FRAUD DETECTION THROUGH GRAPH-BASED USER BEHAVIOR MODELING

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bit.ly/ccs2015_graphmodeling

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Thanks to

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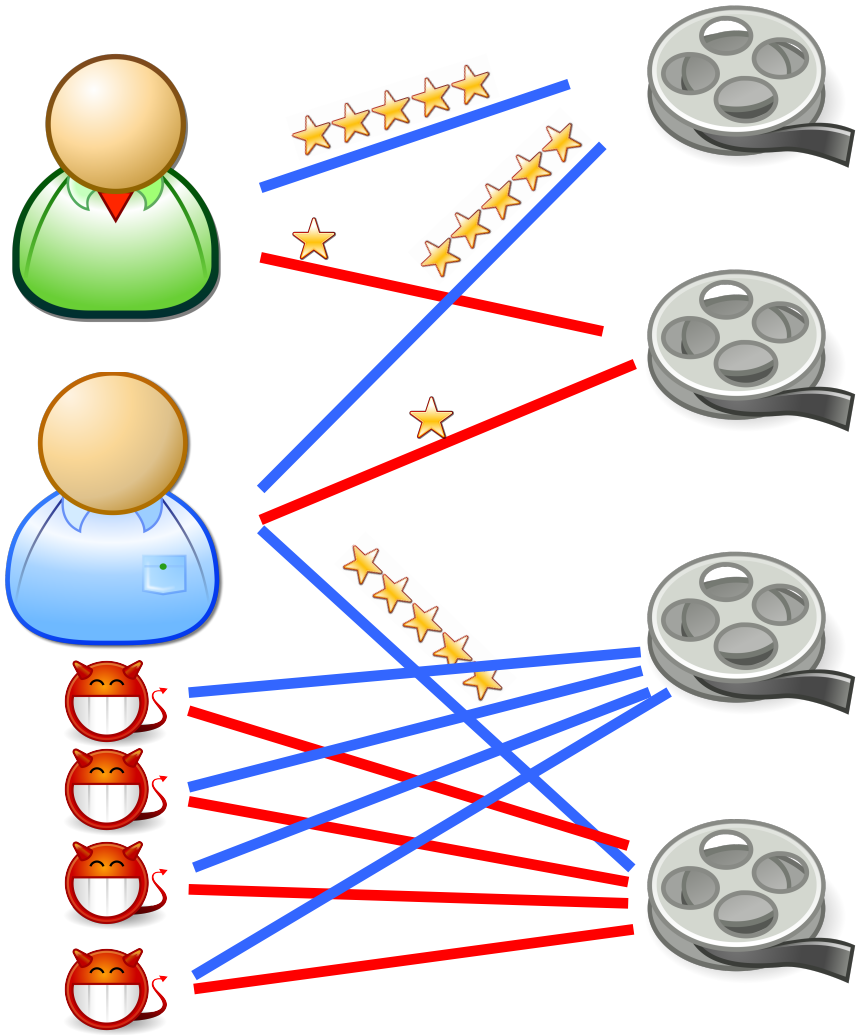
CAREER 1452425, DGE-1252522, ...

User Behavior Challenges



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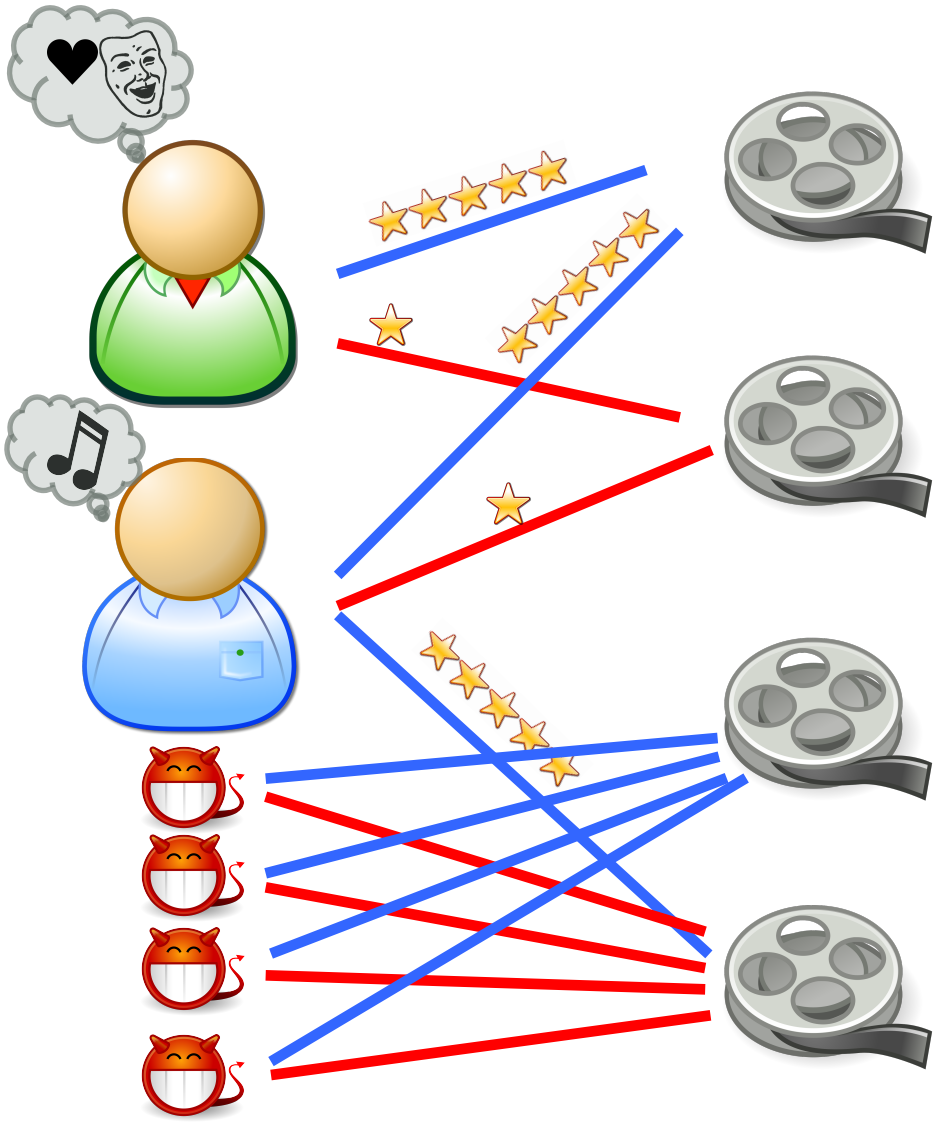
User Behavior Challenges



Three Main Questions:

1. How can we understand typical/normal user behavior in a graph?

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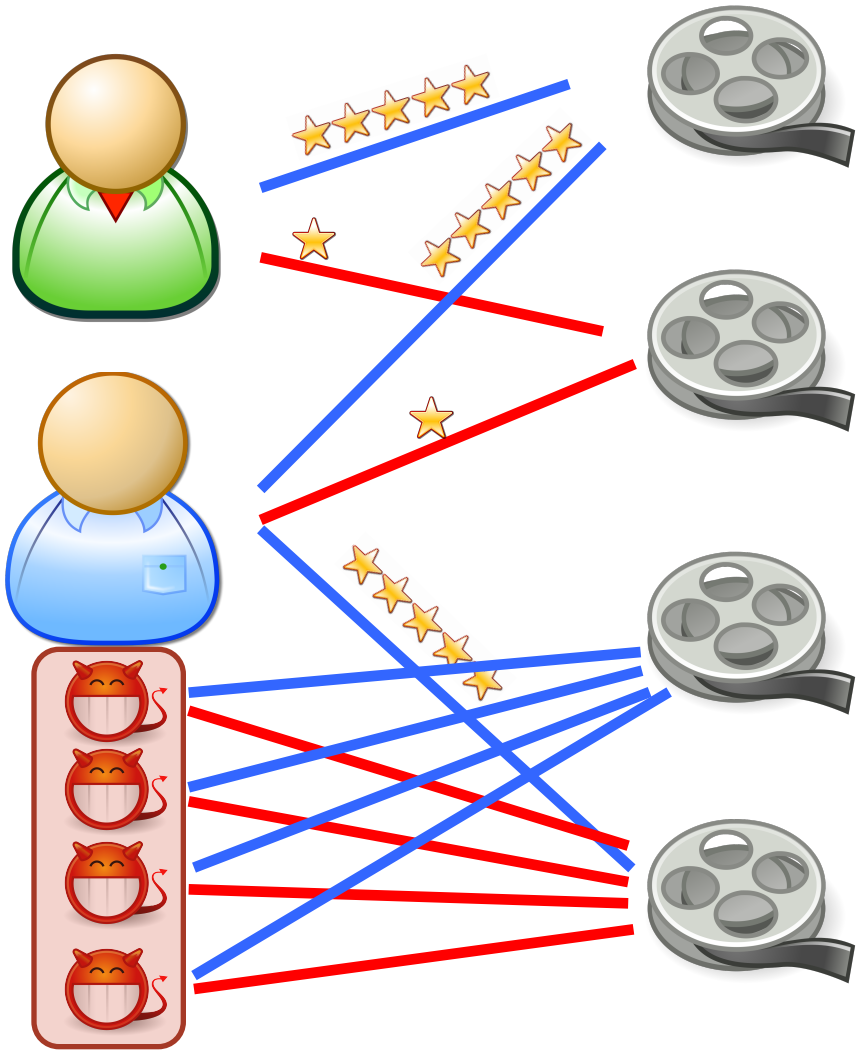
User Behavior Challenges



Three Main Questions:

