Elham Afzali, Ph.D

Curriculum Vitae

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🎓 Google Scholar

Drawing on a strong background in statistical theory and computer science, I am dedicated to addressing data-driven challenges by developing innovative methods and contributing to research excellence across academic and applied domains. I am committed to continuous learning, interdisciplinary collaboration, and creating impactful solutions through statistical thinking.

Research Interest: Statistical Learning, Machine Learning, Bayesian Inference, Kernel Methods, Conditional Modeling.

Education

- **Doctor of Philosophy (PhD), Statistics** — **2020–2025**

University of Manitoba — *Winnipeg, Canada*
Thesis: Advanced Kernel-Based Approaches for Robust Inference in Intractable Models.

- **Master of Science (MSc), Mathematical Statistics** — **2014–2016**

University of Tehran — *Tehran, Iran*
Thesis: EBSeq-HMM: A Bayesian Approach for Identifying Gene-expression Changes in
Ordered RNA-Seq Experiments

- **Bachelor of Science (BSc), Statistics** — **2009–2013**

Allameh Tabataba'i University — *Tehran, Iran*
Dissertation: Medical Image Processing for Early Detection of Alzheimer's Disease Using Structural MRI.

Publications

Peer-Reviewed Publications

1. **Afzali, E.**, Muthukumarana, S., & Wang, L. (2025). "Correcting Mode Proportion Bias in Generalized Bayesian Inference via a Weighted Kernel Stein Discrepancy." [Under review].
   DOI: https://arxiv.org/abs/2503.02108

2. **Afzali, E.**, Muthukumarana, S., & Wang, L. (2024). "Navigating interpretability and alpha control in GF-KCSD testing with measurement error: A Kernel approach." Machine Learning with Applications.
   DOI: https://doi.org/10.1016/j.mlwa.2024.100581

3. **Afzali, E.** & Muthukumarana, S. (2023). "Gradient-Free Kernel Conditional Stein Discrepancy goodness of fit testing." Machine Learning with Applications.
   DOI: https://doi.org/10.1016/j.mlwa.2023.100463

4. **Afzali, E.**, et al. (2021). "Hybrid VAR-LSTM Networks Modeling and Forecasting COVID-19 Data in

Canada. Statistical Society of Canada, Case Study."

DOI: https://ssc.ca/sites/default/files/imce/15_not_blind.pdf

Honors, Awards & Recognition

o Outstanding Research by a PhD Student, Department of Statistics, University of Manitoba   *2025*

o UMGSA Conference Grant, (CAD 500)   *2024*

o Faculty of Graduate Studies Travel Award, (CAD 750)   *2024*

o UMGSA Conference Grant, (CAD 500)   *2023*

o 3rd-place-winning team of Plant Image Recognition Algorithm challenge,
International Data Science NEXUS. (Team Leader)   *2021*

o Top 10 Team, Case Study on COVID-19 Modeling Recognized by the Statistical
Society of Canada (SSC). (Team Leader)   *2021*

o University of Manitoba General Award Fund (CAD 1000)   *2021*

o Top 0.5%, Statistics Master's Entrance Exam Ranked among approximately
3,000 participants in Iran.   *2014*

Conference Participation

Contributed Presentations: ....

o Joint Statistical Meetings (JSM)
  - Presentation title: *Interpretability of GF-KCSD Testing with Measurement Error*   *Portland, 2024*

o Joint Statistical Meetings (JSM)
  - *Presentation title: GF-KCSD as a Goodness-of-Fit Metric for Conditional Distributions Toronto, 2023*

o Joint Statistical Meetings (JSM)
  - *Poster Presentation title: Goodness-of-Fit for Conditional Distributions*   *Toronto, 2023*

o Statistical Society of Canada (SSC) Annual Meeting,Case Study on Covid-19 Data.   *2021*

Attended Conferences/Workshops: ....

o Statistical Society of Canada (SSC), Biostatistics Section Workshop in
Advanced Data Visualization in R.   *Online, 2025*

o *Statistical Analysis of Network Data*, Faculty of Science, University of Manitoba,
by Prof. Eric D. Kolaczyk.   *Winnipeg, 2024*

Teaching Experience:

o **Sessional Instructor**
  Department of Statistics, University of Manitoba
  - Stat 2220 – Contemporary Statistics for Engineers. (184 Students)   *Fall, 2021*
  - Stat 2220 – Contemporary Statistics for Engineers. (148 Students)   *Winter, 2021*
  - Stat 1000 – Basic Statistical Analysis I. (248 Students)   *Fall, 2020*

o **Teaching Assistant**

Department of Statistics, University of Manitoba

- Stat 1000 – Basic Statistical Analysis I.	*Winter, 2022*
- Stat 2220 – Contemporary Statistics for Engineers.	*Winter, 2022*
- Stat 1000 – Basic Statistical Analysis I.	*Winter, 2020*
- Exam Invigilator, Grader and TA at the Statistical Help Center.	*Winter, 2020*

