

# Ali Firooz

( Seyed Ali Firooz Abadi )  
Computer Science, PhD · Chemical Engineer, MS  
State College, PA 16801

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## Summary

- Highly motivated interdisciplinary scientist with expertise in **data science, machine learning, artificial intelligence**, and **chemical engineering**, driven by a passion for leveraging cutting-edge technologies to solve complex real-world problems.
- 3+ years** of hands-on experience in developing robust data management pipelines, high-performance databases, and scalable architectures to process, analyze, and extract insights from complex, high-throughput datasets.
- Proficient in applying advanced data processing techniques, including dimension reduction, machine learning algorithms, and deep learning models, to build accurate predictive models and enable data-driven decision-making.
- Experienced in leveraging deep learning techniques to solve real-world problems in areas such as signal classification, image classification, sentiment analysis, and natural language processing.
- Collaborating with prestigious institutions, including **Prisma Health Cancer Institute** and **School of Medicine Greenville**, to drive innovative research and develop novel approaches to cancer profiling and patient outcome prediction.

## Skills

<b>Programming</b>	<b>Fluent:</b> Python, SQL/MySQL, Shell/Bash   <b>Prior Experience:</b> R, C++, C#
<b>Frameworks</b>	PyTorch, Scikit-learn, Numpy, Pandas, Matplotlib, SciPy, Multiprocessing & AsyncIO, TensorFlow, .Net
<b>Web Development</b>	Flask, HTML, CSS, JavaScript, TypeScript, PHP, Bootstrap
<b>Technologies</b>	<b>Fluent:</b> Azure, Git, GitHub, Docker, LaTeX, Linux   <b>Prior Experience:</b> AWS, Azure DevOps, SAS, Tableau
<b>Tools</b>	Experimental Design and Statistical Analysis (Minitab), Design Expert, Emacs & Vim, VSCode & JetBrains
<b>ChemEng. Softwares</b>	ANSYS Fluent, SpaceClaim, ICEM, PDMS & Piping, HYSYS
<b>CFD Models</b>	UDF, UDM, DPM, Multiphase Models, Mesh motion, Dynamic mesh, Combustion

## Experience

### University of South Carolina

Jan 22 - Present

Graduate Research Assistant

Columbia, SC, US

- Managed high-throughput liquid chromatography-mass spectrometry (LCMS) data (**over 6.9 billion data points** across 78 files), storing it into a MySQL database by leveraging the advantages of SQLAlchemy's asyncio methods to expedite the process. Explored neural networks like ResNet and CNN to differentiate between cancerous and surrounding tissues based on the processed data
- Applied dimension reduction techniques (PCA, t-SNE, ISOMAP) to perform cluster analysis and reveal natural groupings in data comprising over **77,000** small molecules and their chemical descriptors. Performed retention time prediction for these small molecules based on their chemical descriptors. Trained baseline models for initial feature selection and data understanding.
- Designed a Cancer-Profiling Database adhering to normal form standards, and utilized SQLAlchemy's Object Relational Mapping (ORM) for MySQL connectivity. The database currently holds over 10,000 records and continues to grow
- Developed a Python pipeline for parsing, cleaning, verifying, and loading data onto the database, leveraging multiple frameworks including Numpy, Pandas, etc. The data are processed from Prisma Health, enhancing the efficiency and accuracy of data management processes
- Conducted research on machine learning (ML) algorithms (using the Scikit-Learn library), including tree-based methods (Decision Trees, Random Forest), and gradient boosting techniques (XGBoost, AdaBoost, CatBoost), to classify patient responses to different combinations of 65 medications. Employed evaluation metrics (CM, F1, recall, precision, etc.) to assess model performance. Visualized the result (using SHAP) for enhanced interpretability and decision-making, while addressing class imbalance issues (using down sampling, SMOTE) and ensuring robust and reliable predictions.
- Contributed to the development of TransONet, a deep learning model with ResNet encoders and Transformer bridges integrated into a UNet structure, achieving **93.5% Dice accuracy** for aortic segmentation in CT scans.
- Led a **5-member team** in developing an End-to-End Web App (Certificate Management System) in an Azure Cloud Native environment. Leveraging various Azure services including SQL Database, Service Bus, Function Apps (with Blob Storage and Service Bus triggers), Logic Apps (with Microsoft 365 Outlook connector), and Data Factory. Applied agile methodologies and CICD practices throughout the development process. Implementing features such as data integration from external feeds, CRUD operations with notifications, dashboard, user profile, and certificate catalog. Used Dotnet (.NET) Entity Framework Core, .NET Core 7.0 (C#), REST API, and React, in addition to following a microservice architecture with serverless components.
- Classified images using Vision Transformer (ViT) architectures using PyTorch and Lightning following object orientation programming (OOP).
- Conducted sentiment analysis on TripAdvisor reviews dataset using Hugging Face ALBERT model, including text tokenization, and fine-tuning.