1. How can we understand typical/normal user behavior in a graph?
2. How can we find suspicious user behavior?

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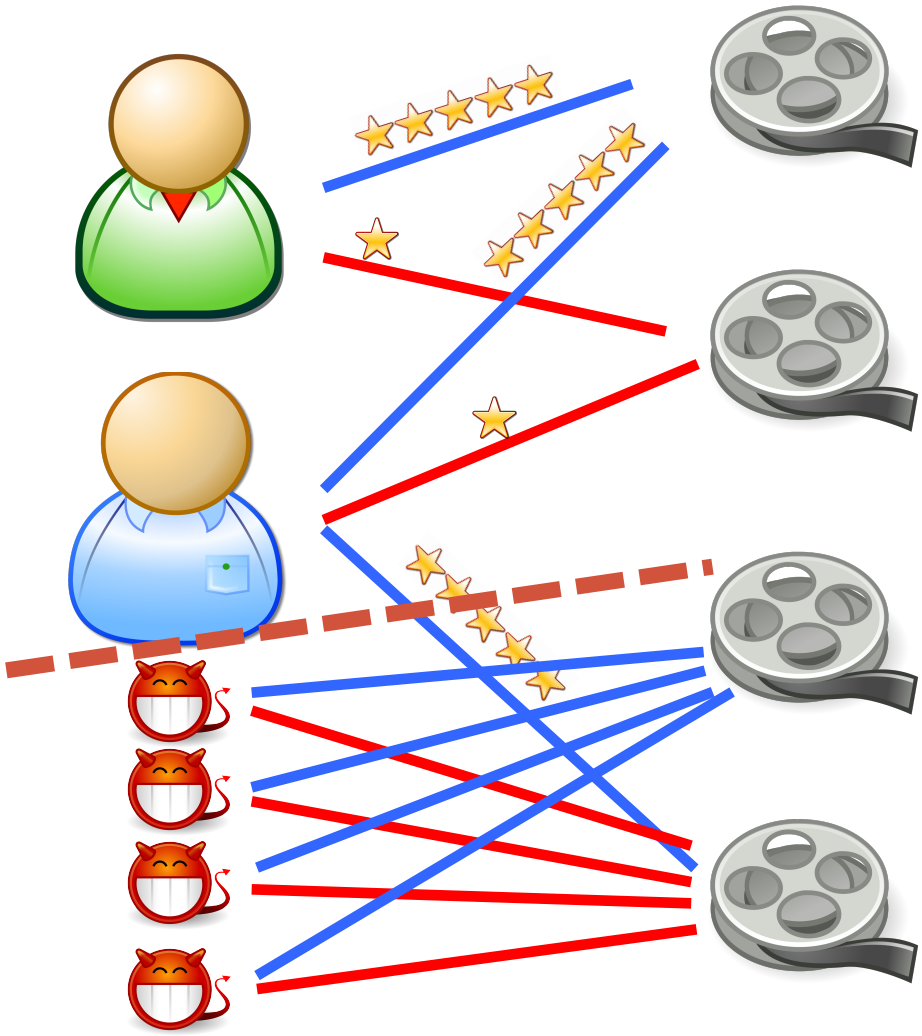

Three Main Questions:

1. How can we understand typical/normal user behavior in a graph?
2. How can we find suspicious user behavior?
3. How can we distinguish the two?

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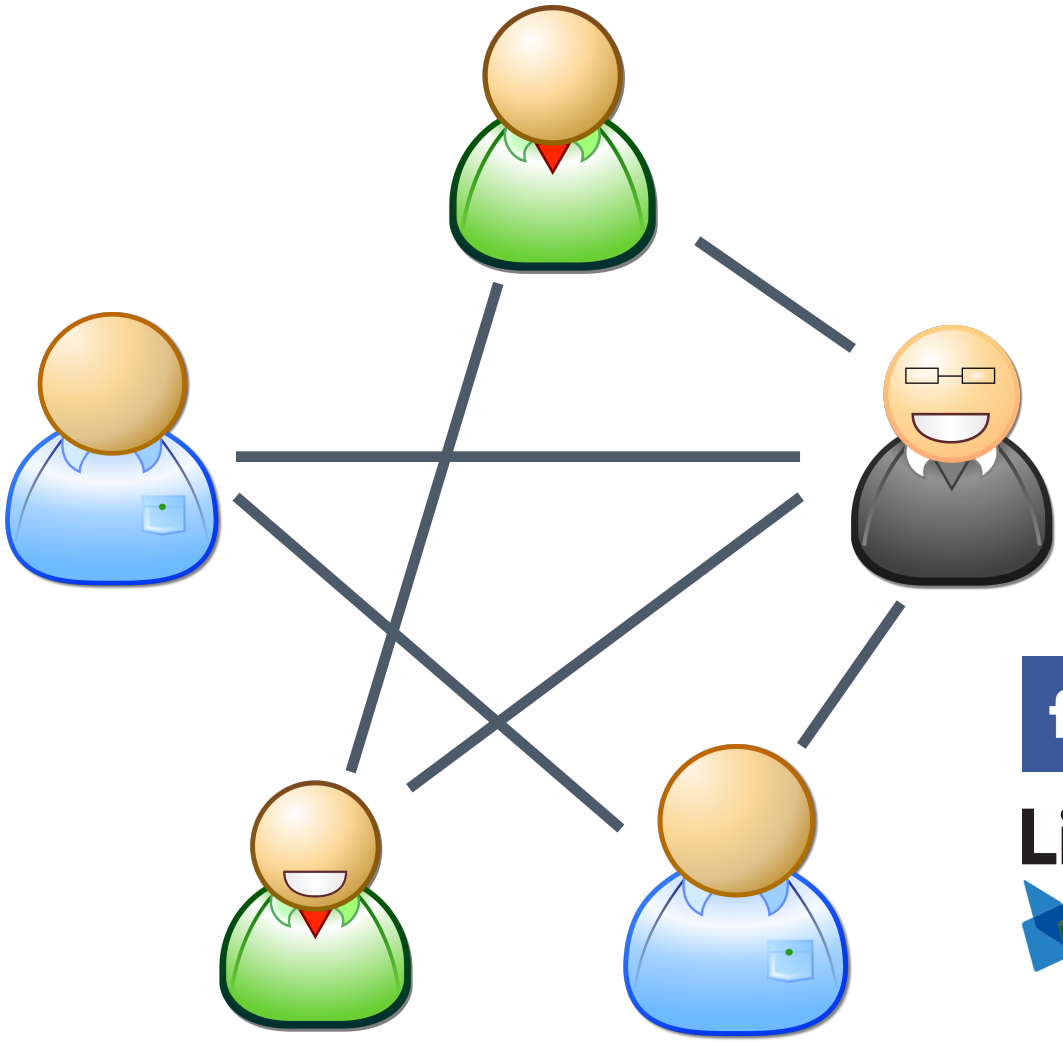
Graphs of User Behavior



- Undirected graphs

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computer science bibliography

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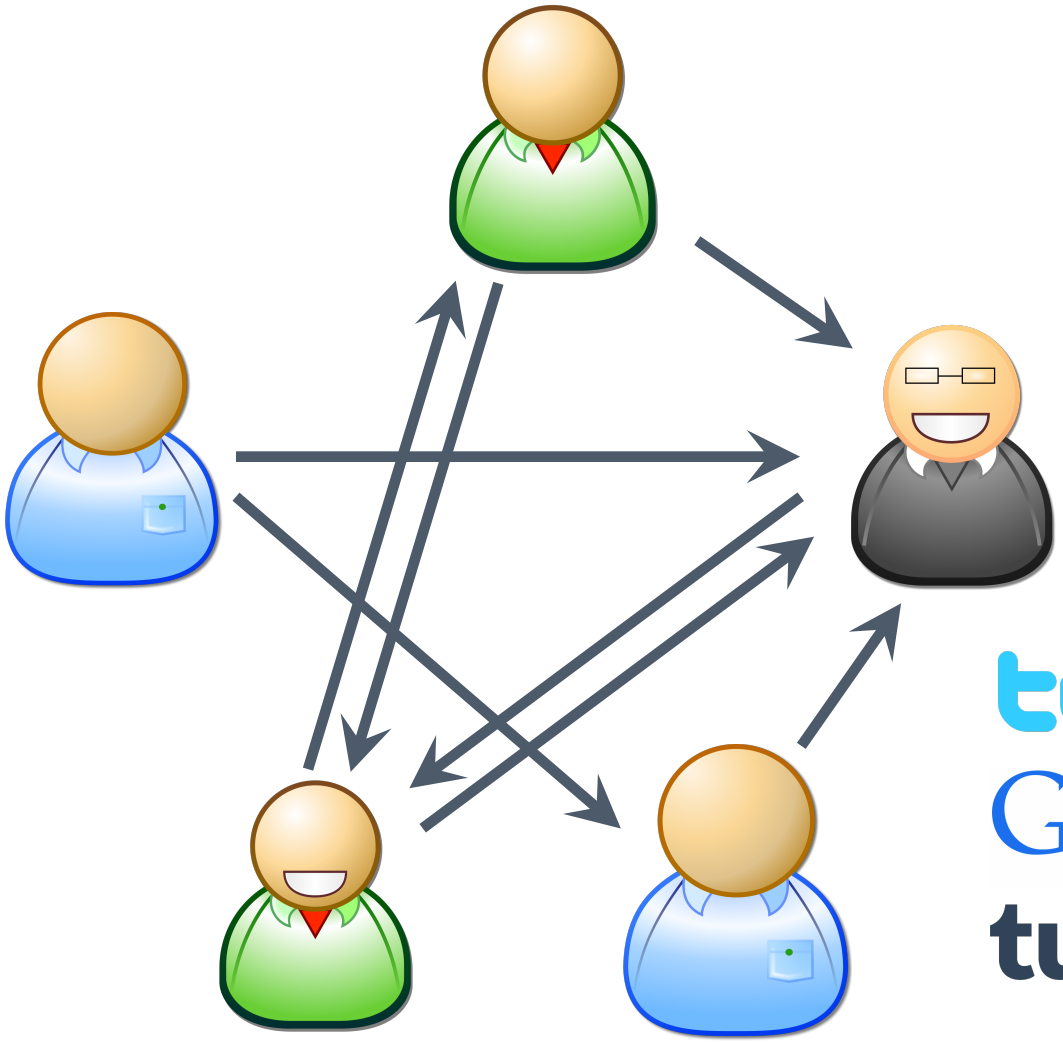

