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DAT301

Use graphs to perform fraud analysis with Amazon Neptune and Neptune ML

Soji Adeshina (he/him)

Applied Scientist, AWS Deep Engines
AWS

Dave Bechberger (he/him)

Sr. Graph Architect, Amazon Neptune
AWS

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Types of fraud



Financial/ bank



Healthcare



Retail/ ecommerce



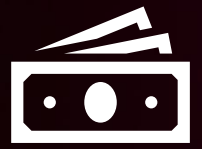
Mail



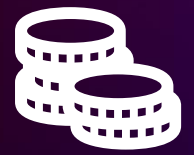
Securities



Insurance



Credit card



Tax

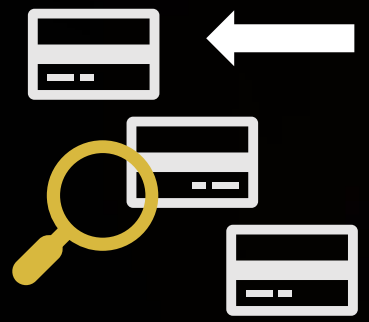
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Challenges of fraud detection

“Fraud is an uncommon, well-considered, imperceptibly concealed, time-evolving and often carefully organized crime which appears in many types of forms.”

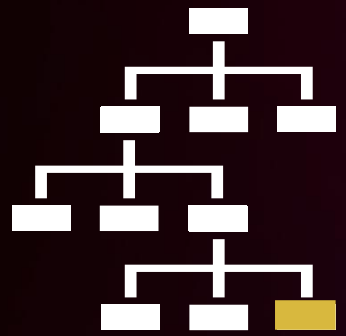
Source: Baesens, Van Vlasselaer, and Verbeke, *Fraud Analytics Using Descriptive, Predictive, and Social Network Techniques,* Wiley and SAS Business Series, Kindle Edition



Uncommon



Well considered



Imperceptibly concealed



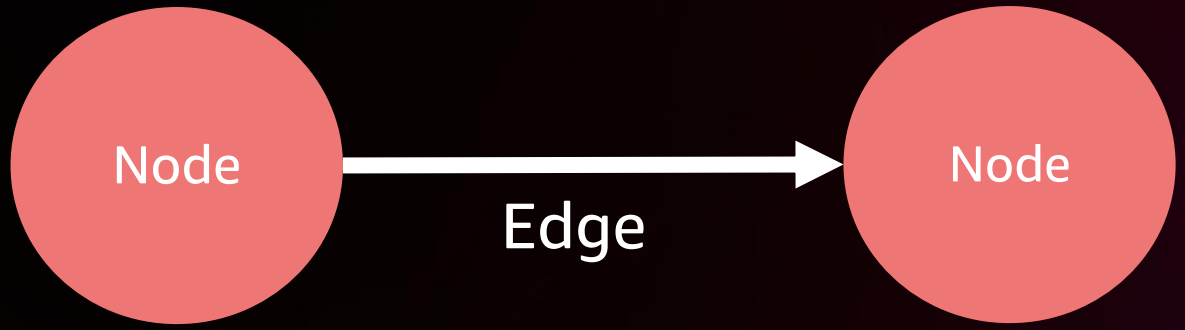
Time evolving

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What is a graph?

- Graph databases are purpose built to store and navigate relationships
- Nodes represent real-world objects (nouns)
- Edges store relationships between objects (verbs)
- Properties store attributes on nodes or edges



