviations seen at the Tevatron. We published papers for the 7 and 8 TeV datasets of LHC Run 1 for top pair spin correlations and top quark polarization [2,4] as well as the top pair charge asymmetry [1,3]. In the process of our work, my Postdoc Jacob Linacre was appointed the CMS Top Properties Subgroup Convener in the CMS Physics organization and started in January 2014 his two-year tenure.

Currently, I am working with Matteo Cremonesi in a team from Fermilab/MIT/Northwestern/Bari on dark matter searches in the fully hadronic monoTop channel.

ZEUS collaboration: 2001 – 2005

I started my graduate research at the University of Hamburg in 2001 joining the ZEUS collaboration during the upgrade of the machine and the integration of the new micro-vertex silicon strip detector. Because of its precise tracking capabilities, I planned to use secondary vertex and impact parameter techniques to identify beauty quarks decaying into muons.

I first concentrated on the identification of muons. In a team of graduate students, I improved the ZEUS muon reconstruction by exploiting redundancies of the different detector components from tracking, calorimetry, to the muon detectors. One of my larger contributions was the implementation of an advanced muon reconstruction efficiency calculation using reference muon signatures. I then used the complete pre-upgrade 1996-2000 dataset to extract beauty quark cross sections in photoproduction. I used the transverse momentum of the muon relative to a jet to identify beauty quarks and measured differential angular correlation cross sections which were found to be in agreement with NLO predictions. With the first data after the upgrade, the micro-vertex detector

became available. I used the dataset from 2003-2004 to identify beauty quarks using impact parameter techniques for the first time in ZEUS.

Technical Experience

Coordinator for Science Workflows and Operations: 2014 - Present

CMS collaboration: 2005 – Present

The technical aspects of my work are closely connected to my physics research. I am involved in computing for the CMS collaboration. Computing is a significant part of the overall analysis workflow and requires intimate knowledge of the scientific process. The scales of computing resources needed for the LHC are unprecedented and analyses at the LHC depend significantly more on computing than at previous experiments. Fermilab is a leader in GRID technologies used to handle all LHC computing resources and also hosts the largest Tier-1 center of CMS.

- The CMS collaboration appointed me lead of the Data Operations Project in 2009. Using my deep involvement in analysis and my expertise in computing, I was responsible for the timely delivery of all data and MC samples for analysis, a significant contribution to the overall success of the experiment. In 2012, CMS extended my responsibilities and appointed me to lead all of the Computing Operations Project, adding the care of over 60 computing centers distributed all over the world and all central computing services of CMS.
- I was supervising the contributions of more than 60 scientists and engineers to the Computing Operations Project worldwide. The team was overseeing the readiness of all the computing facilities and monitor both central workflows and analysis and the transfers of data and MC samples between the sites.
- To help with operations of the CMS computing infrastructure, I was working with computer scientists and engineers visiting Fermilab for 1 to 2 years from Columbia, Ecuador and China. In the course of the stay at Fermilab, one of the visitors wrote a master thesis about petascale transfers for the LHC under my supervision, and defended the thesis successfully at the Chinese Academy of Sciences end of May 2013.
- I was a L2 manager in the U.S. CMS Software & Computing Program responsible for Computing Operations. In this capacity and also before, I reported regularly to the funding agencies and took part in reviews of DOE and NSF.
- I was member of the organizing committees of the International Conference on Computing in High Energy and Nuclear Physics (CHEP) 2010 and 2012 and organized parallel tracks and was editor of the proceedings. I also authored or co-authored multiple contributions to the CHEP conferences

in 2010, 2012, 2013 and 2015. I was member of the organizing committee of the Meeting of the American Physical Society (APS) Division of Particles and Fields (DPF) in 2013.

- In October 2014, I was appointed Assistant Scientific Computing Division Head for Science Operations and Workflows. I am responsible for the delivery of scientific computing services to all Fermi National Accelerator Laboratory experiments including High Energy Physics experiments (e.g. CMS), Neutrino Physics experiments (e.g. NOvA, Minerva), Intensity Frontier experiments (e.g. mu2e, Muon g-2) and Astroparticle Physics experiments (e.g. DES)

I was also the lead developer of an innovative tracking algorithm that was used during the commissioning of the CMS detector and I supervised several students in the course of the project. I conducted the first software tutorials in CMS teaching the basics of analysis software and how to perform analysis on the GRID to the CMS community, using a user-friendly GRID analysis tool, of which I was one of the lead developers as well.

ZEUS collaboration: 2001 – 2005

The upgrade of the ZEUS detector made it necessary to integrate the new and changed detector components in the event visualization solution of ZEUS.

- I was one of the proponents and lead developers of a new object-oriented and ROOT-based event display.
- A client-server structure allowed physicists to display events without direct access to the event store. Also online events could be displayed worldwide with very small latency during data taking.

I used my knowledge of ROOT to develop a wrapper for the Fortran based code base of ZEUS and integrated it into an analysis framework, which was used by several graduate students.

