Farnaz Yousefi Zowj

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EDUCATION

Auburn University, Samuel Ginn College of Engineering
Ph.D. in Chemical Engineering   *2019-Present*
- Dissertation title: Systems Engineering-assisted Machine Learning for Biomedical Applications.
- Advisors: Dr. Peter He and Dr. Jin Wang

Auburn University, Samuel Ginn College of Engineering
M.Sc. in Chemical Engineering   *2019-2021*
- Thesis title: Feature Engineering and Machine Learning for Computer-assisted Screening of Children with Speech Disorders.
- Advisors: Dr. Peter He and Dr. Jin Wang

Sharif University of Technology
M.Sc. in Chemical Engineering-Biotechnology   *2017-2019*
- Thesis title: Fabricating Scaffold by Electrospinning with Natural Based Polymer for Creating Skin Wound Dressing.

University of Tehran
B.Sc. in Chemical Engineering   *2013-2017*
- Senior project: Foundations of Engineering Parameters Simulation, Design, and Application of Micro/Nano-Bioreactors.

SKILLS

Technical Skills
- **Data Analytics** - Proficent in Python (NumPy, Pandas, TensorFlow), MATLAB, R (tidyverse, caret, ggplot2), Excel, SQL
- **Visualization** - Shiny, Tableau
- **Presentation** - Prezi, PowerPoint
- **Supercomputer** - Hopper Cluster of Auburn University

Academic Skills
- **Supervised Learning** - XGBoost, Random Forest, SVM, Logistic Regression, LDA, etc.
- **Unsupervised Learning** - Kmeans clustering, Hierarchical clustering, Spectral clustering, etc.

WORK AND RESEARCH EXPERIENCE

- **Graduate Research Assistant**, *Chemical Engineering Department*   *2019-Present*
  - **Feature Engineering and Machine Learning for Computer-assisted Screening of Children with Speech Disorders (Funded by National Institutes of Health)**.
    * Proposed a framework integrating feature engineering and selection, SMOTE sampling, simulation, and machine learning algorithms (Random forest, Support vector machines, XGBoost, Linear discriminant analysis) to provide robust screening tool for identifying children at-risk for speech disorders and potentially resulting in being used in clinics.
    * Utilized tools such as Python, MATLAB, SpeechMark, and Excel.
    * Used a Monte Carlo simulation approach to overcome the small sample size limitation.
    * Predicted speech disorders with our prediction model with sensitivity and specificity of more than 86%.
  - **Systems Engineering-assisted Kmeans Clustering to Investigate the Trend of the COVID-19**.
    * Aimed to find a similarity metric to cluster the similar SARS-CoV-2 genome sequences in the US and find the dynamics of the clades of SARS-CoV-2.
    * Used tools such as Python, Clustal Omega (multiple sequence alignment tool), and Excel.
    * Developed an angle-based clustering technique which uses the angles of two samples to define features for an unsupervised ML technique, K-means clustering.
    * Conducted a temporal and spatial analysis of COVID-19's spread using various visualization techniques.
    * Utilized sparse matrix, due to the large volume of data, to save memory and speed up the processing of data.
    * Performed parallel computing on the Hopper Cluster supercomputer to reduce the computational time.

- **Graduate Teaching Assistant**, *Chemical Engineering Department*   *2019-2020*
  - Computer-Aided Chemical Engineering course (An introduction to systematic problem-solving using MATLAB®).
  - Chemical Engineering Analysis course (Mathematical modeling, analytical, numerical and statistical analysis of chemical processes).

CERTIFICATES

- **Supervised Learning with scikit-learn**, *DataCamp*   *2021*
- **Unsupervised Learning in Python**, *DataCamp*   *2021*
- **Linear Classifiers in Python**, *DataCamp*   *2021*
- **Case Study: School Budgeting with Machine Learning in Python**, *DataCamp*   *2021*
- **Introduction to Deep Learning in Python**, *DataCamp*   *2021*
- **Defining Research with Human Subjects- SBE**, *CITI Program*   *2020*
- **Records-Based Research**, *CITI Program*   *2020*
- **Engineering and Computing RCR**, *CITI Program*   *2020*
- **Research with Children- SBE**, *CITI Program*   *2020*

HONORS AND AWARDS

- Selected as **top 10** finalists of the Finish in Five Competition, Auburn University.   *2020*
- Full Ph.D. tuition scholarship, Auburn University.   *2019*
- Ranked **2nd** among M.Sc. students in Chemical Engineering, Sharif University of Technology. *2018*
- Ranked **4th** in the national university entrance exam of M.Sc. in Chemical Engineering (Biotechnology major). *2017*
- Ranked **9th** in the national university entrance exam of M.Sc. in Chemical Engineering (Pharmaceutical Engineering major). *2017*
- Successfully passing the first stage of three different Scientific Olympiads (Mathematics, Computer, and Astronomy). *2011*

PUBLICATIONS

- **Yousefi Zowj, F.**, Suthar, K., Speights, M., He, P., Machine Learning for Automated Screening of Children with Speech Disorders. *accepted in the 4th International Symposium on Process Systems Engineering*.   *2021*

- **Yousefi Zowj, F.**, Suthar, K., Speights, M., He, P., Feature Engineering and Machine Learning for Computer-assisted Screening of Children with Speech Disorder *under review in PLOS Digital Health*.   *2021*

- **Yousefi Zowj, F.**, Summers, A., Solinska, J., He, P. An Investigation of Dynamics of SARS-CoV-2 Clades in the US. *under review in the 2022 American Control Conference*.   *2021*

- Speights, M., MacAuslan, J., **Yousefi Zowj, F.**, Suthar, K., He, P. AI-powered vocal biomarker screening tool to improve early detection of developmental speech disorders. *under review in the 2022 Motor Speech Conference*.   *2021*

PRESENTATIONS

- **AIChE Annual Meeting**, *Boston, MA*
  - Feature Engineering and Machine Learning for Computer-Assisted Screening of Children with Speech Disorders.   *2021*

- **The Graduate Engineering Research Showcase (GERS)**, *Auburn, AL*
  - Machine Learning for Automated Screening of Children with Speech Disorders.   *2021*

- **Three Minute Thesis (3MT) Competition**, *Auburn, AL*
  - An Investigation of Dynamics of SARS-CoV-2 Clades in the US.   *2021*

- **Finish in Five Competition**, *Auburn, AL*
  - Computer-assisted Analysis of Speech to Quantify Child Speech Disorders.   *2020*