# Summary

## Areas of Expertise

* Data Science and AI
* Oil Production and Process

## Technical Skills

*Data Science:*

* Machine/Deep Learning
* Classification and Clustering
* Regression and Time Series
* Keras, Tensorflow, CNN, RNN, LSTM, ConvLSTM
* Pandas, Scikit-learn, Scipy, NumPy, PySpark, Matplotlib, Seaborn, Folium
* Big Data, Distributed ML, Databricks, Spark, Hadoop, Horovod, SystemML
* Python, SQL, Java, C++, JSON, Matlab
* Azure, IBM Cloud, AWS
* Google Map, Foursquare, ArcGIS APIs

*Production and Process:*

* OLGA, PIPESIM, SPS (Stoner), PIPEPHASE, PVTSim, Multiflash
* HYSYS, Unisim, ProMax

# Profile

A Professional Engineer with extensive data science experience and profound domain knowledge in oil production, field development, process engineering, and anomaly detection. As a subject matter expert, provides machine learning modeling, tuning and deployment support for production, and upstream facilities. Proven track record of new technology development. Strong teamwork and communication skills. Has published and presented 10+ peer-reviewed papers.

# Professional Experience

## Senior Lead Engineer

## Wood Group Plc, 2011 – Present

Lead data science and production system modeling. Develop Python data processing packages. Implement Machine Learning models in multiphase data analysis. Plan and execute flow assurance and data analysis activities. Develop and implement data analysis workflows, practices, and procedures. Create a Python tool kit to automate Pipesim simulations. Interface with subsurface and facilities engineers to optimize production for the whole life cycle. Mentor junior engineers. Facilitate design review and HAZOP. Estimate man-hours and prepare bid proposals. Deliver great presentations to management, clients, and peers.

*Selected Data Science Projects:*

#### Shale Gas Production Prediction

Developed deep learning models (CNN, RNN) to predict shale gas flow rate. Performed feature engineering analysis and selected the key features. Tuned the model to achieve an R-2 score above .97

#### Bottom Hole Pressure Prediction

Built a time series recurrent neural network (RNN) to predict a shale well bottom hole pressure. Reshaped 2-dimensional data for an LSTM layer input. The simulations showed great agreements with test data. Tuned the model for future 2-week pressure prediction.

#### Gathering Flowline Flow Pattern and Pressure Prediction

Cross validated different machine learning classification methods and optimized the XGBoost method to predict the flow pattern within flow lines. Used the predicted flow patterns as feature parameters for machine/deep learning models to improve pressure prediction by 1%.

#### Shale Wellhead Pressure and Liquid Holdup Estimation Using Machine Learning

Studied different regression methods to estimate the wellhead pressure. Performed a hyperparameter tunning for deep learning neural network models to increase the modeling accuracy.

#### Adjacent Well Flow Rate Estimation at Late Life

Tested Deep Neural Network, Gradient Boosting, Random Forest, SVR, SGD Ridge Regression methods to estimate the adjacent well flow rates. Optimized and increased the SVR model score by adding ‘holdup’ as an additional feature.

#### Blockage Location Detection Using Machine Learning

Developed Machine learning algorithms to detect the locations of blockages. Optimized collaborative filters and correlation methods to extract blockage features and calculate the locations of blockages.

#### Internal Project to Recommend New Office Location

Used the Foursquare API to get venue information for areas in Houston. Developed a K-means model to cluster the areas. Ranked potential new office area using a recommendation algorithm.

*Selected Flow Assurance and Process Projects:*

#### Saudi Aramco Jafurah Unconventional Development Projects

Headed a thermo-hydraulic analysis for shale development. Built a PID control system in OLGA to simulate well dynamic startup scenarios. Developed an OLGA solution to model solar radiation impact on above-ground pipelines. Optimized field layout using GIS-based PIPESIM models and machine learning techniques. Upgraded batch simulation by developing a Python tool in PIPESIM. Determined surface pressure for maximizing production in late life.

