

Graph Neural Networks for Financial Fraud Detection: A Review

Dawei CHENG, Yao ZOU, Sheng XIANG, Changjun JIANG

Frontiers of Computer Science, DOI: [10.1007/s11704-024-40474-y](https://doi.org/10.1007/s11704-024-40474-y)

Research Questions

RQ1: How can various GNN methodologies in financial fraud detection be understood through a unified framework?

RQ2: Why use GNNs for financial fraud detection? What roles do they play?

RQ3: How to design GNNs suitable for financial fraud detection?

RQ4: How are GNNs deployed in real-world financial fraud detection scenarios, and what are their impacts?

RQ5: What are the current challenges and future directions for GNNs in financial fraud detection?

Foundational Framework

Theoretical Support

Implementation

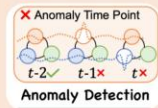
Challenge

RQ1: GNN Classification
(Sections 3)

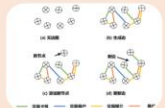


GCN

GAT



GTN



HGNNs

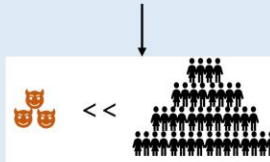
RQ2: Reason for Choosing GNNs
(Sections 4)

- Automatic Feature Learning
- Integrating Multimodal Data
- Dynamic Graphs
- Graph Construction

- Transaction
- Relationship
- Behavioral & Patterns
- Information Flow

RQ3: Methodology For GNN selection
(Sections 5)

- Architectural Choices for GNN
- Feature Selection
 - Edge Features
 - Node Features
 - Multimodal Data
- Imbalanced Data



RQ4: Real-world Applications
(Sections 6)

- Credit Card
- Online Payment
- Insurance
- Money Laundering



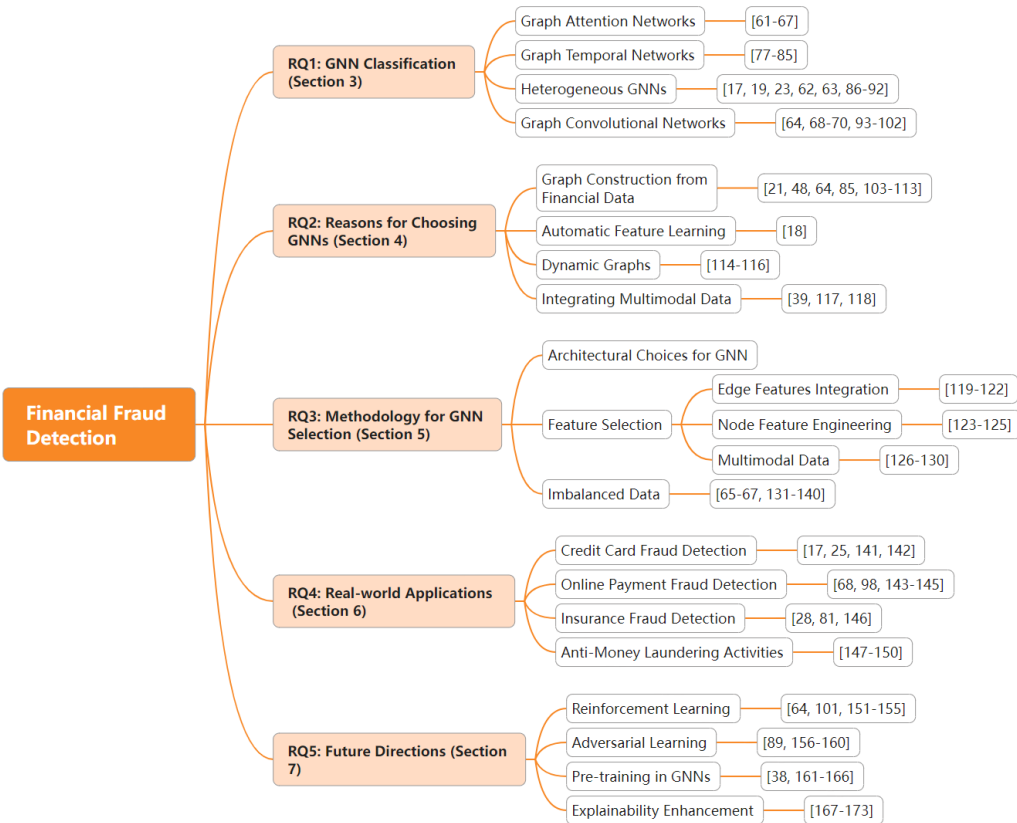
RQ5: Future Directions
(Sections 7)



- Reinforcement Learning
- Adversarial Learning
- Pre-training in GNNs
- Explainability Enhancement

GNNs for Financial Fraud Detection

Main Contributions



- ✓ **Unified Framework:** Proposed a framework to categorize and analyze GNN methods in financial fraud detection, enhancing understanding.
- ✓ **Suitability of GNNs:** Explored why GNNs are well-suited for tackling financial fraud detection.
- ✓ **Design Insights:** Provided insights into designing GNNs specifically for financial fraud detection.
- ✓ **Real-world Applications:** Highlighted practical examples of GNNs in action within the financial sector.
- ✓ **Future Directions:** Discussed current challenges and future opportunities in GNN research for fraud detection.

The general content of the paper