Michael William Fouts

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Professional Profile

Data scientist and engineer with experience in data modeling/analytics, project management, compliance, and technical training with a specialty in utilities. View personal data science projects at michaelwfouts.github.io.

Education

Graduate

West Virginia University, Morgantown, WV August 2022 - Present
Benjamin M. Statler College of Engineering and Mineral Resources and Honors College
Major: Chemical Engineering (Ph.D.)
Cumulative GPA: 4.00/4.00

Undergraduate

West Virginia University, Morgantown, WV August 2013 - May 2017
Benjamin M. Statler College of Engineering and Mineral Resources and Honors College
Major: Chemical Engineering; Minor: Mathematics
Cumulative GPA: 4.00/4.00

Work Experience

West Virginia University; Morgantown, WV
Machine Learning/Process Modeling Research Assistant August 2022 – Present

- Created Bayesian technique using Hamiltonian Monte Carlo to create Physics Informed Machine Learning (PIML) models with multiple Gaussian Processes approximated through a set a linear function in overall non-linear models. Improves on current methodologies of Physics Informed Neural Networks (PINNs) for models with moderate input space via up to a 10x reduction in clock time training of models using JAX acceleration. Examples include data driven modeling of reaction rate kinetics and time dependent adsorption.
- Created feature for generalized machine learning codebase that uses a Gibbs Sampling based Markov Chain Monte Carlo approach in combination with algorithmic model creation (overall technique called Bayesian Smoothing Spline ANOVA or BSS-ANOVA) to incorporate a prior model as an input to quickly update predictions based on new portions of the data space being explored, such as in process control scenarios. Coded in Python.
- Ran computational models and performed a hyperparameter grid search using PySINDy (Python package for Sparse Identification of Nonlinear Dynamics) to evaluate and compare results with novel machine learning methodologies in the research group. Results sent as part of publication.
- Contribute to Python package *FokL* on PyPi that creates Bayesian linear models using BSS-ANOVA basis functions with forward variable selection. Package currently has over 22,000 downloads.
- Mentored six undergraduate students, two as direct reports, in data science such as creating models in Python with BSS-ANOVA, creating package maintenance routines using *tox*, replicating paper results, such as localized modeling of Gaussian Processes via discretized K-means clustering of the input space, creating web hosted documentation, as well as supporting their own independent research.
- Led the Student Group for the NSF funded TRIMMing CO_2 Project, facilitating an environment for interuniversity collaboration through monthly research presentation meetings.

Phillips 66; Bartlesville, OK
Energy, Research, Innovation (ERI) Digital Products Intern May 2025-August 2025

- Developed mathematical model of predicting liquid dropout rates in gathering and processing (G&P) pipelines to forecast the size of liquid slugs delivered to slug catchers following pipeline pigging operations. Model gave the dropout rate at any given point along the pipeline as well as the composition of the dropout given data for the flow, temperature, pressure, and gas composition.
- Validated mathematical model through two methodologies, the better achieving ~18% prediction error that met operational tolerance requirements for field applications. 1) Performed pressure drop analysis

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across pipeline segments, integrating liquid dropout predictions with elevation profile data to identify low points where liquid accumulates and calculate corresponding pressure drop impacts. 2) Conducted mass balance validation at natural gas processing plant slug catcher inlets, estimating the timing of slugs using pig launch data.

- Delivered technical seminar of findings to entire ERI division, demonstrating model capabilities and validation results

Sanofi US; Framingham, MA

Data Science Process Modeling Co-Op Nov. 2024-May 2025

- Created In-Silico Model used to serve as a benchmark for Design of Experiment technique evaluations to circumvent costly and timely wet lab experiments. Model was initially based on existing literature of monoclonal antibody production from Chinese Hamster Ovary cells. Modifications were made to introduce cell death terms, transform from a batch to a bolus fed-batch reactor, and extend the time of the experiments from 6 to 14 days.
- Evaluated classical DoE approaches (fractions factorial, resolution IV models, response surface models) with hybrid models that take into account the batch reactor time dynamics, shifting the paradigm from modeling final quality metrics to modeling rates of reaction at each time step based on the reactor's states via modeling service DataHow Lab. Evaluation showed positive results increasing final titer.
- Created a framework for evaluating how stochasticity in titer measurements and probability of experimental failure can be taken into account via a Monte Carlo analysis to evaluate the robustness of DoE methodologies.