- Undirected graphs
- Directed graphs

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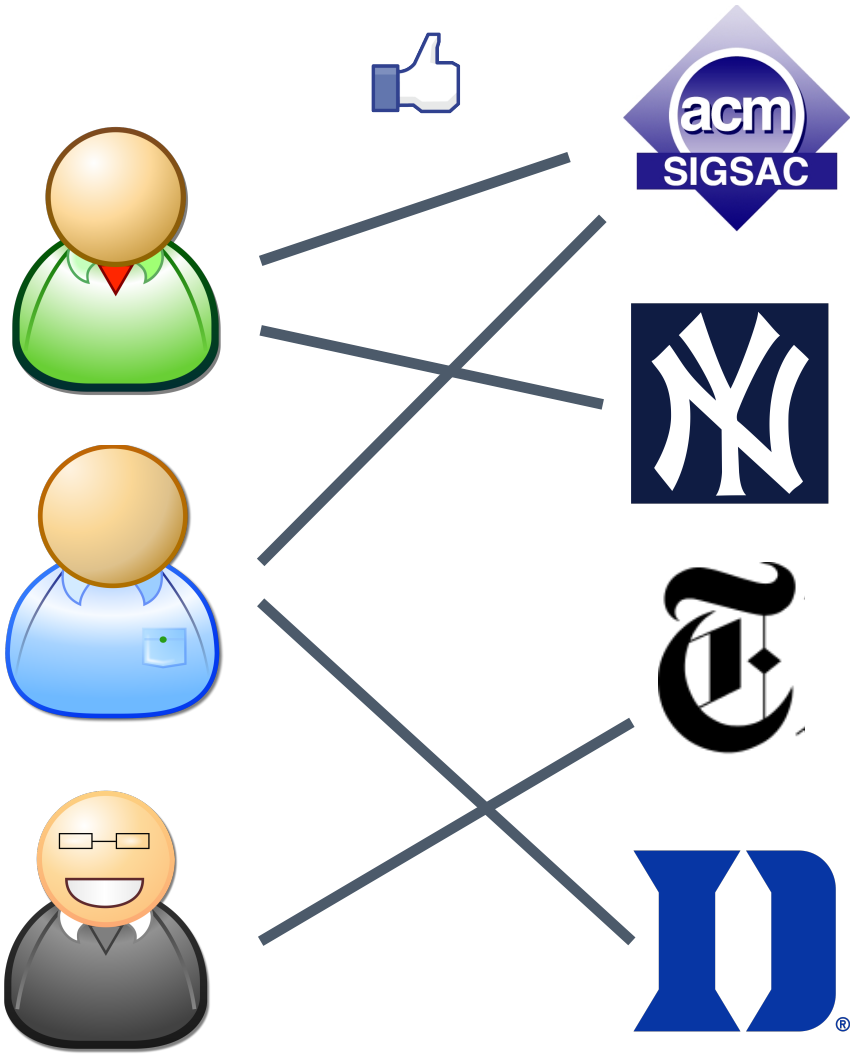

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- Bipartite graphs

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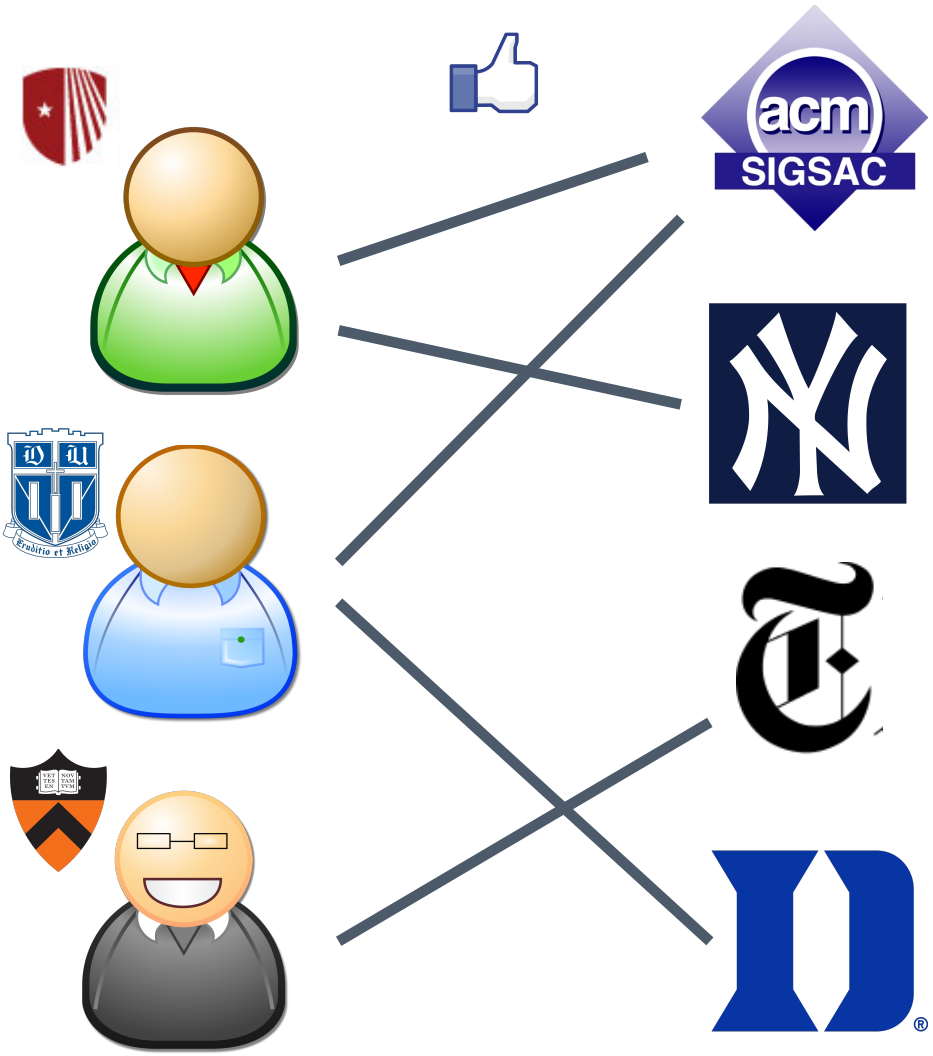

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- Bipartite graphs
- Node attributes

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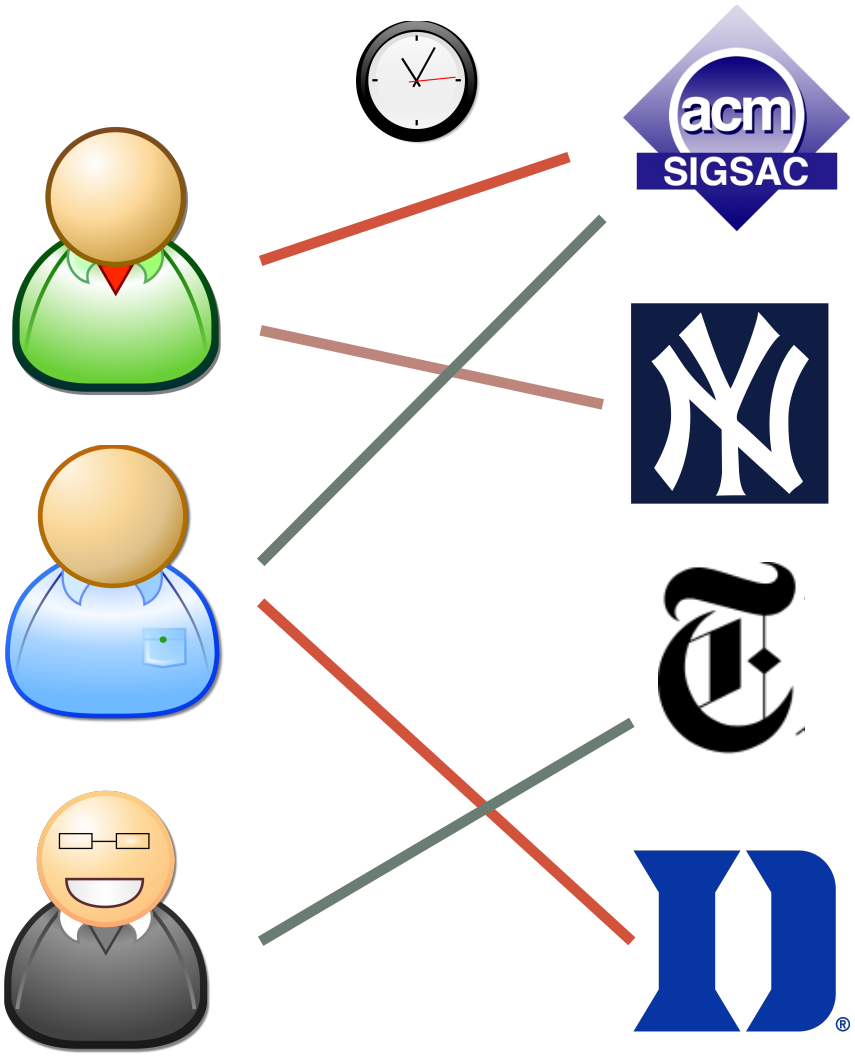

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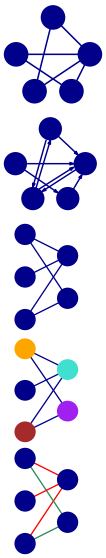
- Edge attributes



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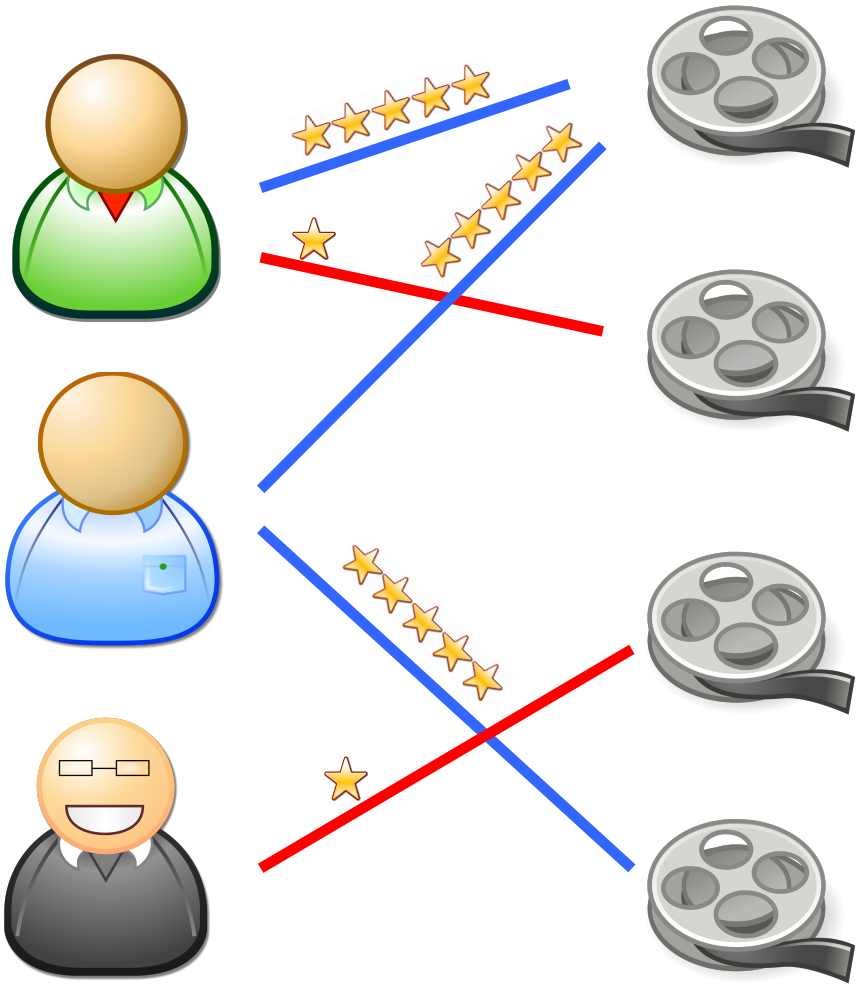