#### Shell/Williams Appomattox/Norphlet Gas Gathering Junction Facility Development

Led a startup and N2 removal analysis in OLGA for a Norphlet deepwater export line. Performed a thermo-hydraulic analysis for an Appomattox deepwater tie-back pipeline. Established hydrate, flare, and liquid management philosophies.

#### ConocoPhillips Montney Pipeline Project

Re-created well fluid from lab test data in Multiflash. Performed sizing and pigging simulations for various GORs in OLGA. Checked hydrate risk, and the adequacy of slugcatchers. Tuned wet crude viscosity against experimental data.

#### ConocoPhillips Permian Basin Delaware Infield Gathering FEL-1 Study

Led thermo-hydraulic analysis in PIPESIM from wellpads to the sale points. Optimized pressures, compression, and numbers of central facilities. Recommended gas lift compression location. Performed OLGA analysis for hydrate risk assessment and slugcatcher sizing. Directed manhour estimates.

#### ConocoPhillips Eagle Ford Shale Multiphase Flowline Analysis

Oversaw thermos-hydraulic analysis in PIPESIM for HP, LP, and gas lift pipelines for COP Eagle Ford shale gas gathering systems. Built GIS-based PIPESIM models, and validated the models against field data.

#### ExxonMobil Baton Rouge Pipeline Improvements

Conducted steady state and surge analysis in SPS for Propane and Butane systems. Calculated maximum pressures and unbalanced forces of the systems for various upset scenarios. Checked the adequacy of pumps.

#### Chevron Bay Area Pipeline Surge Analysis

Conducted steady state and surge analysis in SPS. Validated and tuned the models using field data. Calculated maximum capacities with DRA injections. Checked the safety relief device adequacy.

#### Saudi Aramco Khurais Increment Project

Conducted thermo-hydraulic analysis for satellite GOSP pipeline systems. Optimized loop line length and recommended the best solution. Developed a Python subroutine in SPS to simulate an energy recovery system. Performed surge analysis and checked the adequacy of the existing SRV systems. Tuned OLGA viscosity model and investigated into the impact of emulsion viscosity on wet crude pipeline hydraulics.

#### ExxonMobil Iraq Export Oil Pipeline Study

Conducted oil export pipeline flow assurance simulations in PIPESIM. Analyzed the adequacy of existing facilities. Authored technical reports.

#### Zirku Facilities Enhancement Study

Responsible for oil and gas separation HYSYS steady state and dynamic simulations. Checked PFD and P&ID. Conducted pipeline ramp-up analysis in OLGA, identified flow regime and liquid holdup for an investigation of vessel vibration. Supervised a separator CFD analysis by a sub-contractor. Generated heat and mass balance report and utility summary for an oil and gas processing plant.

# Previous Experience

## Data Processing Engineer, Circor Energy, 2008-2011

Responsible for the provision of data analytics knowledge to managers, project personnel, clients and third parties. Architected and implemented data analytics and visualization for anomaly detection. Developed data acquisition, and data processing workflows. Prototyped and commercialized a pipeline on-line monitoring system which enables detection of blockages and leaks in live subsea pipelines. Conducted JIP projects with universities and industrial clients, and mentored young engineers working towards professional status.

*Selected projects:*

*BP, Bruce Subsea Pipeline Project, North Sea*

*BP, Cleeton Subsea Pipeline Study, North Sea*

*Duke Energy (USA), Cooling Water Pipeline Hydraulic Study, South Carolina*

## Earlier experience, 1999 to 2008

The University of Manchester, 2006 to 2008 – Signal Processing Engineer Control Systems

The University of Nottingham, 2002 to 2006 – Research Assistant

Beijing Oriental Jicheng Company, Ltd., 1999 to 2002 – Process Engineer

# Qualifications

## Education

Postdoctoral Researcher, Electrical and Electronic Engineering, University of Manchester

Doctor of Philosophy (Ph.D.), Chemical and Environmental Engineering, University of Nottingham

Bachelor of Engineering, Processing Engineering, University of Science and Technology, Beijing

## Certifications / Licenses

Licensed Professional Engineer, Texas (#118804)

Chartered Engineer, Engineering Council, UK

IBM Data Science Professional Certifications