Lunexus Space/Harappa Modeling; Remote April 2024 – December 2024

Independent Consultant

- Worked on process modeling kinetics of recycling satellite photovoltaics in space (under NDA).

Deloitte Consulting, LLP; Arlington, VA

Data Science Consultant July 2021 – August 2022

- Performed data engineering, exploratory analysis, and Qlik dashboard development for USPS for use cases including financial analysis of billions of dollars worth of purchases, identification of excess logistical resources saving tens of millions of dollars, and tracking of employee availability through the COVID pandemic. Created automation workflows using R that saves ~5 hours weekly to transform and aggregate data for reporting. Led other USPS employees in onboarding and on additional automation tasks.
- Created qualification/document recommendation system based on Requests for Proposals (RFPs) that saved ~2 hours (40%) per proposal across 37 engagements in research time for supporting documentation to write responding proposals. System created in python takes documents, parses their text, performs the analyses (document/cosine similarity with TF-IDF vectorization) and outputs the recommendations in a Plotly Dash visualization. Moved code base to AWS (EC2, S3, CodeCommit) cloud to better integrate multiple collaborators.
- Performed text analysis on 24 Climate Adaptability Plan's submitted by Federal Government Agencies to identify overarching themes and identify unique keywords to each individual agency's plan to determine what they are most concerned with and Deloitte's ability to help them achieve their goals.
- Created data pipeline using Python to automate the data ingestion from excel spreadsheets saving ~10 hours (30% of work) per quarter.
- Created synthetic data using python libraries to develop a Qlik Proof of Concept Dashboard showing Deloitte's analytic capabilities with the technology at a FedTech conference.

Eastern Gas Transmission & Storage (A Berkshire Hathaway Company); Bridgeport, WV

Gas Measurement & Instrumentation Data Quality Engineer July 2019 – July 2021

Gas Measurement & Instrumentation Engineer June 2017 – July 2019

Gas Measurement & Instrumentation Intern May 2015 – Aug. 2016

- Created a system that automatically identifies compliance and equipment issues on test reports using SQL queries increasing the number of issues found by ~120% and saving ~400 hours/year compared to

manual audits. System also performs audits not previously done estimated to save ~1600 additional hours/year compared to being completed manually. System doubles as a continuous training opportunity for technicians, having reduced the number of report errors by 44% over a 7 month period. Metrics reported using R Markdown.

- Worked as Project Manager and Business Lead on a big data project to monitor lost and unaccounted for gas. Outside of management, personal contributions included creating and modifying dashboards using R Shiny. Project saved ~100 hours/year work in 2020 and is projected to increase to at least 400 additional hours saved/year in 2021. System identifies ~20 significant anomalies per month averaging measurement adjustments on the magnitude of thousands of dollars.
- Lead transmitter replacement program calculating the capability index of process transmitters to identify issues with their performance and develop a replacement program to increase system accuracy.
- Performed comprehensive lab analysis of analyzers and transmitters, including designing tests and collecting data, to evaluate product performance. Required to present technical data for internal reporting. Results helped lead to millions in purchases for the standardization of new equipment. Used LabView for testing automation.
- Designed and helped commission measurement and regulation stations. Worked with Project Engineering and Field Engineering on several engineering/capital projects. Created VBA code that reduced design time by 2-3 hours per design (20-40% time reduction) by automating calculations and generating reports in Word.
- Created VBA code to automate the sending of customer test reports that saved ~140 hours/year.
- Managed a ~$1.12 million/~$2.52 million capital project budget within 2% in 2018/2019 respectively.
- Lead internal standards creation, evaluation, and enforcement processes to ensure high quality documentation.
- Represented business unit as subject matter expert for meter testing compliance software working with operations to ensure proper documentation and IT for proper data storage and upgrades.