Professional and Research Experience

○ **Research Assistant**   **January 2020–Present**

Department of Statistics, University of Manitoba   *Winnipeg, Canada*

- Developed novel kernel-based algorithms and theoretical frameworks for high-dimensional data to overcome critical challenges such as mode blindness, intractable likelihoods, and gradient limitations, thereby lowering the computational cost of score-based models.
- Led the design and implementation of a hybrid VAR-LSTM deep learning model to forecast COVID-19 dynamics in Canada. By integrating classical time-series analysis (VAR) with neural networks (LSTM), the model achieved 93.07% accuracy on long-term predictions, substantially outperforming standard models.

○ **Data & Report Analyst**   **May 2022 – January 2024**

Lockport Archaeology Project   *Winnipeg, Canada*

- As the lead analyst in a collaborative, interdisciplinary research initiative, I conducted statistical analysis to investigate historical narratives of the Lockport region. I curated and validated complex archaeological datasets, while also conducting a comprehensive review of relevant literature. Using advanced statistical methodologies and data visualization techniques, I identified meaningful patterns and trends in high-dimensional archaeological data. This work bridged the fields of statistics and archaeology, demonstrating the interpretive power of quantitative methods in uncovering cultural and historical insights.

Industry Experience

Data Scientist   **January 2016 – December 2019**

Refah Bank   *Tehran, Iran*

○ **Data Scientist & Business Intelligence Lead, R&D Department:** Worked with large-scale banking data to support executive decision-making; developed dashboards and daily reports using Power BI and Excel; conducted customer analytics and data mining using Python and SQL; implemented a data warehouse and ETL pipelines (e.g., SSIS) to support business intelligence operations.

○ **Peer Reviewer, Research Unit, R&D Department:** Reviewed academic papers and graduate theses for internal research validation and knowledge dissemination.

○ **Human Resources BI Analyst, HR Department:** Automated HR reporting through interactive dashboards; identified and monitored key performance indicators (KPIs) to support personnel management and policy decisions.

○ **Quantitative Risk Analyst, Risk Department:** Developed statistical risk assessments and developed predictive models for financial forecasting and credit risk analysis.

Data Analyst   **April 2013 – September 2014**

Entekhab Factory   *Tehran, Iran*

○ **Marketing Data Analyst, Marketing Department:** Assisted in the collection and organization of customer data to support market research and brand development strategies. Collaborated with marketing and analytics teams to evaluate the outcomes of promotional campaigns and provided data-driven insights to enhance customer engagement. Supported reporting and visualization of customer trends using Excel and basic statistical tools.

Professional Service & Memberships:

Peer Reviewer . . . .

○ Manuscript Peer Reviewer for Journal of Machine Learning with Applications.   *2023 – present*

Professional Memberships . . . .

○ Statistical Society of Canada (SSC)   *2020–2025*

○ Joint Statistical Meetings (JSM)   *2023–2025*

○ American Statistical Association (ASA)   *2023–2025*

Professional Development & Trainings:

○ Advanced Data Visualizations in R – Statistical Society of Canada / Instats   *February, 2025*

○ Bayesian Data Analysis in Python – DataCamp   *August, 2024*

○ Artificial Neural Networks (Deep Learning) – Compute Ontario   *June, 2024*

○ Data or Specimens Only Research – CITI Program (human-subjects ethics)   *March, 2024*

○ Statistical Learning – Stanford Online / edX   *January, 2024*

○ Python for High Performance Computing – SHARCNET   *October, 2023*

Skills

Programming Language: Python (NumPy, Pandas, SciPy), R, MS SQL

ML Frameworks: PyTorch, TensorFlow, Scikit-learn

Data Visualization: Power BI, Seaborn, Matplotlib, ggplot2

Statistical Software: Minitab, SPSS, E-Views, WinBugs, AMOS, MS excel

Tools & Technologies: Git, Linux, Jupyter, Visual Studio Code, PyCharm

Documentation & Reporting: LaTeX, MS Office Suite (Word, PowerPoint)

Core Competencies: Statistical Learning, Bayesian Inference, Deep Learning, Model Interpretability, Time Series Analysis, Data Mining, Feature Engineering, Big Data Analytics

Volunteer Experiences

○ **Volunteer Farsi Teacher, Iranian Community of Manitoba (ICMB)**

Taught Farsi language to children as part of ICMB's cultural education program. *Winnipeg, Canada, 2020*

○ **Volunteer, Mahak Charity**

Supported children with cancer through charity events and outreach. *Tehran, Iran, 2016–2019*