# **Ali Zarreh, Ph.D.**

San Antonio, TX| [LinkedIn](http://www.linkedin.com/in/ali-zarreh) | [zarreh.ai](http://zarreh.ai/) | [GitHub](https://github.com/zarreh) | [Google Scholar](https://scholar.google.com/citations?hl=en&user=BOhaCCAAAAAJ) | 210-446-8687 | [alireza.zarreh@gmail.com](mailto:Alireza.zarreh@gmail.com)

**Professional Summary**

Seasoned Data Scientist with extensive experience in developing and deploying machine learning and deep learning models for retail analytics, optimizing business operations, and leading data-driven decision-making processes. Proven track record in enhancing predictive modeling, forecasting accuracy, and operational efficiency, with a strong foundation in technical leadership and cross-functional collaboration.

**EDUCATION**

**University of Texas at San Antonio,** Klesse College of Engineering **San Antonio, TX**

*Doctor of Philosophy (Ph.D.) Mechanical and Manufacturing Systems Engineering 2019*

**University of Tehran,** Faculty of Engineering **Tehran, Iran**

*Master of Science in Mechanical Engineering (manufacturing and mechatronic focus) 2008*

**Azad University** **NajafAbad, Iran**

*Bachelor of Science in Mechanical Engineering (manufacturing) 2005*

**Technical Skills and Competencies**

* **Programming Languages & Development:** Advanced expertise in Python, R, SQL, and Scala. Practical knowledge in Java and C++ for broader application contexts.
* **Machine Learning & Deep Learning:** Proficient in employing deep learning frameworks like TensorFlow, Keras, and PyTorch for predictive modeling and forecasting. Skilled in machine learning algorithms via Scikit-learn, XGBoost, and Spark MLlib.
* **Big Data Technologies:** Expert in using Spark, Hadoop and Ray for data processing and distributed computing at scale.
* **Optimization & Forecasting:** Skilled in applying optimization techniques and time-series analysis for effective forecasting, particularly in retail and e-commerce contexts.
* **Quantitative Analysis:** Strong background in statistical analysis, mathematical modeling, and hypothesis testing to support data-driven insights and recommendations.
* **Cloud Computing & DevOps:** Demonstrated expertise in cloud platforms like GCP, AWS, and Azure Databricks, and in DevOps tools for deployment and CI/CD processes.
* **Data Architecture & Engineering:** Competent in designing and implementing robust data architectures, ensuring data quality and accessibility for analytics purposes. Experienced in using Dataform for data modeling and preprocessing workflows.
* **Operationalization & Scaling:** Proficient in deploying scalable machine learning models and integrating them into production environments, using tools like Vertex AI for ML pipelines and MLOps.
* **Collaboration & Leadership:** Demonstrated ability to lead cross-functional teams and collaborate with stakeholders to drive data-driven decision-making. Effective mentorship of junior data scientists and interns, fostering a culture of learning and innovation.
* **Data Visualization & Business Intelligence:** Skilled creating interactive dashboards and plots with Dash, Flask and plotly for creating actionable insights. Familiar in Tableau and MS BI, with experience in Google Data Studio.
* **Strategic Thinking:** Proven ability to translate complex data insights into strategic business recommendations, contributing to improved operational efficiencies and revenue growth.

**PROFESSIONAL EXPERIENCE**

**H.E.B, Inc San Antonio, Texas**

*Senior Data Scientist February 2020-present*

* Supply chain project
* Assortment planning projects
* Gforce (Generative AI force) contributing to multiple GenAI projects for recipe chatbots, leverging Open AI fine-tuned or RAG.
* Led the design and implementation of a forecasting engine using Ray, VertexAI on GCP and Dataform, using various local and global models from conventional time series to state of art deep learning techniques achieving a 9% error reduction and a 15% reduction for promoted items, enhancing inventory efficiency by 5%.
* Transformed promotional forecasting platform to Pyspark distributed computing from R and scala, revisit and upgrade the logics and models in AWS which resulted in 2% reducing in error and astonishing nearly 70% in runtime.
* Developed PipeLearner, a Spark distributed package, cutting down model training and deployment time by over 50%.
* Directed multiple price/promotion optimization projects, consisting delivering both the predictive and prescriptive modeling, using XGboost and Linear family models at scale for predictive part and use linear programming and meta-heuristics for optimization, resulting in extreme satisfaction in super users, increasing revenue for markdown products by 5%, reduce stock out and expiring products.