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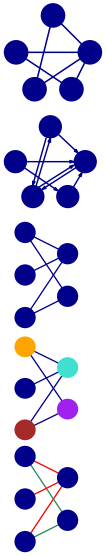

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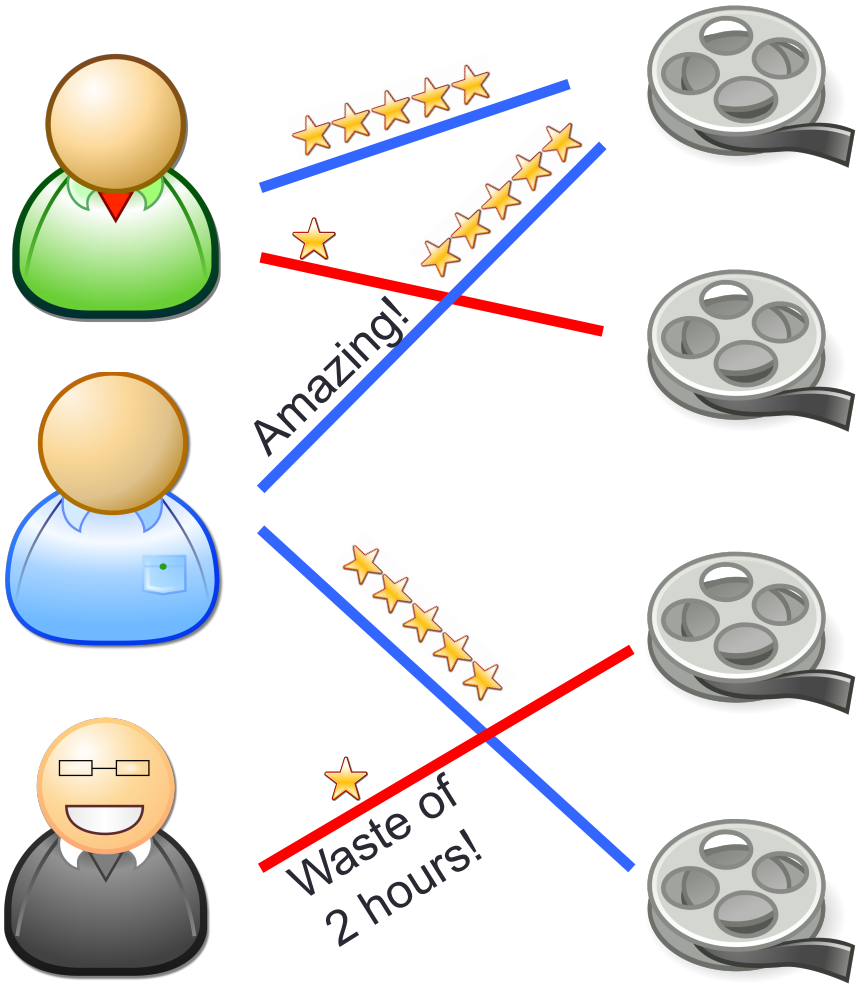

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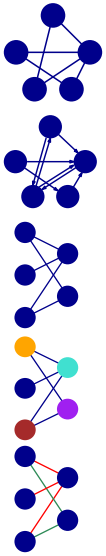

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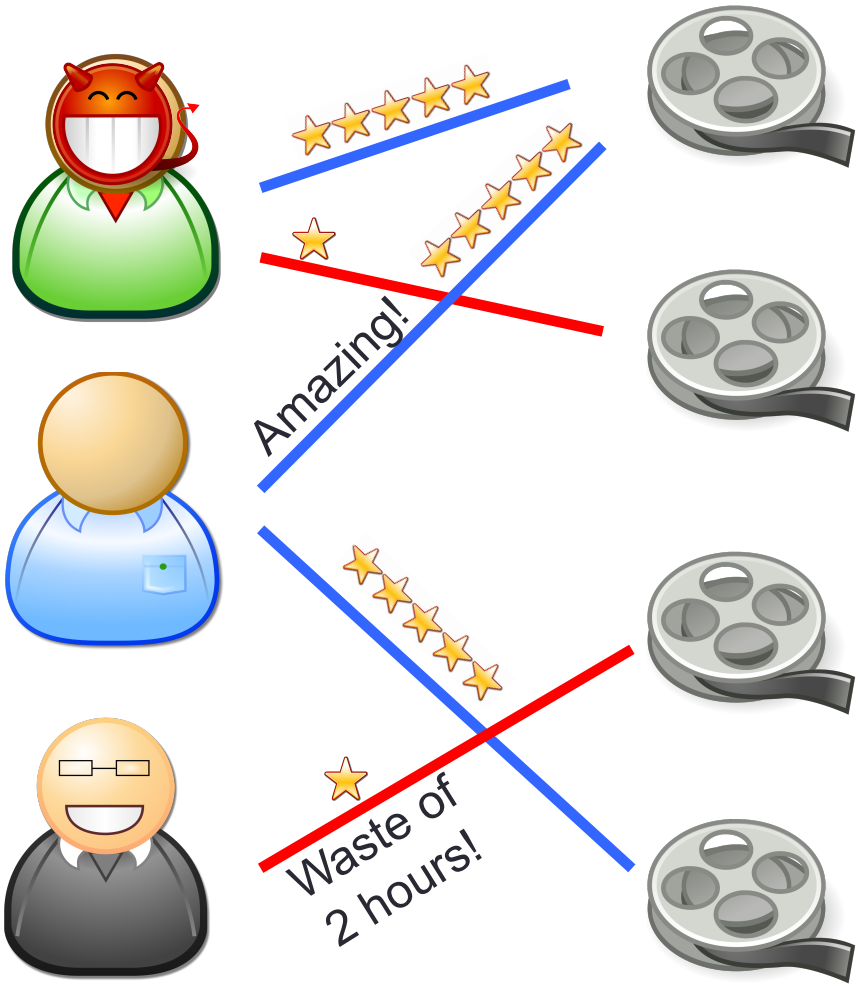

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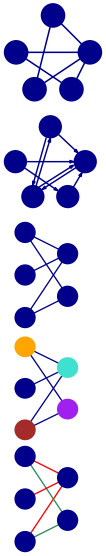

Semi-supervised

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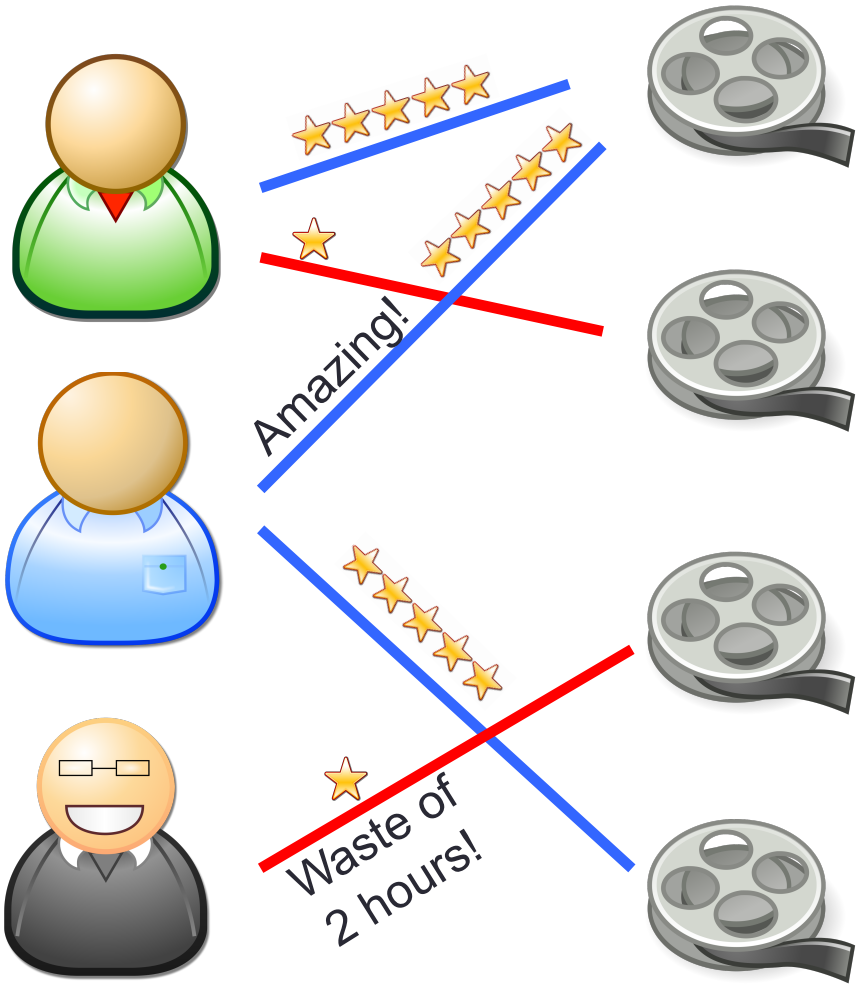

{ Undirected
Directed
Bipartite }

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{ Node Attributes }

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{ Edge Attributes }

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{ Unsupervised
Semi-Supervised }

