Jiefei Liu

1003 Wooten Dr., Las Cruces, NM, 88001
575-571-0810 jiefei9657@gmail.com linkedin.com/in/jiefei-liu-877501266 github.com/JiefeiLiu

Education

New Mexico State University **2022.08 – Present**
Doctor of Philosophy, Computer Science, anticipated graduation date: 05/2027 *Las Cruces, NM*

- Research Interests: Generative AI (Diffusion Models, GANs, Large Language Models), Federated Learning, Continual / Class-Incremental Learning, and Unseen Class Detection.

New Mexico State University **2020.08 – 2022.08**
Master of Science, Computer Science (GPA: 3.79) *Las Cruces, NM*

New Mexico State University **2016.01 – 2020.05**
Bachelor of Science, Computer Science (GPA: 3.47) *Las Cruces, NM*

Minors: Electrical Engineering, Mathematics

Project and Research Experience

Federated ML for Network Vulnerability Assessment and Monitoring. Department of Defense (DOD) project.

- Develop methods to address unseen class detection challenges (Concept draft, Out-Of-Distribution data generation) in Intrusion Detection Systems (IDS), enhancing system reliability against novel cyber threats.
- Researched generative AI methods for intrusion detection, fine-tuned large language models (LLMs) to generate synthetic IDS datasets, and conducted comparative analyses with GAN and diffusion models to evaluate data quality, diversity, and realism; identified the most effective generative approach for enhancing IDS performance under privacy and data scarcity constraints.
- Explored prompt-based large language models (LLMs) for intrusion detection, aiming to replace traditional ML classifiers for direct attack classification and extend their use toward unseen attack detection as a future research direction.
- Research and designed a robust federated class-incremental learning (Continue learning) framework to advance scalable and adaptive federated learning solutions.

Probing Attacks on Networks and Mitigation Using ML, Department of Defense (DOD) project.

- Designed federated learning frameworks tailored for the Intrusion Detection Systems (IDS) domain, enabling decentralized yet secure model training.
- Addressed local class imbalance through data augmentation strategies and simulated realistic IDS scenarios to ensure robustness.
- Achieved at least 2× performance improvement over baseline methods, demonstrating the effectiveness of the proposed framework.
- Leveraged Generative AI methods (GAN and diffusion) within the Federated Learning setting to evaluate their effectiveness in reducing communication overhead.
- Identified the most efficient generative approach for communication savings while preserving data privacy.
- Achieved a 96% reduction in communication cost compared to our previously proposed Federated Learning framework.

Cow Trajectory Analysis Project.

- Applied time-series segmentation (ClaSP) and hierarchical clustering to group GPS-tracked data points with similar patterns.
- Enabled biologists to more efficiently label cow behaviors, supporting downstream animal behavior analysis.

Midcontinent Independent System Operator (MISO) company project.

- Extracted data points from power grid alarm log files, performing rigorous data verification, cleaning, and preprocessing to ensure high-quality inputs.
- Analyzed alarm data for reliability insights using Python libraries including Pandas, Scikit-learn, and Matplotlib.

Developed constrained skyline queries (CSQ) over transportation networks.

- Developed a web-based demo for constrained skyline queries (CSQ) over transportation networks, enabling users to submit queries, process server responses, and visualize paths and results on interactive maps (Google Maps API, HTML, JavaScript).

Built Python/NLP-based academic voice search system.

- Processed queries on a Flask backend, applying NLTK for NLP tasks and Gensim for topic modeling, then returned and displayed the most relevant results on the frontend.

Presentations

- Multi-Model-based Federated Learning to Overcome Local Class Imbalance Issues. ICMLA, 2023. *2023.12*
- Animal Behavior Analysis Using Unsupervised ML. American Society of Animal Science, 2023. *2023.07*
- Is Generative Models Ready for Network Intrusion Detection Systems? MILCOM, 2025 *2025.10*

Skills & Software

- **Programming:** Python, Java, R, HTML, JavaScript, Web Design, C/C++.
- **ML/AI Expertise:** Federated & Continual Learning, Generative AI (Diffusion, GANs, LLMs), Open-set Recognition, Deep Learning, Predictive Modeling.
- **Libraries/Tools:** PyTorch, Pandas, NumPy, Sklearn, Matplotlib, flwr, NLTK, Gensim, Flask, ctgan, Anaconda, pip.
- **Other:** Linux, Git, Cloud/HPC, APIs (Google Maps, Google Voice), IDEs (PyCharm, VSCode, IntelliJ, MATLAB).