## Chemistry and Chemical Engineering Research Center of Iran

Graduate Research Assistant (Chemical Eng)

Jan 16 - May 20

Tehran, Iran

- CFD Simulation of a pilot-scale Bubble column reactor: Hydrodynamics, Temperature, and Concentration
- Study of Process Parameters on Crystal Size Distribution and Crystallization Hydrodynamics
- Polymeric composite rheology analysis and characterization

## Education

### University of South Carolina (USC)

PhD & MS in Computer Science and Engineering

Jan. 2022 - Present

SC, US

- GPA: 3.72 /4 (updated Jan 2025)
- Enrolled in a dual-degree program and **awarded my MS in CS in December 2024**
- Relevant coursework: Advanced Algorithms, Database System Design, Artificial Intelligence, Deep Learning

### Chemistry and Chemical Engineering Research Center of Iran (CCERC)

MS in Chemical Engineering

Sep 2016 - Mar 2019

Tehran, Iran

### Arak University

BS in Chemical Engineering

Sep 2012 - Aug 2016

Arak, Iran

## Honors & Awards

2023	<b>AACR Associate,</b>	The American Association for Cancer Research	US
2023	<b>First Place in the Cancer Category,</b>	INBRE SE IDeA Conference	US
2023	<b>Highest Scoring Graduate Student,</b>	INBRE SE IDeA Conference	US

## Certificates

2023	<b>Machine Learning Specialization,</b>	tinyurl.com/ML-specialization	Stanford University
2023	<b>Intermediate Deep Learning with PyTorch,</b>	tinyurl.com/DL-PyTorch2	DataCamp
2023	<b>Unsupervised Learning, Recommenders, Reinforcement Learning,</b>	tinyurl.com/unsupervised-ML	Stanford University
2023	<b>Advanced Learning Algorithms,</b>	tinyurl.com/adv-algo	Stanford University
2023	<b>Supervised Machine Learning: Regression and Classification,</b>	tinyurl.com/supervised-ML	Stanford University
2023	<b>Biomedical Investigator,</b>	tinyurl.com/citibiomed	CITI Program
2019	<b>Advanced ANSYS Fluent,</b>		Iran

## Publication

- A. B. Rajeoni, B. Pederson, **A. Firooz**, et al. "TransONet: Automatic Segmentation of Vasculature in Computed Tomographic Angiograms Using Deep Learning." in 2023 International Conference on Computational Science and Computational Intelligence (CSCI), 2023, doi.org/10.48550/arXiv.2311.10328.
- B. K. Austin, **A. Firooz**, H. Valafar, and A. V. Blenda, "An Updated Overview of Existing Cancer Databases and Identified Needs", Biology, vol. 12, no. 8, 2023.
- **A. Firooz**, A. T. Funkhouser, J. C. Martin, W. J. Edenfield, H. Valafar, and A. V. Blenda, "Comprehensive and User-Analytics-Friendly Cancer Patient Database for Physicians and Researchers", in 2022 International Conference on Computational Science and Computational Intelligence (CSCI), 2022, pp. 1615–1621.
- **A. Firooz**, A. T. Funkhouser, J. C. Martin, W. J. Edenfield, H. Valafar, and A. V. Blenda, "Analysis of cancer patients' molecular and clinical data using artificial intelligence and machine learning approaches", Cancer Research, vol. 83, no. 7 Supplement, pp. 5425–5425, 04 2023.
- **A. Firooz**, S. M. Noblitt, J. Martin, W. J. Edenfield, A. Blenda, and H. Valafar, "Application of machine learning in predicting breast cancer patient outcome," BMC Proceedings, vol. 17, no. 19, pp. 011, 2023. doi.org/10.1186/s12919-023-00281-y.

## Leadership & Volunteer Experiences

- Led a team of 4 undergraduates at the USC Hackathon to develop a chatbot leveraging Retrieval-Augmented Generation (RAG) technique. The project utilized MongoDB Atlas Vector Search, LangChain for orchestration, Ollama embeddings for enhanced contextual understanding, and LangChain text splitters for efficient document parsing and management. 2024
- Supervised 2 undergrads in the development of a Flask web interface for database, implementing security measures, such as input validation, and parameterized queries to prevent vulnerabilities like SQL injection and cross-site scripting (XSS) attacks. 2023
- Voluntarily graded and provided feedback for Advanced C++ Programming Techniques course. 2023
- Taught Linux workshop with 20 participants, at SC INBRE Bioinformatics Core Summer Workshops. 2022
- Assisted 20+ first-year CS students with Web Development in HTML, CSS, and JavaScript. 2022