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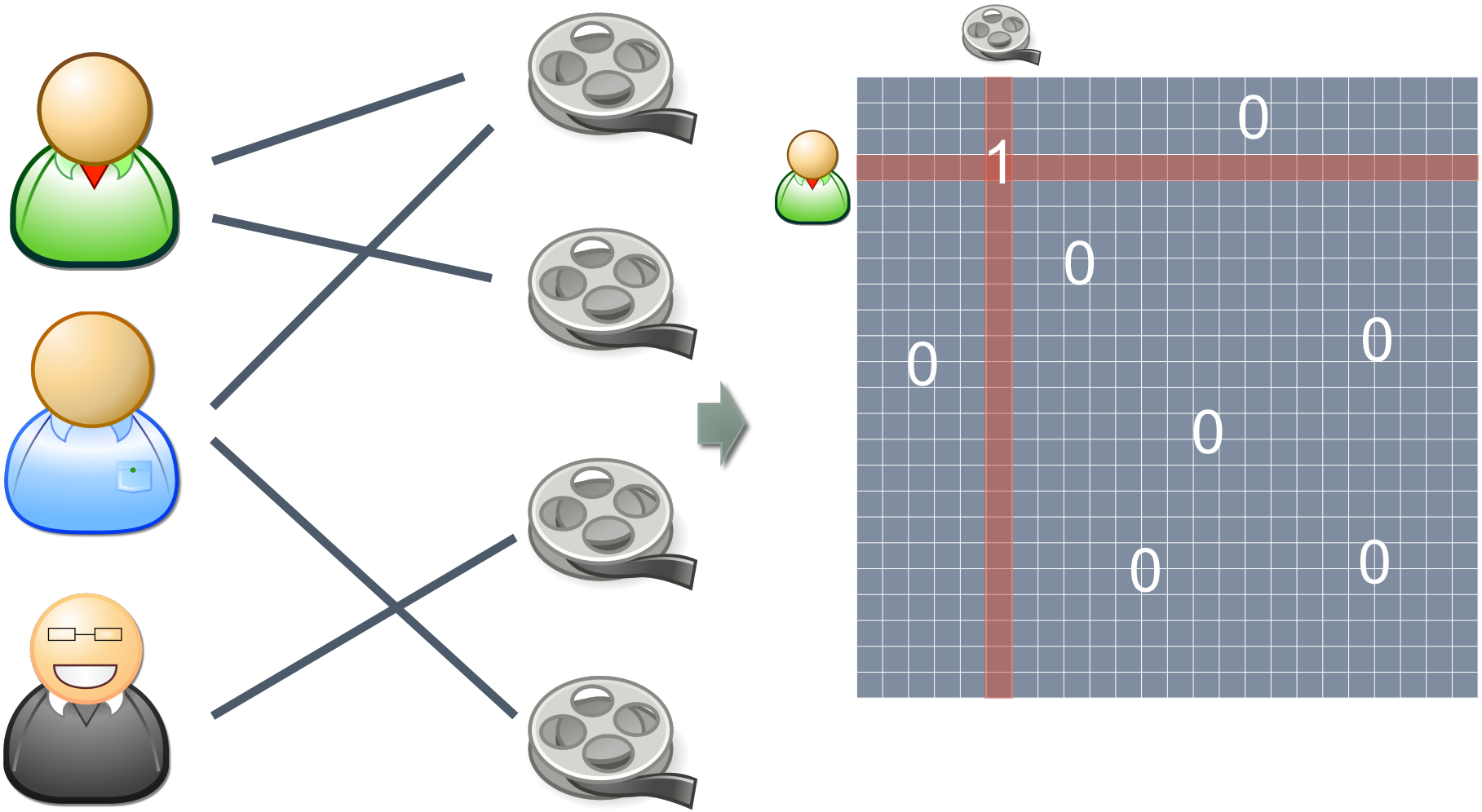

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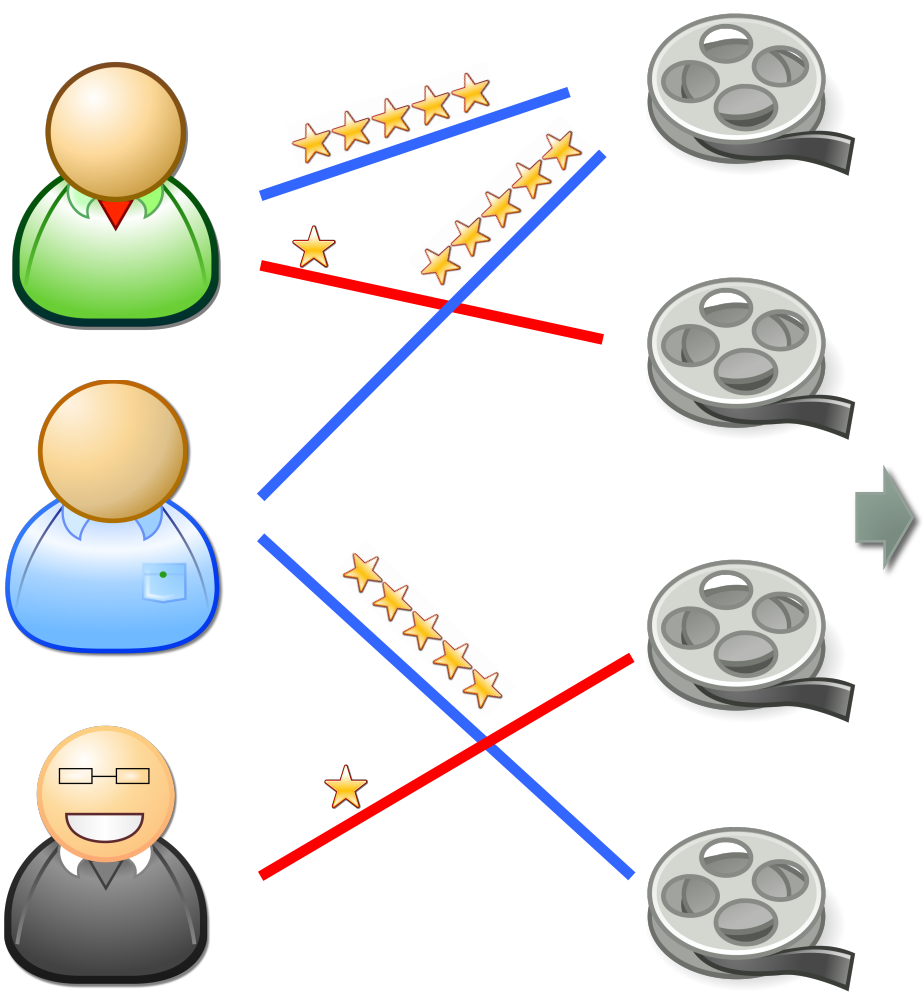

