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Fraud detection in insurance with social network analytics

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Goals

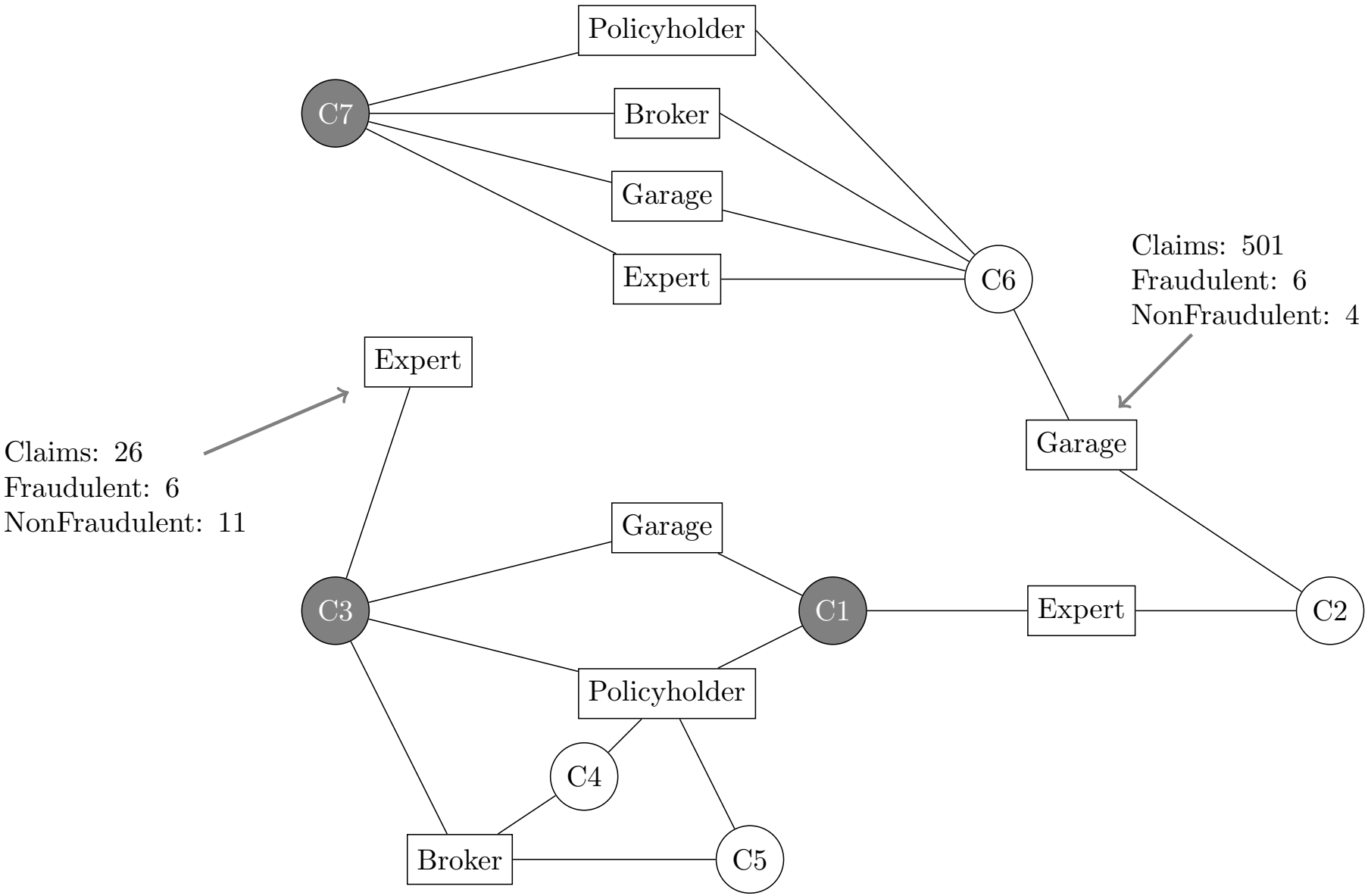
Use **social network analysis** to improve fraud detection

1. Detect **groups** of collaborating fraudsters
2. **Propagate influence** and rank claims with respect to fraud exposure
3. Build analytical **fraud detection model**

$\Rightarrow$ Flag **suspicious cases** for further investigation

- Graph database
- Queried with Cypher
- Visualization

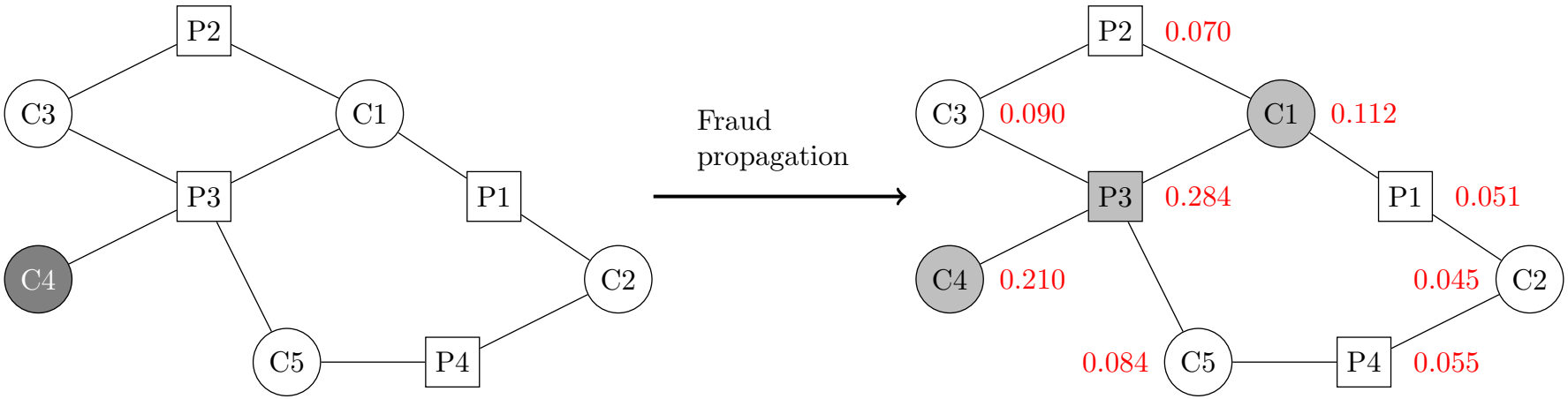
Claim network



Fraud exposure

- BiRank algorithm
  - PageRank for bipartite networks
- Customized restart vector steers the ranking towards fraud

$$\xi_{claim} = \alpha \boldsymbol{A} \xi_{party} + (1 - \alpha) \boldsymbol{v}, \qquad \xi_{party} = \boldsymbol{A}^T \xi_{claim}$$



- C4 is fraudulent and source of influence
- C4, P3 and C1 obtain high scores

Fraud detection model

- **Extract** useful information from network
  - Own exposure score
  - Exposure score from neighborhood
- **Combine** with local features
- Apply a **supervised learning** algorithm
- Complications
  - Target has three values: fraud, non-fraud and unknown
  - Class imbalance: less than 1% of claims have a known label

Thank you

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