

Naeem Shahabi Sani

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U.S. Work Authorization: EAD via NIW (I-485 pending)

Research Interests

Scalable machine learning and randomized numerical linear algebra, with emphasis on efficient algorithms for low-rank matrix recovery and completion that replace iterative optimization with one-shot randomized formulations. Federated and privacy-preserving learning with minimal communication; learning with missing data through confidence-aware neural architectures and genetic programming.

Education

Ph.D., Computer Science Aug 2021 – June 2026 (expected)

University of Oklahoma, Norman, OK, USA

- Advisors: Dr. Chao Lan and Dr. Dean F. Hogen
- Dissertation: *Randomized Algorithms for Efficient Matrix Recovery and Learning with Incomplete Data*
- Qualifying Examination passed: November 2023

M.Sc., Artificial Intelligence Sep 2015 – Sep 2018

Islamic Azad University, Tehran Branch, Iran

- Thesis: *A Multi-Objective Ant Colony Optimization Algorithm for Community Detection in Complex Networks*

B.Sc., Software Engineering Sep 2009 – Sep 2014

Islamic Azad University, Iran

Academic Appointments

Graduate Research Assistant Aug 2021 – Present

University of Oklahoma, School of Computer Science (Advisors: Dr. Chao Lan and Dr. Dean F. Hogen)

- Led independent research projects from problem formulation through algorithm design, theoretical analysis, implementation, and empirical evaluation on large-scale benchmark datasets.
- Authored three first-author papers and contributed to two additional collaborative papers, all submitted to peer-reviewed venues.
- Implemented research codebases in Python/PyTorch with publicly available code; designed reproducible experimental pipelines across distributed and centralized settings.

Graduate Teaching Assistant Aug 2023 – Present

University of Oklahoma, School of Computer Science

- Supported instruction across six course assignments spanning theoretical CS, machine learning, and cybersecurity (see Teaching Experience for details).
- Mentored 100+ students through office hours, review sessions, and one-on-one advising; graded 500+ assignments with detailed feedback.

Publications

Refereed Journal Articles

1. N. Shahabi Sani, M. Manthouri, and F. Farivar. “A Multi-Objective Ant Colony Optimization Algorithm for Community Detection in Complex Networks.” *Journal of Ambient Intelligence and Humanized Computing*, 11:5–21, 2020. [[DOI](#)]
2. N. Shahabi Sani and F. N. Tabriz. “A New Strategy in Trust-Based Recommender System Using K-Means Clustering.” *International Journal of Advanced Computer Science and Applications*, 8(9), 2017. [[DOI](#)]

Papers Under Review and In Preparation

3. N. Shahabi Sani (first author), F. Najian Tabriz, S. Shafaei, and D. Hougen. “Evolving Multi-Channel Confidence-Aware Activation Functions for Missing Data with Channel Propagation.” Submitted to *GECCO 2026* (under review). [[arXiv:2602.13864](#)]
4. N. Shahabi Sani et al. “Randomized Least Square for Efficient Low-Rank Matrix Recovery.” Under review.
5. N. Shahabi Sani et al. “Efficient Federated Low-Rank Matrix Recovery.” Under review.

Research Contributions

Randomized Least Squares for One-Shot Low-Rank Matrix Recovery 2025 – Present

- Proposed a novel non-iterative matrix recovery algorithm (RLS) that replaces the alternating optimization in standard ALS with a single-pass randomized least-squares formulation.
- Derived ε -optimal recovery error bounds and demonstrated 90–99% reduction in recovery time compared to iterative baselines (ALS, nuclear norm, CSMC) on five benchmark datasets (MovieLens, FilmTrust, BookCrossing, Jester), while maintaining competitive accuracy.

Three-Channel Evolved Activations (3C-EA) with ChannelProp 2025 – Present

- Designed a genetic-programming framework for evolving multivariate activation functions $f(x, m, c)$ that condition on feature values, missingness indicators, and imputation confidence scores.
- Introduced ChannelProp, a deterministic mechanism for propagating missingness and confidence information through linear layers via normalized weight magnitudes.
- Demonstrated consistent improvements over ReLU, Swish, LeakyReLU, and ELU across 13 datasets under MCAR, MAR, and MNAR missingness, with notable gains on minority-class detection and multi-class tasks.

One-Shot Federated Low-Rank Matrix Factorization (OFMF) 2025

- Developed the first single-round federated matrix factorization algorithm, eliminating the repeated client–center communication required by gradient-based methods.
- Achieved $40\times$ speedup over existing federated baselines (FMF, VFL-SGDMF) while matching or exceeding factorization accuracy on ORL, Yale, and Jester datasets.
- Demonstrated that the inherent randomization provides differential privacy essentially “for free,” with the noise-augmented variant (OFMF(nf)) performing comparably to the standard version.

Distributed kNN Classification (bigWNN) [co-author] 2025

- Co-developed an adaptive weighted-aggregation strategy for distributed kNN classifiers in IoT/edge computing environments, with performance guarantees via excess error bounds.
- Learned optimal ensemble coefficients from auxiliary data, consistently outperforming bigNN and bigNN+ across five real-world datasets.

Randomized Weighted Nearest-Neighbor Condensing [co-author]

2025

- Co-developed a randomized variant of weighted kNN condensing that reduces compression time by 99.9% while maintaining classification accuracy, enabling scalable, memory-efficient classification.

PsoFisher: Hybrid Imputation and Feature Selection for Missing Data

2023–2024

- Designed a sequential pipeline combining MICE imputation with Binary PSO and Fisher-criterion feature selection, eliminating inference-time imputation and improving classification accuracy by 15% on missing-data benchmarks.

Teaching Experience

Graduate Teaching Assistant, University of Oklahoma, School of Computer Science

- Mentored students through office hours and targeted help sessions, emphasizing rigorous reasoning and clear problem decomposition.
- Provided algorithm walkthroughs (e.g., how/why an approach works, edge cases, and complexity reasoning) to strengthen students' conceptual understanding.
- Evaluated assignments and exams with standardized rubrics; delivered constructive feedback to improve future performance.
- Supported course logistics by answering questions, resolving confusion early, and ensuring consistent expectations across sections.

Courses:

- **Cybersecurity** (Spring 2026)
- **Discrete Structures** (Fall 2024, Fall 2025)
- **Algorithm Analysis** (Spring 2025)
- **Machine Learning** (Spring 2024)
- **Theory of Computation** (Fall 2023)

Awards and Scholarships

Fred & Norma Ackman Engineering Scholarship (\$500/semester)

Fall 2023 – Spring 2024

University of Oklahoma, College of Engineering.

Tomorrow's Engineer Scholarship (\$500/semester)

Fall 2022 – Spring 2023

University of Oklahoma, College of Engineering.

Technical Skills

Programming: Python (NumPy, Pandas, scikit-learn, PyTorch, TensorFlow), C++, Java, MATLAB

Tools: Git, Docker, Linux/Unix, L^AT_EX, Jupyter, VS Code

Data/DB: SQL (Azure, MySQL), Firebase