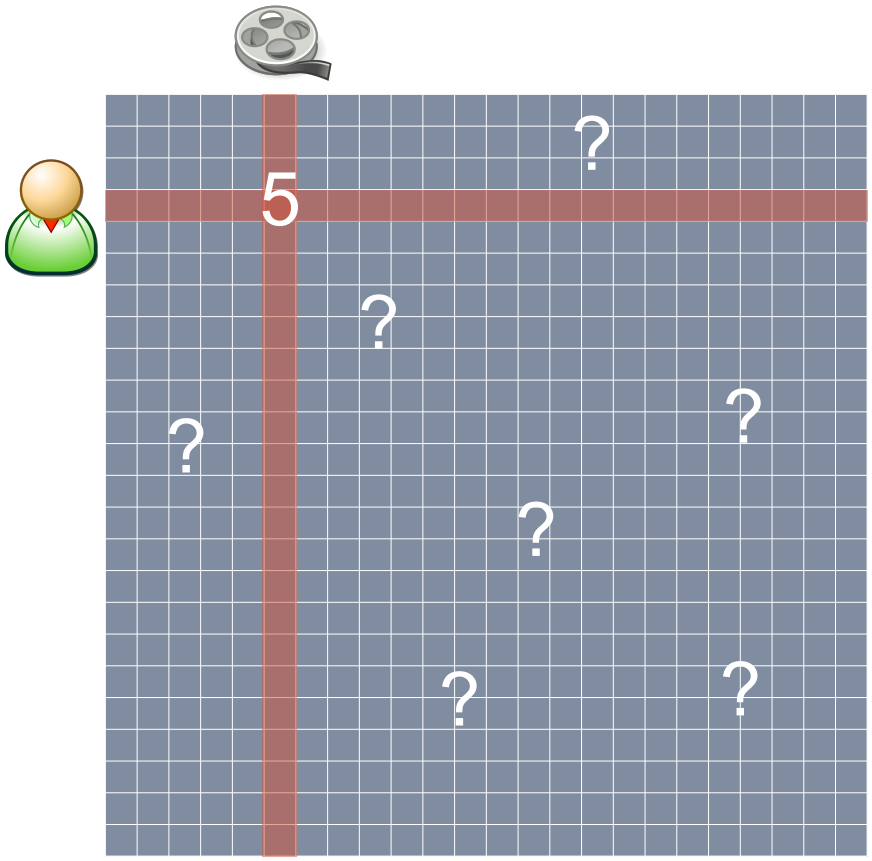

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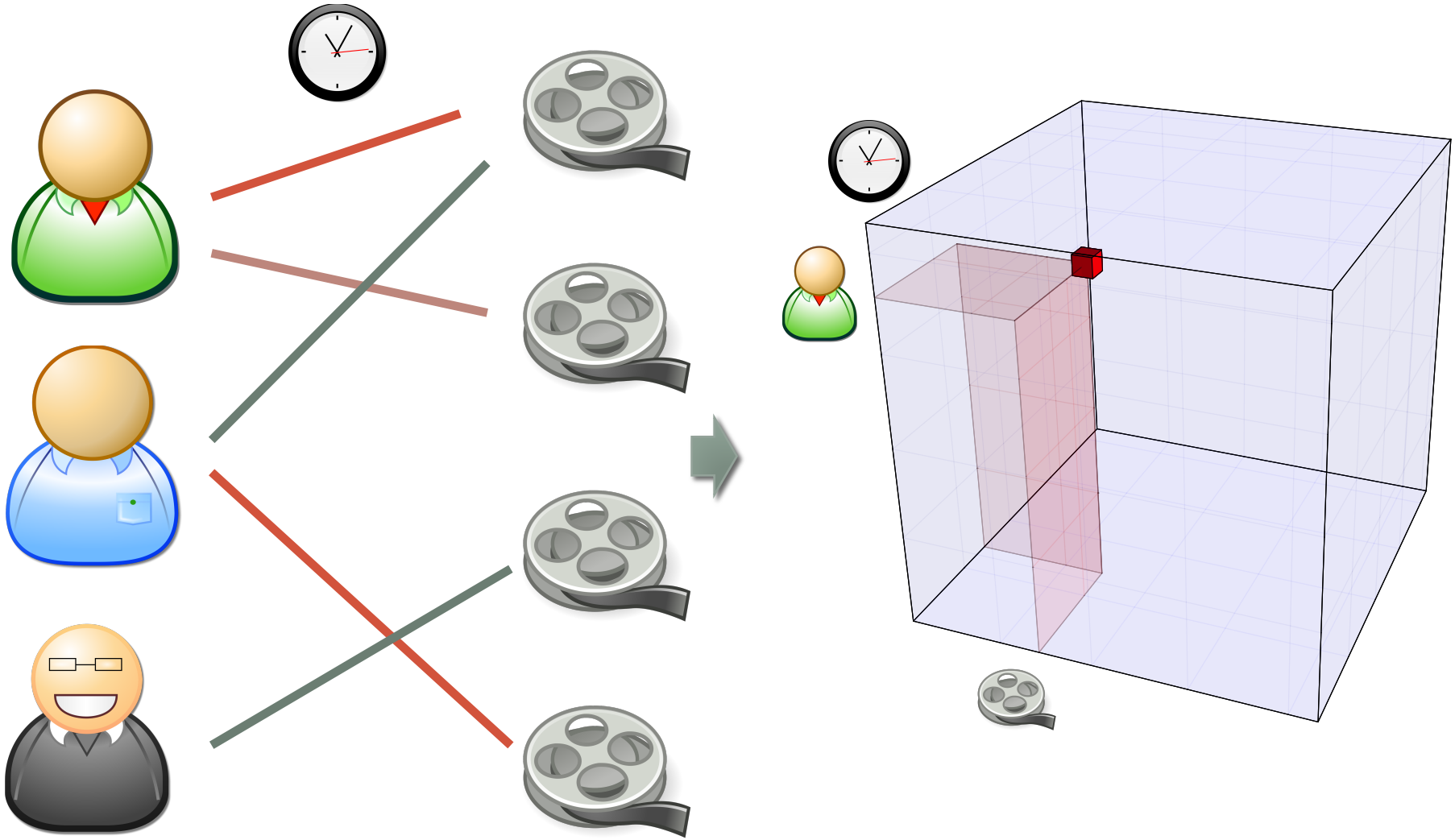
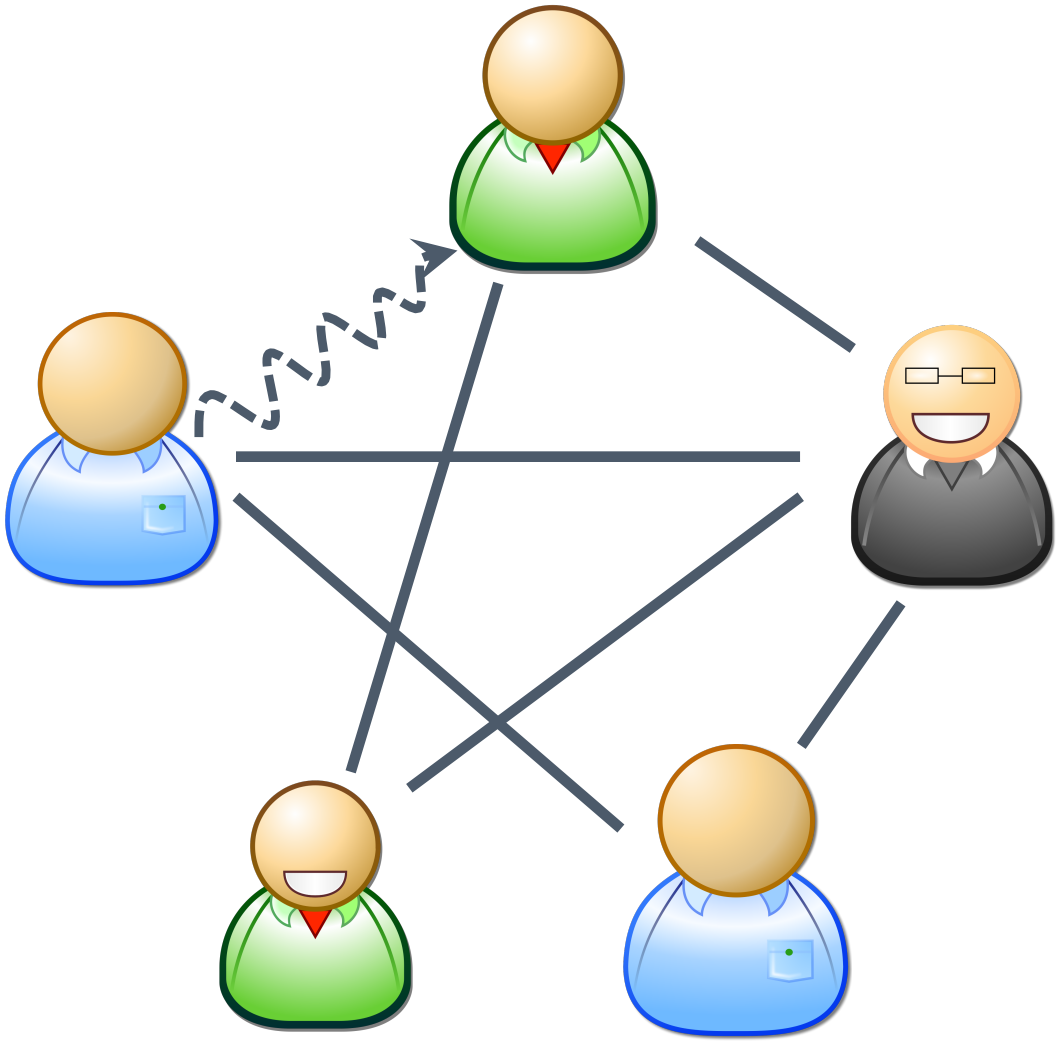
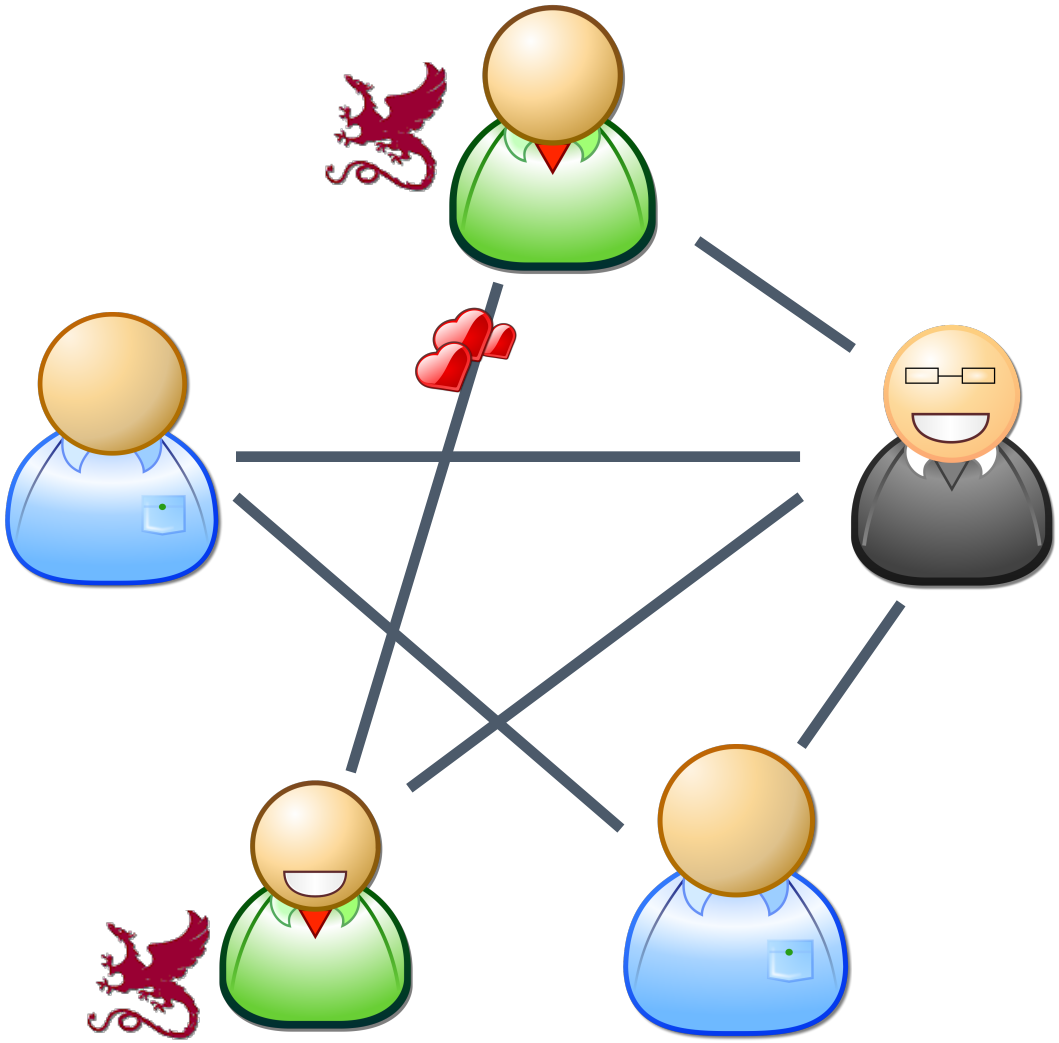