Pierpont Community and Technical College; Fairmont, WV

Adjunct Gas Measurement Instructor — Four Semesters from 2020-2024

- Created open source online textbook for Gas Measurement class, available at michaelwfouts.github.io/gas-measurement-book.
- Lead development of orifice meter lab using 3D printed single chamber orifice meters to enhance the hands on learning of students. Included working with contractors to create models, securing funding from Pierpont, and learning how to print the meters on a personal printer.
- Taught Gas Measurement course required for second year students in the Petroleum Technology Associates program. Educated students on a curriculum combining hands on and lecture learning. Developed online components to better accommodate during the COVID-19 pandemic.
- Started and funded the Excellence in Gas Measurement Award to recognize student success in 2023 and 2024.

National Aeronautics and Space Administration (NASA) IV & V; Fairmont, WV

NEAP Intern — Summer 2011/2013

- Created failure traces within James Webb Space Telescope's fault management database
- Conducted advanced software analysis on a model of the International Space Station's Carbon Dioxide Removal Assembly Model (CDRA) using MATLAB and Simulink

Honors and Awards

2024-2025 Appalachian Basin GPA Midstream Scholar
2017 West Virginia University Outstanding Senior (Top 1% of all West Virginia University)
2013-2017 Statler Engineering Excellence Scholar
2013-2014 Statler Undergraduate Research Scholar
2013 WVU Neil S. Bucklew Scholar
2013 Dominion Memorial Scholar

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Service and Leadership

2022-2023 Vice President of Chemical and Biomedical Engineering Graduate Student Organization
2016-2017 Vice President of Engineers Without Borders Chapter at WVU
2016-2017 Treasurer of WVU American Institute of Chemical Engineers Chapter at WVU
2016-2017 Undergraduate Academic Affairs Committee Representative
2015-2017 Omega Chi Epsilon (Chemical Engineering Honorary)
2014-2017 Tau Beta Pi Member (Engineering Honorary)
2014-2016 PR Officer/Webmaster for Engineers Without Borders Chapter at WVU
2014-2015 President of Helvetia (WVU Honorary)
2013-2015 WVU Campus Tutor
2013-2014 Intramurals Captain for Engineers Without Borders Chapter at WVU

Conference Presentations

- 2024, Michael W. Fouts, Fernando Lima, David Mebane AIChE (American Institute of Chemical Engineers) - *Fast Training Physics Informed Machine Learning Models Using Gaussian Processes*
- 2024, Michael W. Fouts Derek P. Slack, Fernando Lima, David Mebane AIChE (American Institute of Chemical Engineers) - *Modeling Online Dynamic Processes with Fast Training Gaussian Processes*
- 2018 and 2019, Michael W. Fouts, Alysia Salva Appalachian Underground Corrosion Short Course – *The Effects of Natural Gas Quality on Internal Corrosion*
- 2017, E. Ciftyurek, X. Xie, M. Fouts, K. Sabolsky , J. W. Zondlo, J. Wang, and E. M. Sabolsky. *Electrochemical Double Layer Supercapacitor (EDLC) Fabricated with Activated Carbon Derived from Eastern White Pine.*

Service to Field

- Peer Reviewer for Chemical Engineering Science (1 review in 2025)

Skills

Software and Programming - Proficient in Python, SQL, R, VBA, Git, Jupyter Notebooks, AWS (EC2, S3, CodeCommit), LaTeX, GitHub, Aspen Plus, CHEMCAD, Qlik, Tableau, Anaconda, VS Code, and Microsoft Office.
Equipment - A wide variety of Meters including Ultrasonic, Coriolis, Turbine, Orifice, Rotary, and Diaphragm; Gas Chromatographs; Oxygen, Moisture, and Sulfur Analyzers; Pressure, Temperature, and Differential Pressure Transmitters; Flow Computers and PLC's; Control Valves and Instrumentation; Regulators; and Actuators

Certifications

AWS Certified Cloud Practitioner (Valid through Sept. 9, 2024)

References

References are available upon request