**University of Texas at San Antonio San Antonio, Texas**

*Research Assistant/Instructor/Teaching Assistant 2016- 2019*

* Enhanced predictive accuracy in educational research using advanced statistical and machine learning techniques, significantly influencing student success strategies.
* Conducted actionable cybersecurity research with a game theory approach, enhancing security for manufacturing data systems.
* Improved shop floor scheduling efficiency in a virtual manufacturing environment using optimization algorithms.

**Reef Chemical Industries Complex Esfahan, Iran**

*Manufacturing/Enterprise Data Analytics Manager 2013- 2015*

* Developed and implemented a machine learning-based anomaly detection system for predictive maintenance, reducing machinery downtime by 30% and saving the company over $200K annually. Utilized Python, Scikit-Learn, and TensorFlow to analyze real-time operational data, effectively identifying potential failures and enhancing maintenance schedules.
* Implemented predictive maintenance models, significantly improving operational efficiency and equipment lifespan.
* Designed comprehensive data structures for operations tracking, boosting data analysis productivity and decision-making.

**Isfahan Steel Complex Esfahan, Iran**

*Data Analyst/Consultant 2009- 2013*

* Led the implementation of an optimized maintenance system, reducing unplanned downtime significantly through improved machinery health forecasting.
* Applied statistical analysis to emergency maintenance data, achieving a marked reduction in emergency repairs.

**TEACHING EXPERIENCE**

**University of Texas at San Antonio San Antonio, Texas**

*Instructor and Teaching Assistant II 2016- 2019*

* Instructor: Engineering Graphics and Practice (ME1403)
* Teaching Assistant: Linear & Mixed Integer Optimiz (EGR6033), Machine Learning and Data Analytics (ME5433), Adv Mfg Systems Engineering (ME5603), Engineering Graphics and Practice (ME 1403 labs, Solidworks), Material Engineering Lab (ME 3113)

**Azad University Eghlid, Iran**

*Faculty member, department of Manufacturing System and Industrial Engineering 2008- 2014*

**Projects**

* Led the development of an AI-driven platform to assist PhD applicants in selecting optimal universities and advisors, leveraging OpenAI and Claude LLMs. Engineered a multi-stage pipeline that:

1. Automated Data Collection: Programmed LLMs to preprocess and extract relevant academic data from multiple websites.
2. Knowledge Integration: Implemented a Retrieval-Augmented Generation (RAG) model to create a dynamic knowledge base, enhancing the LLM's response accuracy to user queries.
3. Application Tools: Developed auxiliary AI tools to refine resumes, personalize Statements of Purpose (SOP), and generate tailored emails for applicant-professor communications.
4. Continuous Improvement: Fine-tuned the model using best practices derived from user feedback, significantly improving platform reliability and user satisfaction.

**PhD Applicant Assistance Tool**

* Developed a comprehensive tool using OpenAI and Claude models to assist PhD applicants in selecting universities and advisors. Initiated by automating data collection from websites and preprocessing it for input into an LLM.
* Implemented a Retrieval-Augmented Generation (RAG) pipeline to create a dynamic knowledge base, enabling real-time, accurate responses to student inquiries about academic programs and faculty.
* Enhanced user experience by integrating features to refine resumes, customizing Statements of Purpose (SOPs), and generate tailored email communications with prospective advisors, leveraging advanced NLP techniques to ensure relevance and personalization.

**MMA Fighter Performance Analysis Tool**

* Designed and executed a data extraction pipeline to gather detailed information on MMA fighters and their match histories from various websites, utilizing advanced web scraping techniques.
* Applied network analysis to construct and analyze a graph of fighters' performances and relationships, employing domain-specific rules to innovate a ranking system based on achievements and match outcomes.
* Developed a custom ranking algorithm to objectively assess and rank MMA fighters, enhancing insights into performance trends and competitive standings in the sport.

**Collaborated with the University of Nebraska at Omaha on a predictive modeling project**

* Developing models to estimate the mechanical properties of human femoropopliteal arteries, critical for customizing stent designs. Utilized demographic and risk factor data to predict nonlinear orthotropic mechanical properties. Co-authored a paper titled "Predicting Nonlinear Orthotropic Mechanical Properties of Human Femoropopliteal Arteries Using Demographics and Risk Factors," currently under review.