Modeling "Normal" Behavior



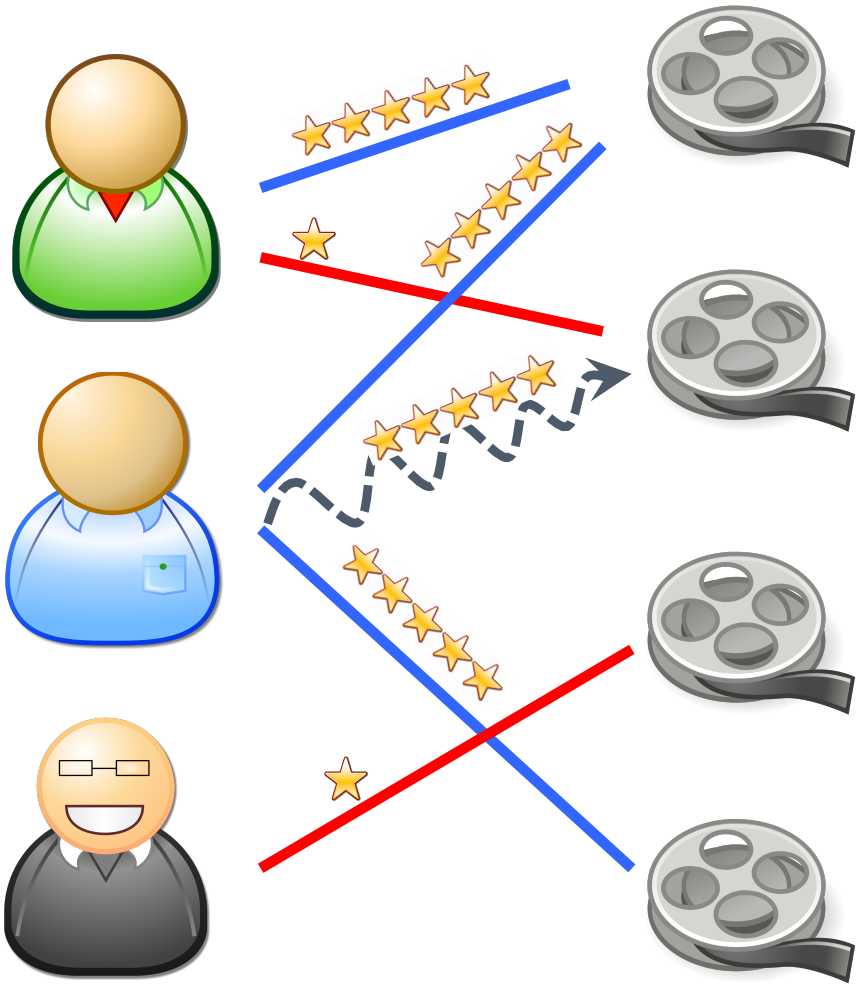
- Predict edges

Modeling User Behavior



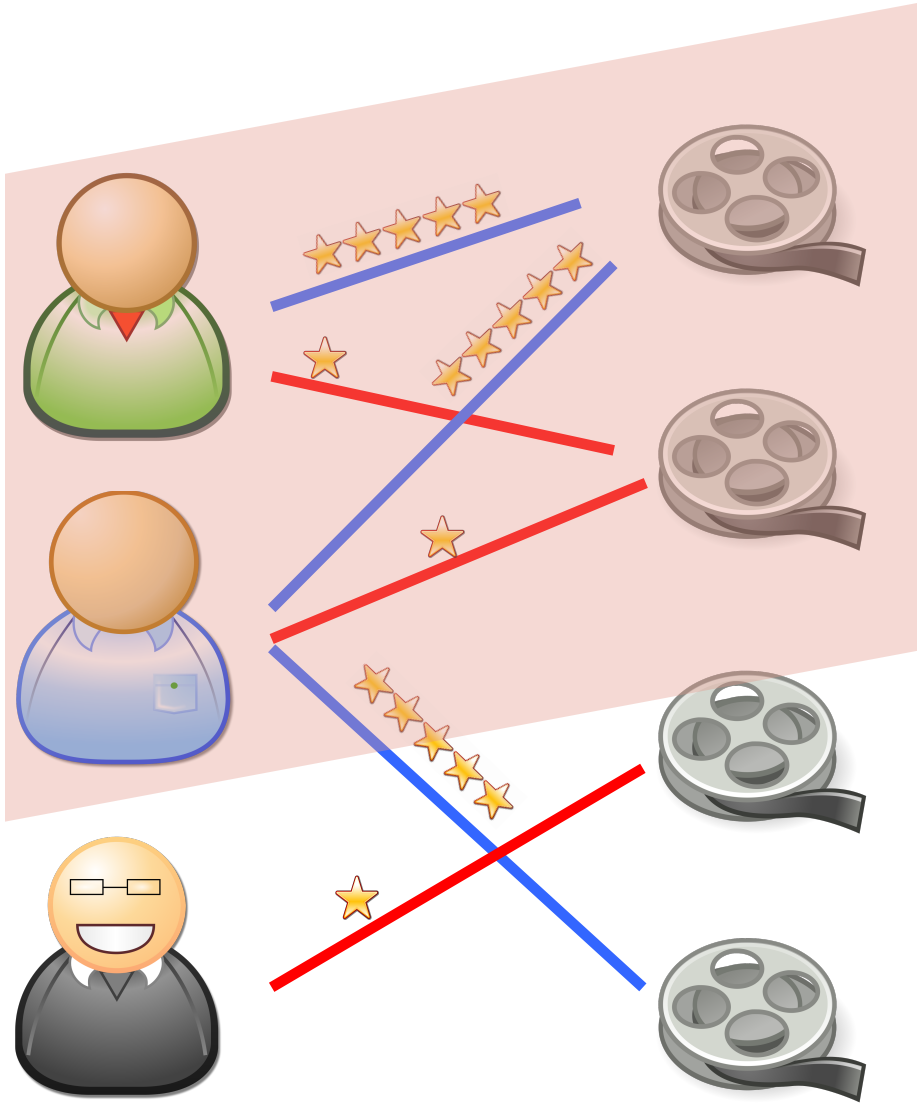
- Predict edges
- Predict node attributes
- Predict edge attributes

Modeling User Behavior



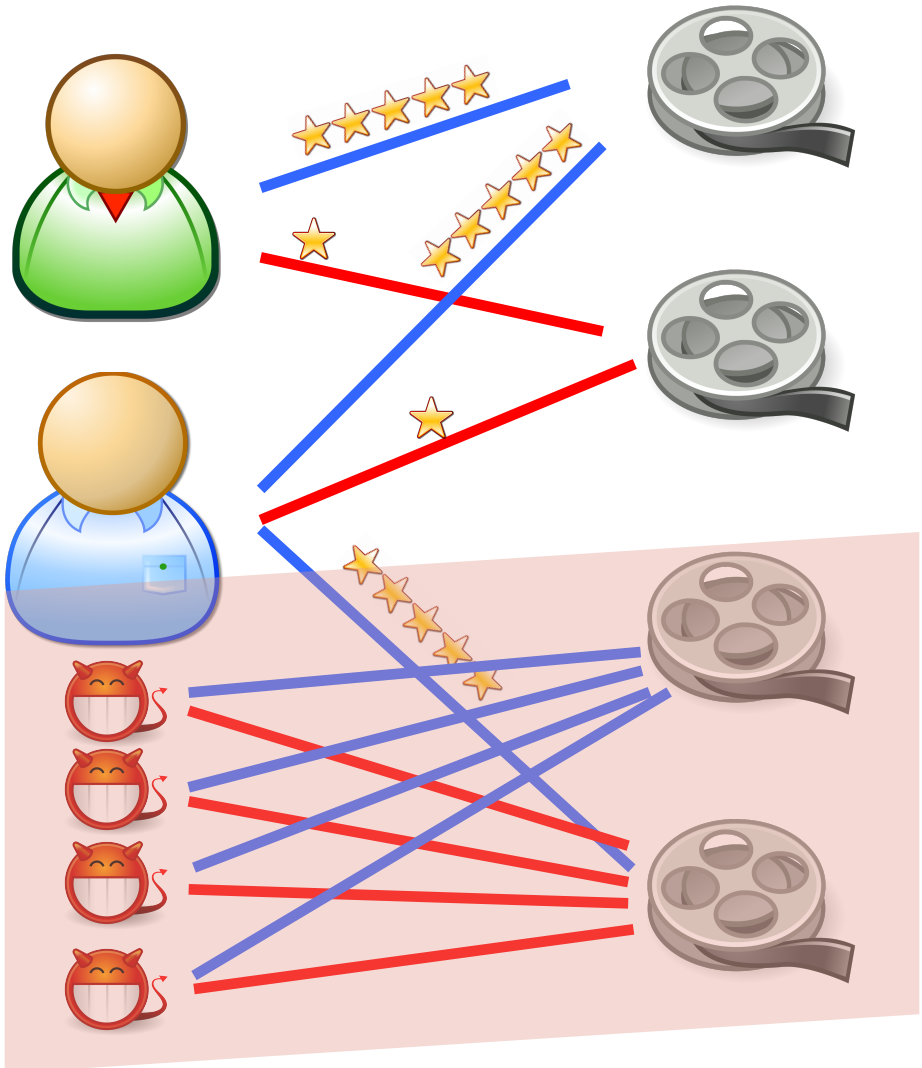
- Predict edges
- Predict node attributes
- Predict edge attributes
  - “Netflix Problem”

Modeling User Behavior



- Predict edges
- Predict node attributes
- Predict edge attributes
  - “Netflix Problem”
- Frequent Itemset Mining & Community Detection

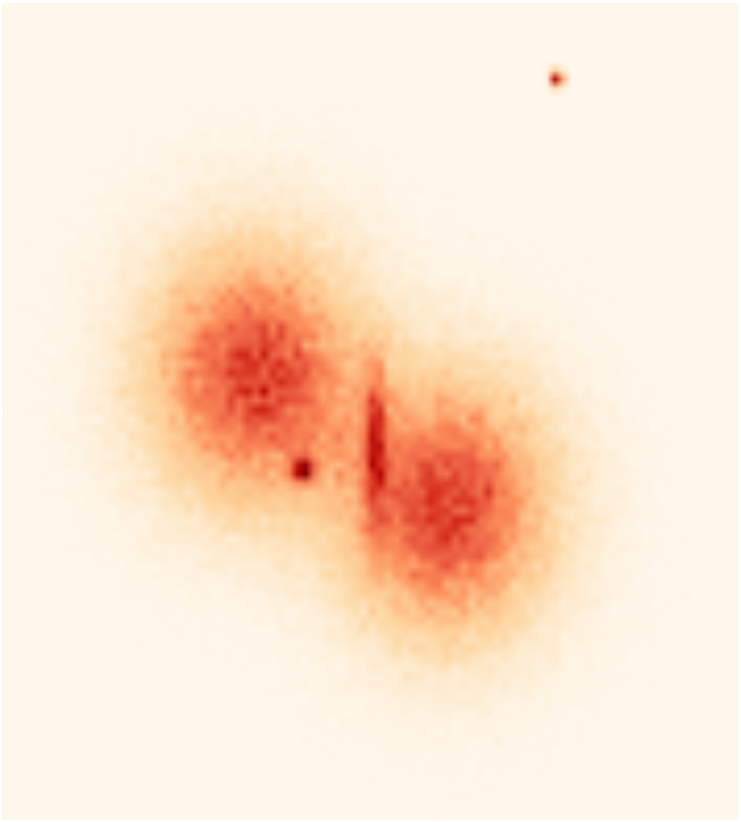
Modeling User Behavior



- Predict edges
- Predict node attributes
- Predict edge attributes
  - "Netflix Problem"
- Frequent Itemset Mining & Community Detection
- **Fraud Detection**

