



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Dustin Burns, Ph.D., GStat

Managing Scientist | Data Sciences  
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### Professional Profile

Dr. Dustin Burns assists clients in the commercial and government sectors design and implement AI strategies at scale. Combining his background in laboratory experiments with his expertise in data analytics and cloud computing, Dr. Burns contributes to projects along the entire data science lifecycle, from experimental design and data collection, through data quality assurance, exploratory data analysis and cleaning, to modeling, visualization, and reporting. While applying AI, Machine Learning, and Deep Learning methods to address traditional business problems in new ways, Dustin strives to incorporate in his work the principles of security, explainability, and reducing algorithmic bias.

Dustin received his Ph.D. in Physics from the University of California, Davis, in the field of experimental high-energy particle and astroparticle physics. Dustin's dissertation research was based at the European Council for Nuclear Research (CERN) Large Hadron Collider (LHC), where he worked on the team that contributed to the discovery of the Higgs boson, a new fundamental particle of nature, in 2012. Additionally, Dustin is a founding member of the CRAYFIS: Cosmic RAYs Found In Smartphones (<http://crayfis.io>) experiment, where he helped design a crowd-sourced comic ray detector array using the cameras in smartphones. More recently, Dustin has applied AI and Machine Learning approaches to evaluate data in a number of commercial and defense settings. The commercial work includes analysis of data from healthcare, medical device, utilities, and environmental science clients. The defense work focuses on the management of large databases and analyses for Department of Defense personnel data. This work includes fundamental research on supply chain security, insider threat, and cyber threat detection and mitigation.

In his current role at Exponent, Dustin leads multidisciplinary teams to respond to the world's most impactful problems and to evaluate emerging technologies using AI. Employing expertise in statistics, AI and Machine Learning, programming in multiple languages and cloud computing environments, Dustin's teams can assist with developing custom algorithms, modernizing analytics programs, advising on regulatory issues, and helping to evaluate intellectual property.

### Academic Credentials & Professional Honors

Ph.D., Physics, University of California, Davis, 2017

M.S., Physics, University of California, Davis, 2013

B.S., Physics, Georgia Institute of Technology (Georgia Tech), 2011

B.S., Applied Mathematics, Georgia Institute of Technology (Georgia Tech), 2011

Ursula Wiegand Scholarship Fund (2008-2011)

Helping Outstanding Pupils Educationally (HOPE) Scholarship, Department of Physics, Georgia Institute of Technology (2008-2011)

AT&T Foundation Scholarship (2010)

National Science Foundation Mentoring Through Critical Transition Points (MCTP) Scholarship, Department of Mathematics, Georgia Institute of Technology (2009, 2010)

Metha Phingbodhipakkiya Memorial Scholarship, Department of Mathematics, Georgia Institute of Technology (2009)

Student Marshal, Middle Georgia College Class of 2008

Engineering Physics Award, Department of Physics, Middle Georgia College (2008)

Sophomore Mathematics Award, Department of Mathematics, Middle Georgia College (2008)

Georgia Academy of Mathematics, Engineering, and Science Achievement Award (2008)

Governor's Scholarship, Georgia Institute of Technology (2008)

Phi Theta Kappa Honor Society, Middle Georgia College (2006)

## Licenses and Certifications

IBM Data Science Professional Certificate, IBM

TensorFlow Developer, DeepLearning.AI

Amazon Web Services (AWS) Certified Cloud Practitioner

Graduate Statistician (GStat), American Statistical Association

Applied Data Science with Python Specialization, University of Michigan, Coursera

AI in Healthcare Specialization, Stanford ONLINE, Coursera

## Academic Appointments

Teaching Assistant, Department of Physics, University of California, Davis, 2011-2013, 2017

Graduate Student Researcher, Department of Physics, University of California, Davis, 2013-2017

Graduate Student Researcher, CERN, 2013-2017

Undergraduate Researcher, Department of Physics, Georgia Institute of Technology, 2008-2011

Undergraduate Researcher, Department of Mathematics, Georgia Institute of Technology, 2009

Undergraduate Researcher, Department of Mathematics, University of Georgia, 2008

## Professional Affiliations

International Society for Pharmacoepidemiology (member)

InfraGard (vetted member)

American Statistical Association (member)

American Physical Society (member)

## Publications

Burns, Dustin. 2021. "Applications of Artificial Intelligence in Cybersecurity." In Software Engineering: Artificial Intelligence, Compliance, and Security, edited by Brian D'Andrade. New York: Nova Science Publishers.

