# Donovan Quimby
**Mechanical Engineer | Data Scientist**

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Erie, Colorado     U.S Citizen | Security Clearance: Secret (2003 – 2013)

## Professional Profile

Engineer, data analyst, and U.S. Navy veteran with expertise in disciplines including thermal fluids engineering, data analysis, and managing diverse teams. Passionate about forming, leading, and driving multi-disciplinary teams to solve unique and novel problems within Waterfall, Agile, and hybrid management methodology environments.

## Education

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| M.S. Data Analytics | Georgia Institute of Technology, Expected May 2022 |
| M.S. Mechanical Engineering | San Diego State University, 2015, Energy and Thermofluids Specialization |
| | Thesis: Large Eddy Simulation of a Supersonic Underexpanded Jet: Comparison of a Low-order Finite Volume(Converge™) and High-order Hybrid Central/WENO-Z Scheme |
| B.S. Mechanical Engineering | University of Massachusetts Amherst, 2003 |

## Technical Expertise

- Expert in a variety of CFD, combustion, heat transfer, 1D system-level simulation, and laser-based optical spray characterization
- Contributing to proposals, performing tasks, and presenting results for various DOE, DOD, and commercial customer projects
- Creating and managing teams to effectively meet schedules and requirements
- Machine learning for clustering, classification, regression, anomaly detection, time-series analysis, optimization, discrete event simulation
- Machine learning/physics-based model integration
- Microsoft Project, ProjectLibre, Azure and Git DevOps (Agile), Microsoft Suite, Python, R, MATLAB, SQL, Spark, Scala, JS, D3.js, Bash, Linux, AWS, GCP, Databricks

## Professional Experience

### Flatiron Analytics, LLC.  – Owner                                          July 2020 – Present

#### Ricardo Engineering Inc. - Contract Engineer                          July 2020 – Present

- Engineering analyst providing Computational Fluid Dynamics (CFD), thermal fluid system, performance, and emissions analytic services
- General data analytic services such as data extraction, transformation, loading, and modeling using various data analytics and machine learning techniques
- Provide technical support and consultation on multiple engineering service proposals
- Capture and analyze high-speed images of fuel sprays using pulsed Nd:YAG shadow imagining techniques, as well as documenting detailed technical procedures of methodology

#### Client Confidential – Consultant Data Scientist                       July 2020 – Present

- Provide data science consultation services for $100M dollar cybersecurity proposal

# Achates Power Inc.                                                        Nov 2008 – Mar 2020

## Senior Engineer, CFD                                                     Jan 2015 – Mar 2020

- Advance development of in-cylinder combustion CFD models and sub-models including multi-phase reacting flows, turbulence, and heat transfer models
- Development of numerous pre and post-simulation analysis scripts using Matlab, Python, and R which dramatically reduced simulation setup and analysis time
- Employ machine learning, data mining, and statistical analysis methods such as hypothesis testing, regression, classification, and data mining techniques to build models, identify patterns, and analyze data collected from laboratories, simulation, and engine test cells
- Lead Engineer responsible for overseeing the collection, processing,  storage, and analysis of data collected in the fuel system and laser diagnostics lab
- Ensure data integrity and hardware safety by employing statistical testing, change monitoring, and error checks
- Create and present papers, presentations, and proposal materials to effectively communicate information to both technical and non-technical audiences
- Build and deploy interactive web apps, dashboards, and automatically generated reports using tools such as Knitr, Shiny, and Jupyter Notebook
- Design experiments and test plans using design of experiment (DOE) techniques tailored to specific applications and goals including factorial, screening, response surface, Latin hypercube, and other space-filling techniques

## Combustion System Lead Development Engineer                             Feb 2015 - Mar 2020

### U.S. Army TARDEC Advanced Combat Engine (ACE)

- Construct, operate, and maintain computational fluid dynamics (CFD) and combustion models for Opposed Piston Two-Stroke (OP2S) diesel combat engines
- Create conjugate heat transfer models and techniques used for thermal analysis of transient combustion events on moving pistons and cylinder liners
- Developed a statistical model calibration technique to increase model accuracy across the engine operating range, identify influential model tuning parameters, and quantify model uncertainty
- Optimized combustion system design, configuration, and calibration, which exceeded customer metrics for fuel consumption, emissions, and heat rejection, securing a $47 million phase II development contract

## Combustion System Development Engineer                                   Apr 2016 – Jul 2019

### DOE ARPA –E Gasoline Compression Ignition Medium Duty Multi-cylinder OP Engine

- Managed and directed gasoline compression ignition (GCI) and diesel combustion simulation teams consisting of cross-functional experts from industrial partners, DOE National Laboratories, and in-house combustion engineers.
- Construct, operate, and maintain computational fluid dynamics (CFD) and combustion models for Opposed Piston Two-Stroke (OP2S) GCI  and diesel engines
- Identified fundamental limitations of available computational combustion CFD codes concerning low-temperature chemical kinetics, ignition delay, and initial condition sensitivity for GCI simulation and prediction
- Constructed and managed multi-path work plans to mitigate GCI combustion simulation shortfalls to meet program deadlines and metrics
- Optimized a combustion system design, configuration, and calibration which exceeded customer metrics for both GCI and diesel versions of the engine securing a follow on program
- Evaluated state of the art combustion CFD techniques, models, and software to determine suitability for GCI combustion analysis

