

Bonan Yang

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Technical Skills

- **Specializations:** Graph Neural Networks (GCN, GraphSAGE, GAT, Graph Autoencoder, Spatio temporal GNNs), Knowledge Graphs, Complex Network Analysis, NLP & LLM, GraphRAG, Vector Databases, End-to-End ML Deployment
- **Languages:** Python, C/C++, R, SQL, Cypher
- **Databases & Storage:** Neo4j, Milvus, Pinecone, HDFS
- **Platforms & Tools:** Linux, Docker, AWS, GCP, Apache Spark, PyTorch, PyG (Pytorch Geometry), Transformers, vLLM/SGLang CUDA, Git, NetworkX, Gephi, yEd Graph Editor

Education & School Activity

• Southern Illinois University Carbondale <i>Ph.D. (ABD) in Computer Science</i>	Carbondale, IL 2022 – Present
• Southern Illinois University Edwardsville <i>M.S. in Computer Science</i>	Edwardsville, IL 2019 – 2021
• Shanghai Institute of Technology <i>B.S. in Computer Science</i>	Shanghai, China 2014 – 2018

Selected Projects

• Large-scale Wikipedia Knowledge Graph <i>Built infrastructure for grounding LLM outputs in structured world knowledge.</i>	2025 – Present
◦ Processed Wikipedia, parsed 18.8M page nodes and 747M link edges, built large-scale knowledge graph with HDFS .	
◦ Implemented distributed graph processing with Spark for namespace filtering, redirect resolution, entity disambiguation.	
◦ Generated entity embeddings with FastText and indexed in Milvus for semantic similarity search.	
◦ Applied to concept alignment and knowledge path discovery, supporting downstream GraphRAG and QA systems.	
• Curriculum-Industry Skill Gap Analysis <i>Extending knowledge flow analysis from classroom to workplace through course-skill-job alignment.</i>	2025 – Present
◦ Built a knowledge graph (neo4j) integrating occupational skill ontology with STEM course syllabus text, enabling multi-source fusion of course-skill-job entities across 462 courses, 3556 skills and 770 jobs.	
◦ Applied semantic encoding for entity vectorization and automatically constructed cross-layer relationships via semantic similarity, supporting multi-hop reasoning and path queries for courses-skills-jobs alignment.	
◦ Designed graph feature engineering to compute skill coverage and job reachability metrics with explainable outputs	
◦ Applied the model to 5 regional public universities' educational data to quantify regional curriculum-industry skill gaps, providing data-driven insights for Illinois State Board of Education (ISBE)	
• Course Graph Visualization Platform <i>Structuring and visualizing knowledge dependencies in university course systems.</i>	2023 – Present
◦ Built full-stack web application: Flask + Neo4j backend with RESTfulAPI , Cytoscape.js frontend	
◦ Deployed to production with Docker containerization, Nginx reverse proxy, and SSL configuration	
• Course Graph Student Progression Analysis <i>Tracking how students flow through knowledge structures and identifying where they get stuck.</i>	2023 – 2024
◦ Constructed course prerequisite graph with NetworkX, integrating 14 years of transcript data for path analysis.	
◦ Applied Bayesian inference and survival analysis to model path completion probability and expected time-to-graduation.	
◦ Designed Markov-style grade transition matrix and graph centrality metrics to capture performance decay and locate systematic bottlenecks.	
• Self-supervised Network Qualification of 3D Objects for Personalized Manufacturing <i>Enabling similarity retrieval and quality comparison of 3D printed objects via self-supervised graph learning.</i>	2024 – present
◦ Transformed 3D printing point cloud data into graph structures to capture geometric topology of manufactured objects.	
◦ Designed Graph Autoencoder with contrastive learning (Anchor-Positive-Negative) to learn object embeddings.	
◦ Built embedding database of printed objects, enabling similarity retrieval and deviation localization for new prints.	
◦ Applied to quality assessment and process parameter optimization in personalized manufacturing.	
• GNN-Based Molecular Toxicity Prediction System <i>Building GNN pipeline from scratch for graph-level classification on molecular structures.</i>	2025 – 2025
◦ Implemented and compared GCN and GAT architectures in PyTorch and PyG for multi-label toxicity prediction across 12 biological assays (Tox21 dataset, 7.8K compounds).	
◦ Parsed SMILES into molecular graphs with RDKit , extracting atom features (element, degree, charge, aromaticity) and building adjacency matrices from bond structures.	
◦ Implemented block-diagonal batching for variable-size graphs and masked loss for sparse labels.	
◦ Achieved 0.78 (GCN) and 0.81 (GAT) average ROC-AUC across 12 toxicity endpoints under severe class imbalance (1:22)	

Awards & Professional Activities

- Research Grants for Doctoral Students (RGRDS) Award, SIUE ([SIUE News](#))
- Outstanding Teaching Assistant Award, SIUE ([Illinois Business Journal](#))
- Conference Presentation, Complex Network and Application 2025 ([Collinsville Daily News](#))
- Conference Presentation, American Society for Engineering Education (ASEE) 2025 ([SIUE News](#))