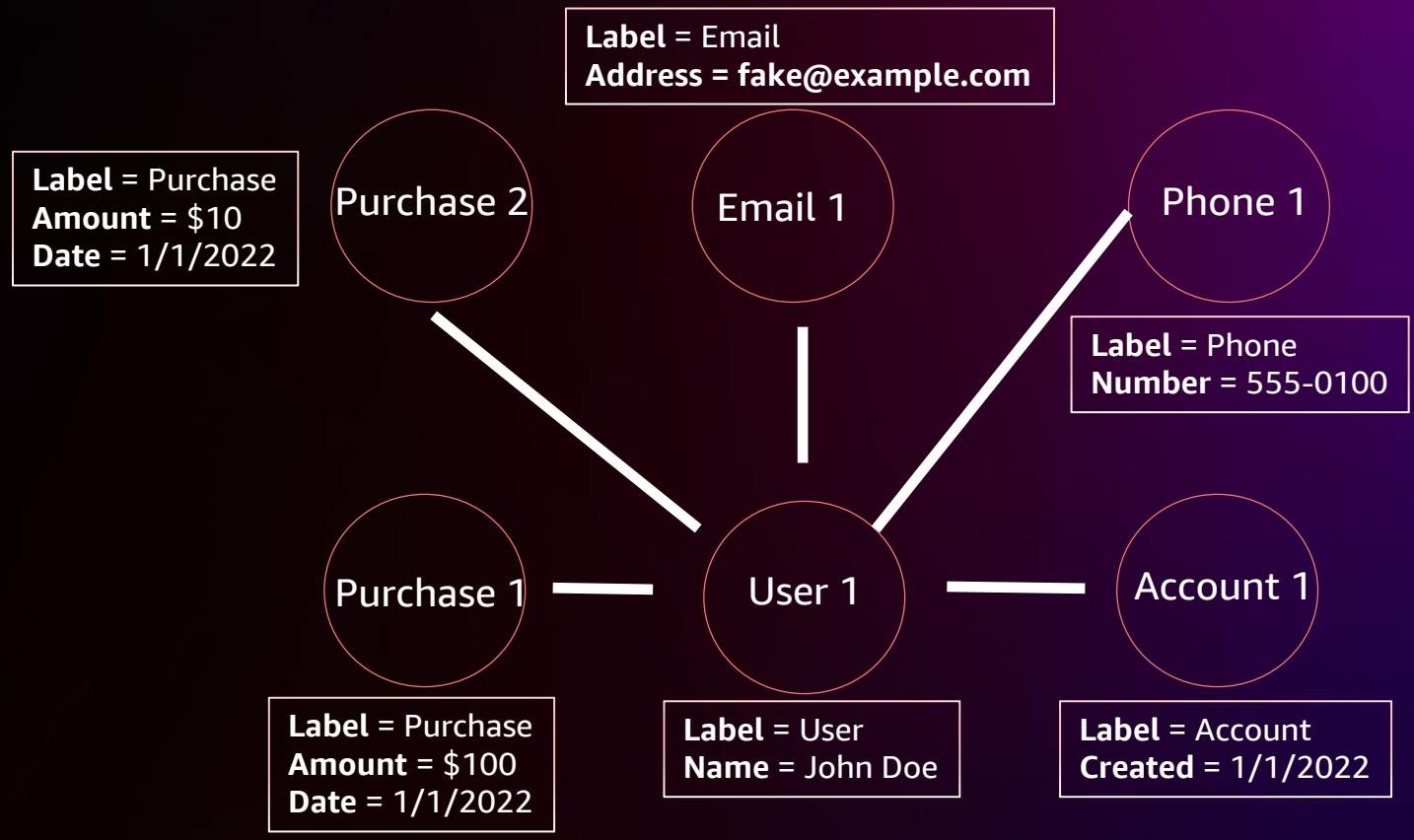
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A fraud graph model

Conceptual fraud model



Fraud graph model



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Amazon Neptune

FULLY MANAGED, PURPOSE-BUILT GRAPH DATABASE IN THE CLOUD



Cost effective



No hardware management



Instant provisioning



Scaling



Security and compliance

- Optimized to store and map billions of relationships
- Enables real-time navigation of connections with millisecond query response time
- Supports open standard query languages openCypher, Gremlin, and SPARQL

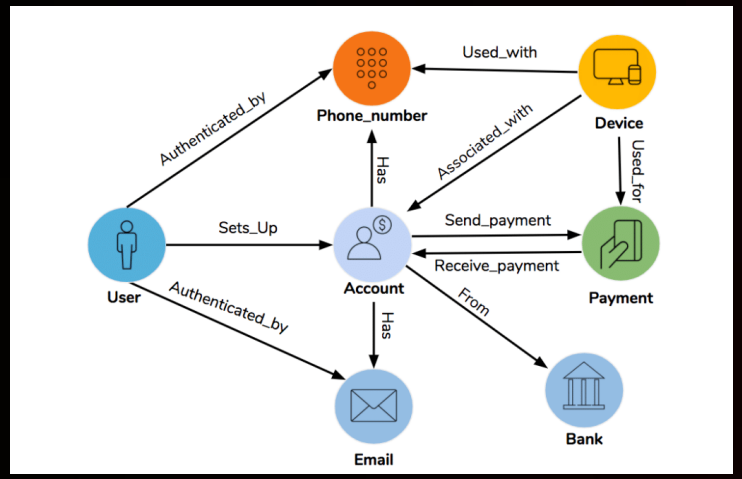
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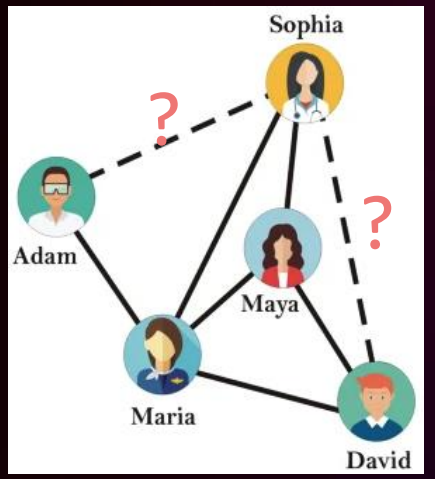
Fraud and graph-based machine learning

