

# SEPEHR AKBARI

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## EDUCATION

<b>Department of CS &amp; Mathematics, Lake Forest College</b>	Lake Forest, IL
<i>B.A. in Computer Science &amp; Mathematics, minor in Data Science</i>	2023 - 2027 (expected)
<ul style="list-style-type: none"><li>• <b>GPA:</b> 4.0</li><li>• <b>Coursework:</b> computational algebraic geometry, tensor geometry, artificial intelligence, machine learning, computer vision, statistics, linear algebra, algorithms, numerical analysis, probabilities, bayesian methods, abstract mathematics, etc.</li></ul>	

## RESEARCH INTERESTS

My current research interest is in the intersection of deep learning and combinatorial optimization. I am particularly interested in leveraging diverse architectures, ranging from reinforcement learning to computer vision, as tools to develop neural heuristics for NP-hard problems in mathematics and computer science.

## RESEARCH EXPERIENCE

<b>Undergraduate Researcher</b>   Lake Forest College	2025.07 - Present
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Utilizing Deep Learning to Predict Descriptors of Gröbner Bases and their Algorithmic Complexity

Advisor: Prof. Jamshidi

- Data generation of polynomial systems and their Gröbner bases using Macaulay2.
- Complexity evaluation of Buchberger's algorithm using Set Transformers and Graph Neural Networks (GNNs).
- Predicting the cardinality of reduced Gröbner bases with deep learning models and reinforcement learning.

<b>Undergraduate Researcher</b>   Lake Forest College	2025.05 - 2025.8
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Quantifying Risk and Identifying Vulnerability Archetypes in Higher Education using Machine Learning and Bayesian Methods

Advisor: Prof. Jamshidi

- Bayesian hierarchical modeling (BHM) using Markov chain Monte Carlo (MCMC) to quantify risk of college closure based on state/region data.
- Linear discriminant analysis (LDA), principal component analysis (PCA), and K-means clustering, paired with game theory methods (SHAP) and statistical inference to define vulnerability archetypes.
- Statistical analysis of media narratives on college closures using latent dirichlet allocation (LDA).
- Intensive data engineering, feature extraction, and dimensionality reduction.

<b>Research Assistant</b>   Lake Forest College	2025.04 - 2025.06
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Computer Vision Objectness-Based Data Augmentation Module using Deep Learning and Saliency Estimation

Advisor: Prof. Banerji

- Novel hybrid framework combining region proposal capabilities of regional convolutional neural networks (RCNN) with the saliency-based BING algorithm.

- High-performance orchestration in Go-lang, managing a Python-based Faster-RCNN (FRCNN) and C++-based BING implementation.
- Object filtering using non-maximum suppression (NMS), intersection over union (IoU), and saliency thresholds, to control model bias.
- Ultimately generating high quality training data of context-aware crops, to improve accuracy with limited data.

**Undergraduate Researcher** | Lake Forest College

2023.12 - 2024.06

Statistical Analysis on the Predictability of Pseudorandom Number Sequences Compared to Sequences Generated by Quantum Hardware

Advisor: Prof. Gard

- A novel statistical test suite for evaluating series of random numbers, using entropy, fast fourier transform (FFT), Chi-squared, Kolmogorov-Smirnov, serial, autocorrelation, etc.
- Quantum true random number generator (QRNG) using IBM Qiskit, and implementation of multiple pseudorandom number generators (PRNGs).
- Benchmarking and scoring system to compare the predictability of different sequences and corresponding generators. Formed into a work-in-progress Python and R package for public use.

**Pre-Collegiate Researcher** | MUWCI

2022.09 - 2023.04

Complexity Analysis of Re-Balancing Algorithms in Binary Search Trees

Supervisor: Amit Rastogi

- Complexity analysis of the re-balancing algorithm efficiency of a Splay Tree in comparison to an Adelson-Velskii and Landis (AVL) Tree upon value insertion and deletion.
- Underlying mechanisms of the trees like rotations, zig-zag, etc. were investigated and implemented in C, and tested in Java.

