

## Summary

Data scientist and digital transformation lead with a background in computational mathematics & optimization, machine learning & applied stats; Scholar with sole-author papers in top journals (JCP, JPSE); 15+ years of analytics & software development experience in various environments.

## Education

- 2016 **Ph.D. Optimization & Spatial Statistics**, *Stanford University*, 3.95/4
- 2011 **Master of Science. Optimization**, *University of Tulsa*, Tulsa, OK, 4.0/4
- 2009 **Bachelor of Science with honors in Chemical Eng**, *Sharif University*, Tehran, 3.85/4
- 2009 **Bachelor of Science with honors in Mechanical Eng**, *Sharif University*, Tehran, 3.8/4

## Experience

- 2016–2020 **Staff Data Scientist**, *GE (Oil & Gas)*
  - Experience involved both customer facing projects and internal projects for developing new product
  - Developed and lead automation of processes to generate predictive models from a continuously updated database. An example is **autoML** which involves various mathematical optimizations to explore the space of most promising machine learning models. This accelerated progress in digital transformation and *saved thousands of person-hours*, in projects such as **equipment maintenance, digital twins development, prescriptive design**.
  - Collaborated with DCF product-line to develop strong digital twins, that monitor & calibrate real-time properties and recommends optimal decisions.
  - Developed several object-oriented Python classes to automate descriptive, predictive, and prescriptive analytics applications; deployed analytics on Microsoft Azure.
  - Developed algorithms to quantify uncertainty in predictive models (for sampling Posterior pdf) for risk analysis and optimization/decision-making under uncertainty.
  - Invented and developed various elements of an offset well analysis project, such as detailed statistics, time-based statistics, and automated performance analysis. This contribution unlocks a potential to save **\$100 million** in operations.
  - Developed a comprehensive data analytics and machine learning framework for optimization of hydraulic fracturing for Diamondback Energy (improved profit is on the order of **\$ 1 million** per design).
- 2013–2014 **Optimization Expert**, *QRI*
  - Developed a toolbox for automated data assimilation & model calibration. The product has been applied for various clients and several large-scale projects.
  - Developed a toolbox for optimization of sequence of operations.
  - Designed & implemented a data science framework to generate very fast reduced-order models for reservoir simulation. The machine learning model could accelerate the simulations by a factor of (at least) 100x.
  - Designed & implemented a general derivative-free optimization toolbox with general constraint handling techniques. This code has been applied in various projects in QRI by engineers to automate model calibration processes or production optimization projects.
- 2016 **Postdoctoral scholar**, *Stanford University*
  - Developed a new multi-objective optimization algorithms to explore Pareto Surface of multiple objectives.
- 2009–2011 **Research Assistant**, *TUPREP at University of Tulsa*
  - Developed new TSVD-based algorithms for massive inverse problems/data assimilation projects.
- 2007–2009 **Analytics Engineer**, *North Drilling Company*
  - Developed a tool for automated analysis of time-series data for anomaly detection and recommending optimal parameters
- 2005–2007 **Mechanical Engineer**, *Gorgan Metals*

## Tools & Skills

<b>Coding</b>	Python, R, C++, FORTRAN, MATLAB	<b>Computing</b>	Google Cloud Platform, Amazon AWS, Microsoft Azure
<b>Libraries</b>	NumPy, Pandas, SciPy, dask, scikit-learn, TensorFlow, Keras, Matplotlib, Seaborn	<b>Data Analytics</b>	Dataiku, RapidMiner, Tableau, Alteryx
<b>Optimization</b>	convex/non-convex, linear/nonlinear, constrained/unconstrained, gradient-based/derivative-free optimizations	<b>Others</b>	Jupyter notebook, GitHub, Azure DevOps, H2O
<b>SQL</b>	Microsoft SSMS	<b>Clustering</b>	kmeans, kmedoids, PCA

## Honors and Awards

- 2004 Ranked 34th nationwide (among 500,000 participant) and 2nd in the State of Golestan in National University Examination in math and physics (Konkour), Iran
- 2014 Awarded for 'Science as Art' competition at Stanford School of Earth Sciences research review
- 2012 Recipient of the SPE Star Fellowship Award in the Western North America Region
- 2011 Member of Phi Kappa Phi National Honor Society

## Selected Courses

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| Stanford | <ul style="list-style-type: none"> <li>o (CS 229) Machine Learning</li> <li>o (Stats 306) Unsupervised Learning</li> <li>o (EE 364) Convex Optimization</li> </ul> | <ul style="list-style-type: none"> <li>o (EE 365) Stochastic Decision Making</li> <li>o (CME 338) Large scale optimization</li> <li>o (CS 106 B) Programming Abstractions</li> </ul> |
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## Journal Publications ( 315 citations | h-index: 8)

- 2019 Shirangi, MG, Closed-loop field development with multipoint geostatistics and statistical performance assessment, Journal of Computational Physics
- 2018 Shirangi, MG, LJ Durlofsky. Joint optimization of economic project life and well controls, SPE Journal
- 2018 Tahmasebi, P, M Sahimi, MG Shirangi. Rapid learning-based and consistent model calibration, TiPM journal
- 2016 Shirangi, MG, LJ Durlofsky. A general method to select representative models for decision making and optimization under uncertainty, Computers & Geosciences
- 2016 Shirangi, MG, AA Emerick. An improved TSVD-based Levenberg-Marquardt algorithm for history matching and comparison with Gauss-Newton, JPSE.
- 2016 Shirangi, MG, LJ Durlofsky. Closed-loop field development under uncertainty by use of optimization with sample validation, SPE Journal
- 2014 Shirangi, MG. History matching production data and uncertainty assessment with an efficient TSVD parameterization algorithm, JPSE.

## Selected conference papers and invited talks

- Sep 2019 Shirangi MG. Automated machine learning in modern data science: advances and opportunities | DevFest organized by GDG, Houston, TX.
- April 2018 Shirangi MG, Statistical Assessment of Closed-Loop Field Development (CLFD) Optimization | Louisiana State University (LSU). Department Seminar, Baton Rouge, LA.
- Feb 2017 Shirangi MG, Volkov O, Durlofsky LJ, Joint optimization of economic project life and controls. Paper SPE-182642 presented at SPE Simulation Conference, Houston, TX.
- 2016 Shirangi MG, Durlofsky LJ, Selection of representative models for decision making and optimization under uncertainty. AGU fall meeting, SF, CA.
- 2015 Shirangi MG, Durlofsky LJ, An Efficient Robust Production Optimization Method for Closed-loop Reservoir Management. SIAM Conference on Mathematical & Computational Issues in the Geosciences, Stanford, CA.
- 2012 Shirangi MG, Applying Machine Learning Algorithms to Production Optimization, Stanford, CA.

Houston, TX