**Notable publlications**

* Kamenskiy A., Jadidi M., Razian S., **Zarreh A**., Shahbad R.(2025). Predicting Nonlinear Orthotropic Mechanical Properties of Human Femoropopliteal Arteries Using Demographics and Risk Factors. *Acta Biomaterialia*, (Under review)
* **Zarreh A.,** Zarreh M., Saygin C., & Wan H. (2025). Optimizing Cybersecurity in Cyber-Physical Manufacturing Systems: A Game-Theoretic Approach and Quantal Response Equilibrium Study. *Journal of Future Sustainability*, 5, 179-194.
* Bracho, A., **Zarreh, A.,** Saygin, C., Wan, H., & Lee, Y. (2021). Evaluation of Dynamic Scheduling Policies against Cyber-attacks on an Open-Shop Manufacturing System using Simulation. *Int. J. of Multidisciplinary and Current research*, 9, 395-404.
* Al Janahi R., Lee Y., **Zarreh A.,** &Wan H. (2020). Effectiveness and Fitness of Production Line to meet customers' demand. *Procedia Manufacturing*, 51, 1348-1354.
* **Zarreh, A**., Lee, Y., Al Janahi, R., Wan, H., & Saygin, C. (2020). Cyber-Physical Security Evaluation in Manufacturing Systems with a Bayesian Game Model. *Procedia Manufacturing*, 51, 1158-1165.
* Shahin, M., Bouzary, H., **Zarreh, A**., Chen, F. (2020). Frameworks Proposed to Address the Threat of Cyber-Physical Attacks to Lean 4.0 Systems. *Procedia Manufacturing*, , 51, 1422-1430.
* **Zarreh, A**., Lee, Y., Al Janahi, R., Wan, H., & Saygin, C. (2021). Evaluation of Cybersecurity in Cyber-Physical Manufacturing Systems with Game Theory Approach and Quantal Response Equilibrium. *Journal of Industrial and Production Engineering*, Submitted.
* **Zarreh, A**., Lee, Y., Al Janahi, R., Wan, H., & Saygin, C. (2021). Cybersecurity Risk Management Framework in Cyber-Physical Manufacturing Systems Using Failure Mode and Effects Analysis (FMEA) and Game Theory. *Journal Risk Analysis*, Submitted.
* Nie, L., **Zarreh, A**., & Wan, H. (2020). A game-theory approach for optimizing of shop floor scheduling in virtual manufacturing network*. Journal of Scheduling*, Under review.
* Bracho, A., **Zarreh, A**., Saygin, C., Wan, H., & Lee, Y. (2020). Evaluation of Dynamic Scheduling Policies against Cyber-attacks on an Open-Shop Manufacturing System using Simulation. *Journal of Industrial and Management Optimization*, Under Review.
* Al Janahi, R., Wan, H., & **Zarreh, A.** (2019). Implementing Kaizen through a Lean RACE Model: A Case Study. *Proceedings of IISE. Presented at the Institute of Industrial and Systems Engineers (IISE) Annual Conference*, Orlando, Florida.
* **Zarreh, A**., Wan, H., Lee, Y., Saygin, C., & Al Janahi, R. (2019). Cyber-Security Concerns for Total Productive Maintenance in Smart Manufacturing Systems. *Procedia Manufacturing*, 38, 532-539.
* **Zarreh, A**., Wan, H., Lee, Y., Saygin, C., & Al Janahi, R. (2019). Risk Assessment for Cyber Security of Manufacturing Systems: A Game Theory Approach. *Procedia Manufacturing*, 38, 605-612.
* **Zarreh, A.**, Janahi, R. A., Wan, H., & Lee, Y. (2019). Factors Contributing to Success in an Introductory Mechanical Engineering Course: A Data-Driven Case Study. *Proceeding of ASEE GSW*. Presented at the American Society for Engineering Education Gulf-Southwest Section, Tyler, Texas.
* **Zarreh, A**., Saygin, C., Wan, H., Lee, Y., & Bracho, A. (2018). A game theory based cybersecurity assessment model for advanced manufacturing systems. *Procedia Manufacturing*, 26, 1255–1264.
* **Zarreh, A**., Saygin, C., Wan, H., Lee, Y., & Bracho, A. (2018). Cybersecurity Analysis of Smart Manufacturing System Using Game Theory Approach and Quantal Response Equilibrium. *Procedia Manufacturing*, 17, 1001–1008.
* Bracho, A., Saygin, C., Wan, H., Lee, Y., & **Zarreh, A.** (2018). A simulation-based platform for assessing the impact of cyber-threats on smart manufacturing systems. *Procedia Manufacturing*, 26, 1116–1127.