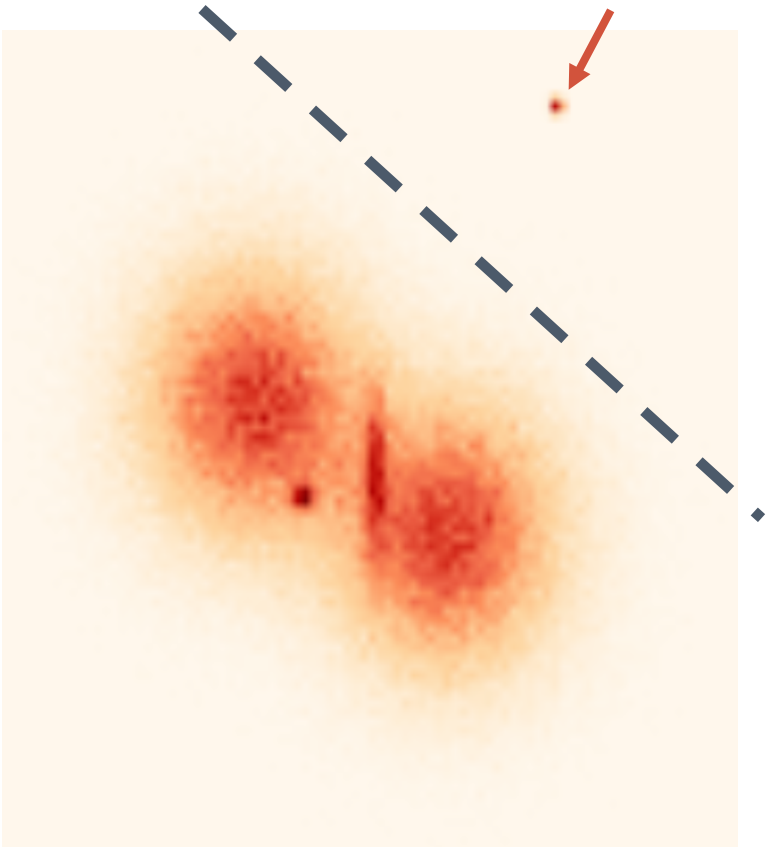
Deceives users and manipulates recommendations!

Modeling User Behavior



Modeling normal users and detecting anomalies are two sides of the same coin – understanding user behavior.

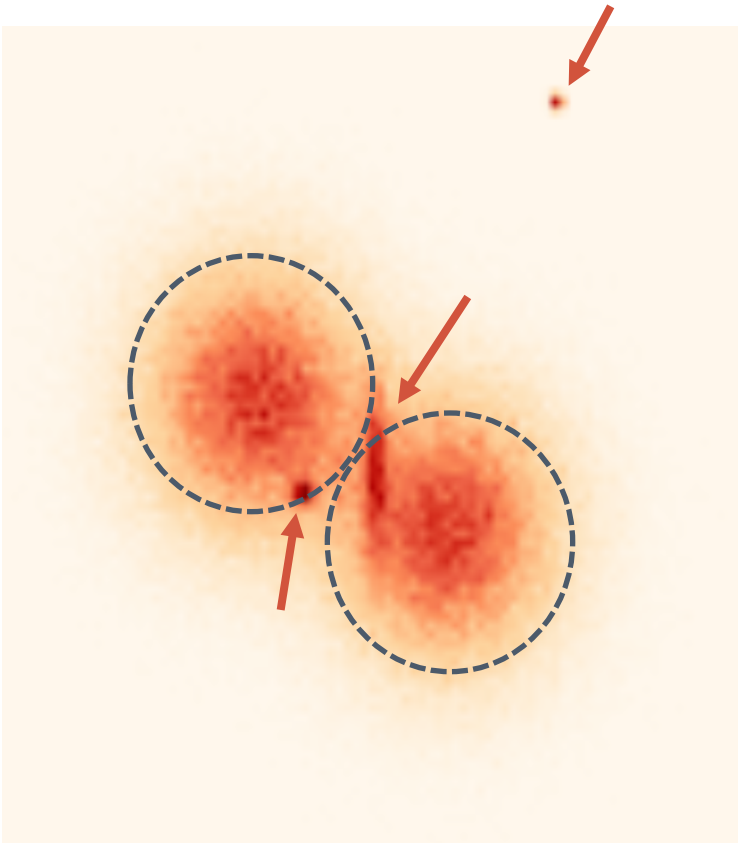
Modeling User Behavior



Modeling normal users and detecting anomalies are two sides of the same coin – understanding user behavior.

Rough model of normal – detect general outliers

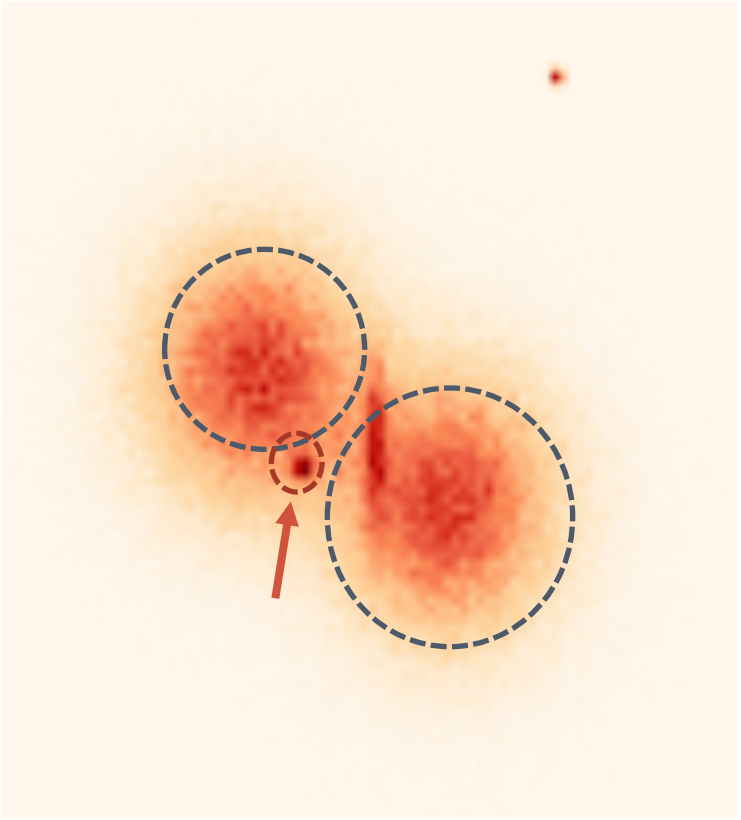
Modeling User Behavior



Modeling normal users and detecting anomalies are two sides of the same coin – understanding user behavior.

More fine grained model of normal can find more subtle outliers

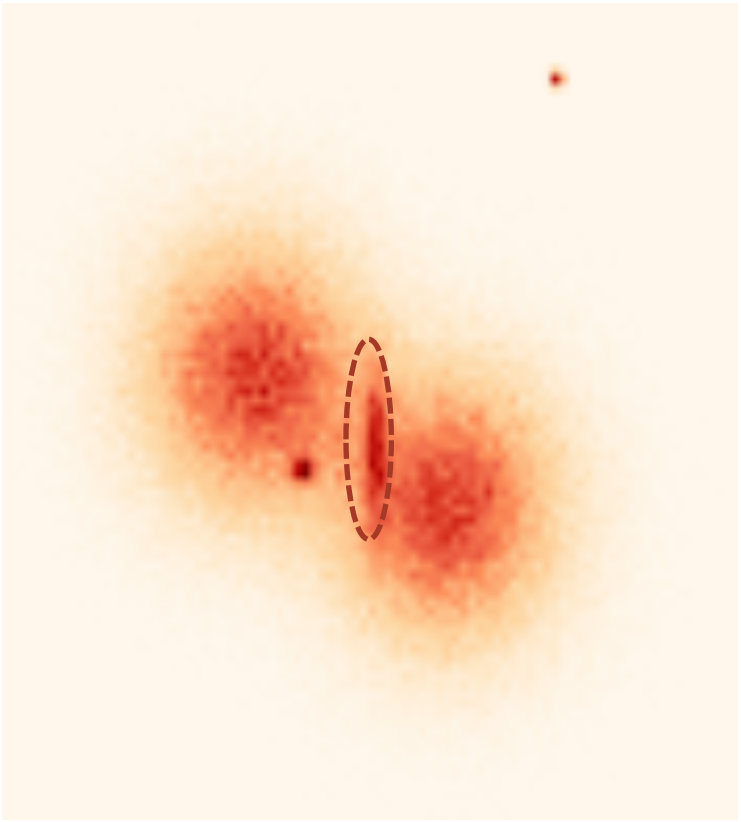
Modeling User Behavior



Modeling normal users and detecting anomalies are two sides of the same coin – understanding user behavior.

More complex model can capture both normal and abnormal patterns – micro-clusters with small variance are particularly suspicious

Modeling User Behavior



Modeling normal users and detecting anomalies are two sides of the same coin – understanding user behavior.

Sometimes domain experts know a specific pattern is fraudulent, and we can search for exactly that pattern.

THREE MAIN TECHNIQUES

1. Local Subgraph Analysis: Patterns and Features

2. Global: Propagation Methods

3. Global: Latent Factor Models and Spectral Methods

FOR ALL THREE PARTS

a) Background

b) Normal

c) Abnormal