Physics Publications with Major Contributions

A.M. Sirunyan et al., **Search for dark matter in events with energetic, hadronically decaying top quarks and missing transverse momentum at $\sqrt{s} = 13$ TeV**, (2018), arXiv:[1801.08427](#) [[hep-ex](#)]

V. Khachatryan et al., **Measurements of t \bar{t} spin correlations and top quark polarization using dilepton final states in pp collisions at $\sqrt{s} = 8$ TeV**, *Phys. Rev. D* 93 (2016) 052007, doi:[10.1103/PhysRevD.93.052007](#), arXiv:[1601.01107](#) [[hep-ex](#)]

V. Khachatryan et al., **Measurements of $t\bar{t}$ charge asymmetry using dilepton final states in pp collisions at $\sqrt{s} = 8$ TeV**, *Phys. Lett. B* 760 (2016)

365–386, doi:[10.1016/j.physletb.2016.07.006](https://doi.org/10.1016/j.physletb.2016.07.006), arXiv:[1603.06221](https://arxiv.org/abs/1603.06221) [hep-ex]

S. Chatrchyan et al., **Measurements of $t\bar{t}$ spin correlations and top-quark polarization using dilepton final states in pp collisions at $\sqrt{s} = 7$ TeV**, *Phys. Rev. Lett.* 112 (2014) 182001, doi:[10.1103/PhysRevLett.112.182001](https://doi.org/10.1103/PhysRevLett.112.182001), arXiv:[1311.3924](https://arxiv.org/abs/1311.3924) [hep-ex]

S. Chatrchyan et al., **Measurements of the $t\bar{t}$ charge asymmetry using the dilepton decay channel in pp collisions at $\sqrt{s} = 7$ TeV**, *JHEP.* 04 (2014) 191, doi:[10.1007/JHEP04\(2014\)191](https://doi.org/10.1007/JHEP04(2014)191), arXiv:[1402.3803](https://arxiv.org/abs/1402.3803) [hep-ex]

S. Chatrchyan et al., **Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC**, *Phys. Lett.* B716 (2012) 30–61, doi:[10.1016/j.physletb.2012.08.021](https://doi.org/10.1016/j.physletb.2012.08.021), arXiv:[1207.7235](https://arxiv.org/abs/1207.7235) [hep-ex]

Full List of Physics Publications with Major Personal Contributions can be found [here](#).

Full List of Publications from all Collaborations and Experiments can be found [here](#).

Computing Publications with Major Personal Contributions

A.A. Alves Jr et al., **A Roadmap for HEP Software and Computing R&D for the 2020s**, (2017), arXiv:[1712.06982](https://arxiv.org/abs/1712.06982) [physics.comp-ph]

O. Gutsche et al., **CMS Analysis and Data Reduction with Apache Spark**, in: **18th International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT 2017)** Seattle, WA, USA, August 21-25, 2017, 2017. <http://lss.fnal.gov/archive/2017/conf/fermilab-conf-17-465-cd.pdf>, arXiv:[1711.00375](https://arxiv.org/abs/1711.00375) [cs.DC]

O. Gutsche et al., **Big Data in HEP: A comprehensive use case study**, *J. Phys. Conf. Ser.* 898 (2017) 072012, doi:[10.1088/1742-6596/898/7/072012](https://doi.org/10.1088/1742-6596/898/7/072012), arXiv:[1703.04171](https://arxiv.org/abs/1703.04171) [cs.DC]

B. Holzman et al., **HEPCloud, a New Paradigm for HEP Facilities: CMS Amazon Web Services Investigation**, *Comput. Softw. Big Sci.* 1 (2017) 1, doi:[10.1007/s41781-017-0001-9](https://doi.org/10.1007/s41781-017-0001-9), arXiv:[1710.00100](https://arxiv.org/abs/1710.00100) [cs.DC]

S. Habib et al., **ASCR/HEP Exascale Requirements Review Report**, (2016), arXiv:[1603.09303](https://arxiv.org/abs/1603.09303) [physics.comp-ph]

G. Garzoglio et al., **Diversity in Computing Technologies and Strategies for Dynamic Resource Allocation**, *J. Phys. Conf. Ser.* 664 (2015) 012001, doi:[10.1088/1742-6596/664/1/012001](https://doi.org/10.1088/1742-6596/664/1/012001)

T. LeCompte et al., **High Energy Physics Forum for Computational**

Excellence: Working Group Reports (I. Applications Software II. Software Libraries and Tools III. Systems), (2015), arXiv:[1510.08545](#) [[physics.comp-ph](#)]

Full List of Computing Publications with Major Personal Contributions can be found [here](#).

List of presentation and talks

O. Gutsche, **The Future of Large Scale Scientific Computing**, (2017), [Colloquium](#) given at the Department of Physics and Astronomy at Texas Tech University, ([Material](#))

O. Gutsche, **Particle Physics - A world wide journey from recording particles to analysis using big computing**, (2017), Plenary Talk at the Chicago Council on Science & Technology Panel: [Fermilab and the New Frontiers of Physics](#), ([Material](#))

O. Gutsche, **CMS Analysis and Data Reduction with Apache Spark**, (2017), Parallel Session Talk at the 18th International Workshop on Advanced Computing and Analysis Techniques in Physics Research ([ACAT 2017](#)), ([Material](#))

O. Gutsche, **50 years Fermilab - Computing Innovations**, (2017), Talk at the Fermilab 50th Anniversary [Symposium](#), ([Material](#))

Full List of Talks can be found [here](#).

List of Articles and Media Mentionings

A. Purcell, **Oliver Gutsche: Fermilab joins CERN openlab, works on data reduction project with CMS experiment**, (2017), Article in [CERN openlab News](#), ([Article](#))

M. May, **Oliver Gutsche: A Spark in the dark**, (2017), Article in [ASCR Discovery](#), ([Article](#))

M. May, **Oliver Gutsche: Open-source software for data from high-energy physics**, (2017), Article in [Phys.Org](#), ([Article](#))

Full List of Articles and Media Mentionings can be found [here](#).