An expert system for detecting automobile insurance fraud using social network analysis

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Detecting fraud through social network analysis

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Insurance fraud
Fraud detection
Expert system
Results and contributions
Conclusions

Automobile insurance fraud

- staged traffic accidents → fake claims
- increased risk for other road users
- losses in Slovenia ≈ 100 million €/year
- problem: groups of collaborating fraudsters
- goal: an expert system applicable in practice

Vir: http://www.insurancefraud.org/
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Fraud detection techniques
- Statistics, data mining, machine learning, expert knowledge
- Detection of anomalies or fraud (demands labeled data)

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- participants are linked together → social network
Detecting fraud through social network analysis

- participants are linked together → social network
- fraudsters can be detected with the naked eye
Expert system for fraud detection

Fraud detection system:

1. representation with networks
2. suspicious components detection
3. suspicious entities detection
4. visualization of the results
Expert system for fraud detection

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Suspicious components detection

- network is composed of several connected components
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Suspicous components detection

- network is composed of several connected components
- common features of 'fraudulent' components → indicators

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Suspicious components detection

- network is composed of several connected components
- common features of 'fraudulent' components → indicators
- suspicious components are detected by simulation
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"Tell me who your friends are, I will tell you who you are"

Suspicious entities detection

→ suspicious entities are detected by iteration → propagation of suspicion overcomes the locality
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 imshow

“Tell me who your friends are, I will tell you who you are”
Suspicious entities detection

- “Tell me who your friends are, I will tell you who you are”
- suspicious entities are detected by iteration $\rightarrow$ models
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Suspicious entities detection

- “Tell me who your friends are, I will tell you who you are”
- suspicious entities are detected by iteration → models
Suspicious entities detection

- “Tell me who your friends are, I will tell you who you are”
- suspicious entities are detected by iteration → models
- propagation of suspicion overcomes the locality
Results and contributions

▶ prototype system:
  ▶ traffic accidents in Slovenia (1999-2008)
  ▶ accuracy ≈ 93% (other approaches 80-85%)

▶ scientific contributions:
  ▶ SCI journal (exceptional scientific work)
  ▶ conference (best paper award)
  ▶ diploma (Prešeren’s award)

▶ company Optilab is developing a tool Admiral
Conclusions

- fraud detection system applicable in practice
- can be transferred to other domains, problems
- nowadays, networks are ubiquitous in everyday life
- network analysis offers a number of approaches

Vir: (Rosvall & Bergstrom, P. Natl. Acad. Sci. USA, 105(4), 2008)
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Thank you

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