MUHAMMAD KAZIM

Fargo, ND, USA

Ph.D. Candidate | AI for Energy Systems Sustainability | Multilayer Network Researcher

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Objective

To lead impactful, interdisciplinary research at the nexus of energy systems, artificial intelligence, and decentralized technologies, driving sustainable innovation through AI-enabled solutions, data-driven resilience, and real-world impact across critical infrastructure and distributed networks.

Education

- **Ph.D. in Industrial & Manufacturing Engineering, North Dakota State University, Fargo, USA.**
  Expected Graduation: August 2025
  - Research Focus: Multilayer Network Analysis for Smart Energy Systems
  - Project: AISustein Project (AI for Resilient Energy Infrastructure)
  - Project Website: https://www.aisustein.com/research
  - Thesis: Enhancing Resilience in Energy Networks: A Multilayer Network and Machine Learning Approach

- **Master's in Computer Science,**
  Abasyn University Peshawar, Pakistan.
  - **Thesis:** Development of an Enhanced Detection Mechanism for Application Layer Distributed Denial of Service (DDoS) Attacks. Focused on improving intrusion detection through machine learning.
  - Bachelor of Science in Computer Science, University of Malakand, Pakistan.
    - Awarded **Gold Medal** (Top Graduate)

Research & Professional Experience

I. Graduate Research Assistant,
Dept. of Industrial & Manufacturing Engineering, NDSU | June 2023 – Continued
(In collaboration with AISustein: https://www.aisustein.com/)

- Developed AI models for multilayer energy systems using real-world data from the Belgian power infrastructure and seven years of incident data from Oklahoma Gas & Electric Company.
- Created predictive maintenance systems using **Graph Neural Networks** (GNNs)
- Conducted research on fault propagation, energy resilience, and interdependencies using advanced machine-learning techniques.

II. Graduate Teaching Assistant

Dept. of Computer Science, NDSU | Aug 2022 – May 2023

- Led lab sessions for CSCI 172 (Intermediate Visual Basic).
- Evaluated student projects and provided technical mentorship.

III. Data Processing Supervisor

BISE Malakand, Pakistan | June 2017 – April 2022

- Automated transcript processing & payroll for 120+ employees
- Deployed Oracle PL/SQL & OMR for student evaluation

IV. Software Engineering & Systems Development (2014–2017)

LGE&RDD, Pakistan | June 2014 – 2017

- Created government platforms for citizen services & e-bidding systems.
- Upgraded web apps using Core PHP, CodeIgniter, Oracle, and AngularJS

Research Publications:

1. Muhammad Kazim et al. "Multilayer analysis of energy networks." Sustainable Energy, Grids and Networks, vol. 39, 2024, 101407. https://www.sciencedirect.com/science/article/abs/pii/S235246772400136X

2. Muhammad Kazim et al. "Link Prediction and Navigability of Multiplex Power Networks." Accepted at **ASCE i3CE 2024**. https://arxiv.org/abs/2503.14641

3. Muhammad Kazim et al. "Multilayer Analysis of Energy Networks: A Comprehensive Review."
   Submitted to **Applied Energy** (Revise and Resubmit – Elsevier).
   Contribution: Provides the first systematic synthesis of Multilayer Network Theory (MLNT) applications in multi-energy systems (MES), integrating 1,200 studies across electricity, gas, and heat networks. Employs bibliometric analysis and thematic clustering to identify trends in resource optimization, cascading failure mitigation, and machine learning integration—offering a foundational roadmap for resilient, sustainable, and intelligent energy infrastructure.

4. Muhammad Kazim et al. "Predicting Transmission Line Failures with Graph Neural Networks: Enhancing Power Grid Resilience and Sustainability." Under Review at Sustainable Energy, Grids and Networks. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5256431

5. Muhammad Kazim et al. "Multilayer GNN for Predictive Maintenance and Clustering in Power Grids."
   Submitted to **Joule** (Cell Press).
   Contribution: Develops a novel multilayer Graph Neural Network framework that integrates spatial, temporal, and causal interdependencies in power grids using seven years of real-world data (347 substations, 292,830 incidents). Achieves high-accuracy predictive maintenance (30-day F1-score: 0.8935) and introduces a risk-aware clustering method to identify vulnerable substation groups—advancing state-of-the-art resilience analytics for smart grid modernization.