Standard graph queries excel at providing deterministic answers

How do we accomplish this when we don’t have all the data or connections?



New data/nodes

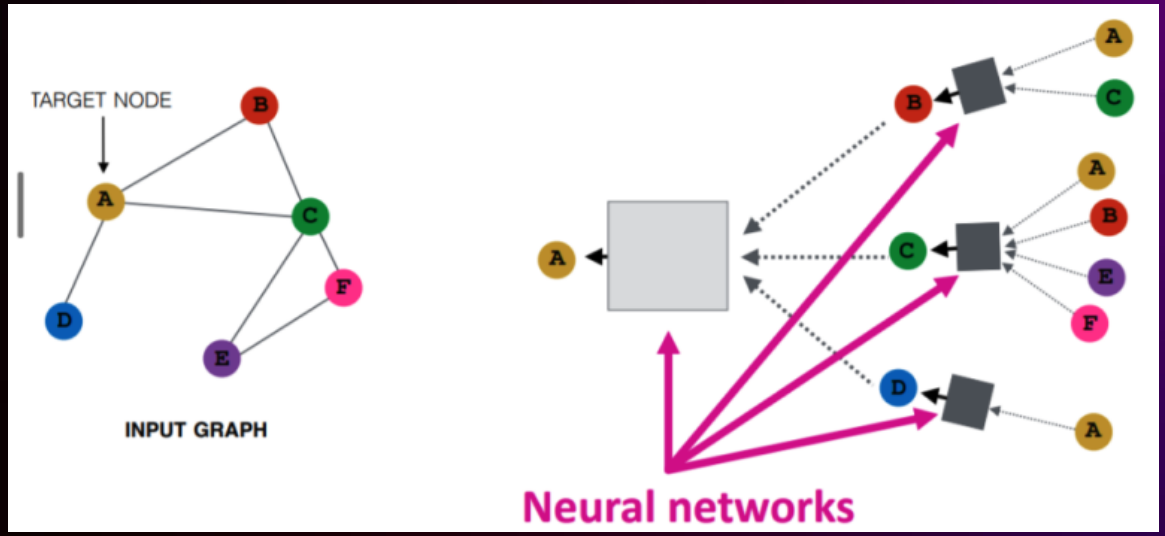


Hidden relationships

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Fraud and graph-based machine learning

- Graph neural networks (GNNs) are a state-of-the-art technique to predict using graphs
- With GNNs, neural networks learn complex graph structures and features patterns and optimize models to solve specific tasks



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Amazon Neptune and Neptune ML

Amazon Neptune



Neptune ML







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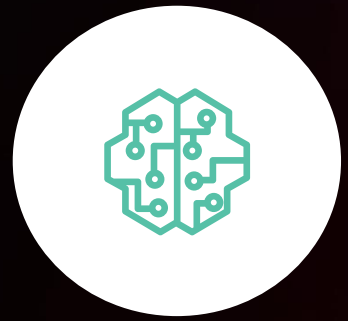
Neptune ML features



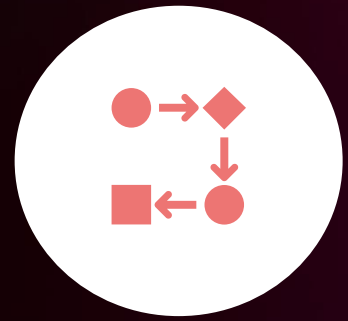
Automated feature selection



Automated scaling



Automatic model selection



Automated SageMaker workflow



Query language integration for ML inference

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