Publications

Under review and in preparation

- **Jiefei Liu**, Huiping Cao, Abu Saleh Md Tayeen, Qixu Gong, Satyajayant Misra, Pratyay Kumar, Jayashree Harikumar. *Diffusion-based Multi-Model Federated Learning for Network Intrusion Detection.* Submitted to **IEEE Transactions on Networking**.
- Pratyay Kumar, Abu Saleh Md Tayeen, Satyajayant Misra, Huiping Cao, **Jiefei Liu**, Qixu Gong, and Jayashree Harikumar, *NetDiffuser: Deceiving DNN-Based Network Attack Detection Systems with Diffusion-Generated Adversarial Traffic.* Submitted to IEEE Transactions on Information Forensics and Security.

Peer-reviewed conference and journal articles

- **Jiefei Liu**, Qixu Gong, Wenbin Jiang, Pratyay Kumar, Abu Saleh Md Tayeen, Huiping Cao, Satyajayant Misra, Jayashree Harikumar. *Is Synthetic Flow Data from Generative Models Ready for Network Intrusion Detection Systems?* IEEE Military Communications Conference (MILCOM) 2025.
- Stephen Villanueva, Abu Saleh Md Tayeen, Qixu Gong, Satyajayant Misra, Aden Dogar, Huiping Cao, **Jiefei Liu**, Pratyay Kumar, Jayashree Harikumar. *NeTIF: Network Traffic to Image Features for Robust Intrusion Detection.* IEEE Military Communications Conference (MILCOM) 2025.
- Pratyay Kumar, Abu Saleh Md Tayeen, Qixu Gong, **Jiefei Liu**, Satyajayant Misra, Huiping Cao, Jayashree Harikumar. *NetPrompt: Evaluation of LLMs as Network Intrusion Detection System.* IEEE Military Communications Conference (MILCOM) 2025.
- Abu Fuad Ahmad, **Jiefei Liu**, Qixu Gong, Satyajayant Misra, Jayashree Harikumar. *Feature Selection via Class-wise Mean Deviation.* Accepted at International Conference on Machine Learning and Applications (ICMLA) 2025.
- **Jiefei Liu**, Derek W. Bailey, Huiping Cao, Tran Cao Son, Colin T. Tobin. *Development of a Novel Classification Approach for Cow Behavior Analysis using Tracking Data and Unsupervised Machine Learning Techniques.* MDPI Sensors, 2024.
- Qixu Gong, Huiying Chen, Huiping Cao, **Jiefei Liu**. *Evaluation of Skyline Path Queries over Road Networks with Graph Neural Network Support.* ACM Transactions on Spatial Algorithms and Systems (TSLAS), 2024.
- **Jiefei Liu**, Huiping Cao, Abu Saleh Md Tayeen, Satyajayant Misra, Pratyay Kumar, Jayashree Harikumar. *Multi-Model-based Federated Learning to Overcome Local Class Imbalance Issues.* 2023 International Conference on Machine Learning and Applications (ICMLA) 2023, pp. 265–270.
- Pratyay Kumar, **Jiefei Liu**, Abu Saleh Md Tayeen, Satyajayant Misra, Huiping Cao. *FLNET2023: Realistic Network IDS Dataset for Federated Learning.* IEEE Military Communications Conference (MILCOM) 2023, pp. 345–350.
- Yifan Hao, Huiping Cao, K. Selçuk Candan, **Jiefei Liu**, Huiying Chen, Ziwei Ma. *Class-Specific Attention for Time-Series Classification.* arXiv:2211.10609, 2022.
- Qixu Gong, **Jiefei Liu**, Huiping Cao. *CSQ System: Constrained Skyline Queries on Transportation Networks.* IEEE 36th International Conference on Data Engineering (ICDE) 2020, pp. 1746–1749.