## TEACHING

TA, Computer Vision & ML (CS 450), Instructor: Prof. Banerji	Spring 2026
TA, Artificial Intelligence (CS 325), Instructor: Prof. Jamshidi	Spring 2026
TA, Linear Algebra (MA 231), Instructor: Prof. Jamshidi	Spring 2026
TA, Abstract & Discrete Math (MA 230), Instructor: Prof. Bousquet	Spring 2026
Grader, Bayesian Comput. Statistics (MA 574), Instructor: Prof. Jamshidi	Fall 2025
TA, Data Structures & Algorithms (CS 317), Instructor: Prof. Banerji	Fall 2025
TA, Machine Learning (CS 250), Instructor: Prof. Bousquet	Fall 2025
TA, Statistical Programming (MA 250), Instructor: Prof. Gard	Fall 2025
TA, Abstract & Discrete Math (MA 230), Instructor: Prof. Jamshidi	Fall 2025
TA, Probability & Statistics (MA 150), Instructor: Prof. Nguyen	Summer 2025
TA, Computational Math (MA 240), Instructor: Prof. Jamshidi	Spring 2025
TA, Computer Science I (CS 112), Instructor: Prof. Nguyen	Spring 2025
TA, Web Development (CS 107), Instructor: Prof. Nguyen	Spring 2025
TA, Computer Science I (CS 112), Instructor: Prof. Nguyen	Fall 2024
TA, Computer Science I (CS 112), Instructor: Prof. Mirza	Spring 2024

INDUSTRY WORK	<b>SWE @ Applied Data Center</b>   Lake Forest, IL	2025.07 - Present	
	<ul style="list-style-type: none"> <li>• Develop full internal processing and analysis tools.</li> </ul>		
	<b>SWE Intern @ TenacityAI</b>   Chicago, IL	2024.05 - 2024.08	
	<ul style="list-style-type: none"> <li>• App development with React Native.</li> <li>• Authorization flow with Supabase and Postgres.</li> <li>• LLM chatbot integration.</li> </ul>		
<b>SWE Intern @ Elite Engineering Solution</b>   Tehran, Iran		2023.05 - 2023.08	
<ul style="list-style-type: none"> <li>• Database migration from MySQL to MongoDB.</li> <li>• Focus on query and index optimization, enhancing system radically.</li> <li>• Internal tool development with new Java Swing API endpoints development.</li> </ul>			
<b>SWE Intern @ Lavan Energy</b>   Tehran, Iran		2022.06 - 2022.08	
<ul style="list-style-type: none"> <li>• Build RESTful API flow from scratch, focusing on data applications.</li> <li>• Frontend with Express, Node, and React. Deployment via AWS.</li> </ul>			
AWARDS AND HONORS	<ul style="list-style-type: none"> <li>• <b>Emma O. Haas Merit Award</b>, Best overall academic record in Class of 27</li> </ul>	2025 2023, 2024 2023 2023	
	<ul style="list-style-type: none"> <li>• <b>Dean's List</b>, Merit award in recognition of overall GPA</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Presidential Scholarship</b>, Merit-based scholarship</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Davis Scholar</b>, United World College Davis scholarship recipient</li> </ul>		
SKILLS	<b>Programming</b>		
	Python, PyTorch, CUDA, NumPy, scikit-learn/vision, OpenCV, TensorFlow, Julia, R, Macaulay2, Singular, PyMC3		
	C/C++, Java, SQL, Web/App development, JS/TS, Git, LaTeX		
	<b>Languages</b>		
English ( <i>native</i> ), Persian/Farsi ( <i>native</i> ), German ( <i>limited proficiency</i> )			
SERVICE	<b>President</b> , Computer Science Club @ LFC	2024 - Present	
	<b>Academic Advisory Committee</b> , Math/CS Dept. @ LFC	2024 - Present	
	<b>Technical Coach</b> , Salaam Schools Robotics Competition	2023 - 2024	