### Performance and Emissions System Engineer                    Oct 2010 – Dec 2015

- Built, validated, and employed 1D system-level simulation models to analyze and optimize the performance and emissions of internal combustion engines
- Conducted analysis and made recommendations on different air handling recipes including turbo, supercharger, charge air cooler, and after treatment selection and configurations for a variety of engine sizes and applications
- Analyzed intake and exhaust pressure wave dynamics and recommend designs to minimize impacts on multi-cylinder OP2S engines ranging from one to twelve cylinders
- Developed 1D brake model able to accurately capture braking performance and down-cylinder gas temperatures
- Devised, validated, and patented trapped burn fraction control algorithms specific to OP2S engine operation and control

### Fuel Systems Engineer                    Nov 2008 – Sep 2010

- Responsible for managing Fuel Systems Laboratory for testing and calibrating of various high-pressure fuel system components including pumps, injectors, sensors, controllers, and rails
- Measured size, velocity, and concentration of atomizing sprays using laser Phase Doppler anemometry (PDA)
- Determined spatially resolved droplet size distribution using Planar Laser-Induced Fluorescence (PLIF)
- Captured high-speed images of fuel injections using pulsed Nd:YAG shadow imagining techniques
- Characterized component flow fields using Particle Image Velocity (PIC) techniques
- Designed critical components and develop testing techniques for high-speed endoscopic visualization of in-cylinder combustion of OP2S engines

### United States Navy                    Sep 2003 – Sep 2008
#### Sonar Technician

- Managed working divisions of five or more personnel to ensure maintenance, training, and certifications meet and exceeded standards
- Analyzed, interpreted, and recommended actions in response to real-time acoustic data compiled from passive and active shipboard and remote sensors
- Created, presented, and disseminated daily and weekly situation briefs used for strategic planning
- Maintained, troubleshot, and repaired acoustic detection systems and sub-systems
- Qualified and practiced Combat System Watch Officer responsible for overseeing all of a ships combat system maintenance, determining the severity and extent of equipment casualties, and coordinating personnel response to equipment casualty during port, underway, and combat operations
- Member of Non-Compliant Visit, Board, Search, and Seizure (VBSS) team responsible for conducting safety and customs inspections, anti-piracy operations, oil terminal security, and U.N. oil sanction and smuggling enforcement

### Univ. of Massachusetts  Electromechanical Engineering lab                    May 2002-Feb 2003
#### Undergrad Research Assistant - National Science Foundation Grant

- Participated in the design of a wireless, self-energizing pressure sensor for use in high-pressure injection molding machines
- Developed  Finite Element Analysis (FEA) models for modal and harmonic analysis of ultrasonic piezoelectric transducers
- Established experimental procedures and designed and fabricated hardware to test ultrasonic transducers
- Organized theoretical and experimental research into reports and presentations

# Publications, Presentations, and Patents

## Publications

Quimby, Donovan, and Gustaaf B. Jacobs. "Large Eddy Simulation of a Supersonic Underexpanded Jet with a High-order Hybrid Central/WENO-Z Scheme." AIAA SciTech Forum, (AIAA 2016-0497)

Sellnau, Mark, C., et al. "Fuel Injection System for Opposed-Piston Gasoline Compression Ignited (OP-GCI) Engines" No. 2019-01-0287. SAE Technical Paper, 2019.

## Presentations

Quimby, Donovan. "Large Eddy Simulation of a Supersonic Underexpanded Jet with a High-order Hybrid Central/WENO-Z Scheme" 54th AIAA Aerospace Sciences Meeting, 4 Jan 2016, San Diego, Ca.

## Patents

Nagar, Nishit, and Quimby, Donovan M. "Trapped burned gas fraction control for opposed-piston engines with uniflow scavenging." U.S. Patent No. 9,284,884. 15 Mar 2016.


# Select Data Science Projects

**Optimal Coordinated Plug-In Vehicle Charging**
Final Report Link: https://donovanquimby.github.io/pev_cord_charg/

**Neuroimaging Normative Age and Assessments Prediction Using Stacked Ensemble Learning**
Final Report Link: https://donovanquimby.github.io/neroimaging_ensemb_models/

**D3.JS Web Browser-Based Interactive Data Visualizations**
Website: https://donovanquimby.github.io/d3_examples/

**Binary Random Forest Classification Algorithm From Scratch**
Repository Link: https://github.com/donovanquimby/binary_random_forest_classifier.git

**Nonlinear Dimensionality Reduction Using Isomap Algorithm From Scratch**
Repository Link: https://github.com/donovanquimby/isomap_nonlinear_dim_reduction.git

**Expectation-Maximization (E.M.) Algorithm for Gaussian Mixture Model with Rank Reduction**
Repository Link: https://github.com/donovanquimby/em_gaussian_mixture_model_rank_reduction.git


# Professional Development

- Data Science: 10 Course Coursera Specialization, John Hopkins University, October 2019
- Python For Everyone: 5 Course Coursera Specialization, University of Michigan, August 2018
- Professional Certification: SAE Diesel Engine Technology Engineering Academy, June 2010