Abstracts

- **Jiefei Liu**, Derek W. Bailey, Huiping Cao, Tran Cao Son, Colin T. Tobin. *Animal Behavior Analysis Using Unsupervised ML.* Journal of Animal Science, 2023.
- Hatim M.E. Geli, Lindsay E. Johnson, Michael J. Hayes, Huiping Cao, **Jiefei Liu**, Hasan Al-Qudah. *Prediction of Short-Term Drought Impacts Using ML: A Case Study for New Mexico.* The 102nd American Meteorological Society Annual Meeting, AMS, 2022.

Work Experience

New Mexico State University **2021.05 – Present**
Research Assistant *Las Cruces, NM*

- Federated ML for Network Vulnerability Assessment and Monitoring. Department of Defense (DOD) project. *2024.04 – Present*
- Probing Attacks on Networks and Mitigation Using ML, Department of Defense (DOD) project. *2022.07 – Present*
- Co-teach CS 579 Special research topics on AIALA (utilize ML techniques to solve agriculture research problems). *2024.08*
- Cow Trajectory Analysis Project. *2022.01 – 2024.06*
- Midcontinent Independent System Operator (MISO) company project. *2021.05 – 2022.08*

New Mexico State University **2020.08 – 2021.05**
Teaching Assistant *Las Cruces, NM*

- CS 271: Object-Oriented Programming — labs, grading, and student support (remote).
- CS 272: Introduction to Data Structures — labs, grading, and student support (remote).

New Mexico State University **2020.07 – 2020.08**
Research Assistant *Las Cruces, NM*

- Analyzed biological systems using R.
- Predicted drought indices using Python ML (Random Forest, SVR).

New Mexico State University **2018.08 – 2020.05**
Research Assistant *Las Cruces, NM*

- Developed constrained skyline queries (CSQ) over transportation networks demo with Google Maps API, HTML, JavaScript.
- Built Python/NLP-based academic voice search system (gensim, nltk, flask).
- Implemented shoe image classification for counterfeit detection.

New Mexico State University **2018.03 – 2019.12**
Recruiting Liaison *Las Cruces, NM*

- Recruited Chinese students and supported NMSU outreach.
- Represented NMSU at 2018 China higher-education fair.

New Mexico State University **2016.05 – 2016.09**
Research Assistant *Las Cruces, NM*

- Supported project by surveying and grouping research papers on brain tumor mathematical models.

Awards

- Graduate Success Project Tuition Award, New Mexico State University *2023.08 – Present*
- Graduate Success Tuition Incentive Award, New Mexico State University *2022.08 – 2023.05*
- Graduate Success Project Tuition Award, New Mexico State University *2020.01 – 2022.05*
- New Discovery Scholars Program (DSP), New Mexico State University *2019.07 – 2020.05*
- Out-of-State to In-State Tuition Scholarship, New Mexico State University *2016.08 – 2019.12*

Volunteers

- CAHSI Data Analytics Competition Session Organizer, GMiS 2025 *2025.09 – 2025.10*
- CAHSI Data Analytics Competition Session Organizer, GMiS 2023 *2023.09 – 2023.11*
- Student Mentor, Google-sponsored summer REU Program *2021.06 – 2023.08*
- President, Chinese Students & Scholars Association (NMSU-CSSA) *2023.08 – 2024.05*
- President, Chinese Students & Scholars Association (NMSU-CSSA) *2018.05 – 2019.05*
- Vice President, Chinese Students & Scholars Association (NMSU-CSSA) *2017.05 – 2018.05*

Core Courses

- **Computer Science (M.S.):** Algorithms, Automata, Bioinformatics Programming, Artificial Intelligence, Graph Neural Networks, Computer Networks, Operating Systems, Advanced Software Engineering.
- **Computer Science (B.S.):** Data Structures, Compilers, Automata, Databases, Artificial Intelligence, Algorithms (graphs, Beast First Search (BFS), Depth First Search (DFS), shortest paths, Dijkstra, Bellman–Ford), Machine Learning (regression, classification, clustering, logistic regression, kNN, SVM/Kernel SVM, decision trees, random forests, CNNs), Programming Languages, Software Development.
- **Electrical Engineering (Minor):** Circuits Design, Signals & Systems.
- **Mathematics (Minor):** Calculus, Linear Algebra, Probability.