Measurements of properties of the Higgs boson decaying into the four-lepton final state in pp collisions at  $\sqrt{s} = 13$  TeV. By CMS Collaboration (Albert M Sirunyan et al.). arXiv:1706.09936 [hep-ex].

Search for associated production of dark matter with a Higgs boson decaying to bb or  $\gamma\gamma$  at  $\sqrt{s} = 13$  TeV. By CMS Collaboration (Albert M Sirunyan et al.). arXiv:1703.05236 [hep-ex].

Les Houches 2015: Physics at TeV colliders - new physics working group report. By G. Brooijmans et al.. arXiv:1605.02684 [hep-ph].

Searching for ultra high-energy cosmic rays with smartphones. By Daniel Whiteson, Michael Mulhearn, Chase Shimmin, Kyle Cranmer, Kyle Brodie, Dustin Burns. arXiv:1410.2895 [astro-ph.IM]. 10.1016/j.astropartphys.2016.02.002. Astropart.Phys. 79 (2016) 1-9.

For a complete listing of publications, see

<https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=Dustin%20Burns>

## Presentations

Burns D. Can AI Predict Human Behavior? The Defense and Aerospace Test and Analysis Workshop (DATAWorks). Washington, D.C. 2020.

Burns D. Can AI Predict Human Behavior? Insider Threat Summit 6 (ITS6). Monterey, CA. 2020.

Burns D. Applications of AI in Cybersecurity. Open Data Science Conference (ODSC), West. San Francisco, CA. 2019.

Burns D. Demystifying AI in Cybersecurity. Insider Threat Summit 5 (ITS5). Monterey, CA. 2019.

Burns D on behalf of CMS. A collider search for Dark Matter produced in association with a Higgs boson in the four-lepton final state at the 13 TeV LHC with CMS. US LHC Users Association Meeting. Lawrence Berkeley National Laboratory, Berkeley, CA. 2-4 Nov 2016.

Burns D on behalf of CMS. A collider search for Dark Matter produced in association with a Higgs boson in the four-lepton final state at the 13 TeV LHC with CMS. APS Far West Section Meeting, University of California, Davis, Davis, CA. 29 October 2016.

Burns D on behalf of CRAYFIS. Cosmic RAYs Found In Smartphones. Grad Slam research presentation competition. Grad Studies, UC Davis, Davis, CA. 1 March 2016.

Mobs E, Meyer C, Burns D, Agapitos A, Koutava I, Kokabi A. CMS Create: Jumping for particles. Report and product demonstration at: 2015 CMS Create Competition. Ideasquare, CERN. 20 November 2015.

Burns D. Dark matter search via mono-Higgs  $\rightarrow$  ZZ  $\rightarrow$  four leptons. Report presented at: CMS Exotica Workshop 2015. Venice, Italy. 13 November 2015.

## Project Experience

Exponent has ingested data from one of the largest government personnel databases and maintained a data warehouse to preserve historical records and update the status of active personnel for over 20 years. Data transfer is performed over a secure network connection from the client's relational database servers to our in-house SAS database workstation. In this relational database structure, various queries are made to extract rich subsets of the data for specific analyses. Our team of data scientists and statisticians performs recurring monthly analyses in both SAS and Python to track trends over time which give key insight into the agency's personnel records and field-deployed equipment. These analyses include tracking of hardware failure modes in the field over time and predictive analytics with machine learning techniques to reduce overall failure rates. Our contributions have resulted in millions of dollars in saved costs and a deeper understanding of the clients multifactor data assets through data-driven reporting and data visualizations.

Exponent's team of database engineers and data scientists successfully aggregated medical data from 100+ hospitals for thousands of events where a medical device malfunctioned and further analysis was required for FDA compliance. This data included patient records, medical device logs and investigation reports, hospital training records, device testing reports, and included interfacing with the client's database endpoints. Data files were exported from the client's enterprise data management system and transmitted to Exponent via secure network file transfer. Each data type had a custom ETL pipeline including time-series analysis of log files and text analysis of interviews and investigation reports. After the data was collected and processed, a multivariate analysis was conducted to extract new insights into the failure investigations, including machine learning modeling, text mining and natural language processing, and application of advanced statistical methods. For example, a correlation analysis was performed to understand the relationship between recurring errors in device log files and the propensity for a device to cause harm to a patient. Additionally, a cluster analysis was performed using NLP techniques to discover patterns in the text of investigation reports that may be related to hidden similarities in device failures. The analysis resulted in a report which elucidated underlying patterns and correlations not initially apparent to investigators.