A Process Mining Framework for Insider Attack Detection

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Outline

1. Insider domain
2. Process mining domain
3. Process mining framework for insider attack detection

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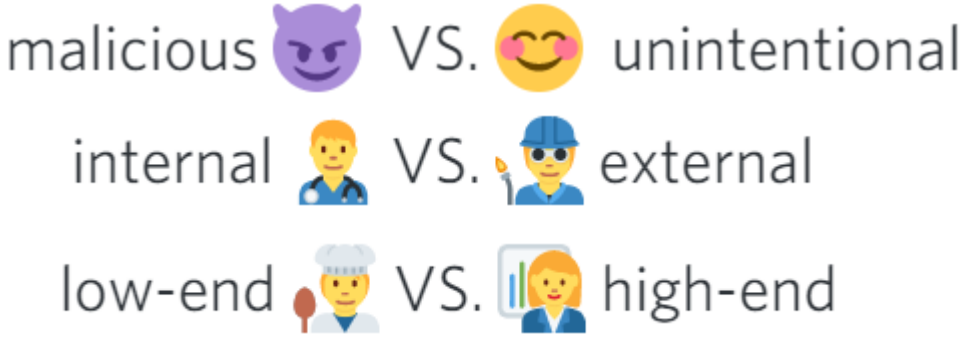
Classification of insiders

- Insider
  - A person with legitimate access to an organization’s resources.



- Affiliate
  - Do not have any justified and legitimate reason to enter the organization.

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Reasons for insider attacks

- Malicious
  1. Self-motivated – get a job promotion, avenge the injustice against them, …
  2. Planted – steal intellectual property
  3. Recruited – perform a malicious act for their benefit

  The motivation can be financial, political, or personal.

- Unintentional
  1. Underminers – life is easier when I don't respect security policies
  2. Overambitious – when I want to be more effective, I have to bypass security
  3. Socially engineered – I was tricked by someone
  4. Data leakers – ooopsie, I just leaked something

  No motivation or intent to cause harm.

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Defense solutions

- Mitigation and prevention
- Decoy-based solutions
- Detection and assessment

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Research gaps in detection and assessment

- The insider behavior is often encoded into a mathematical model that might not be accessible or is very abstract / complex.
- The proper response to a detected case is challenging.
- It is hard to detect previously not seen insider attacks.

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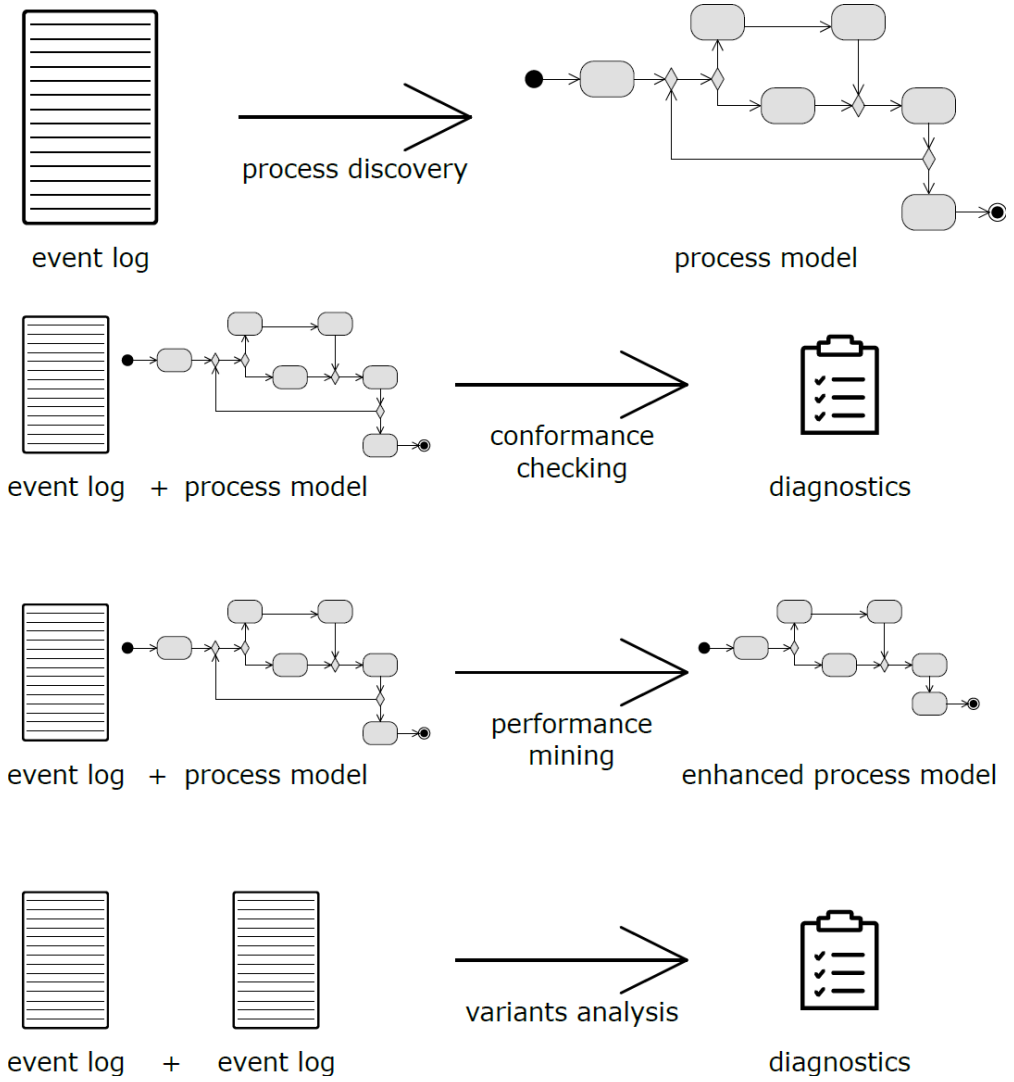
Process Mining



Challenges of Process Mining in insider attack detection

- Criteria identification
- Data preparation
- Process analysis

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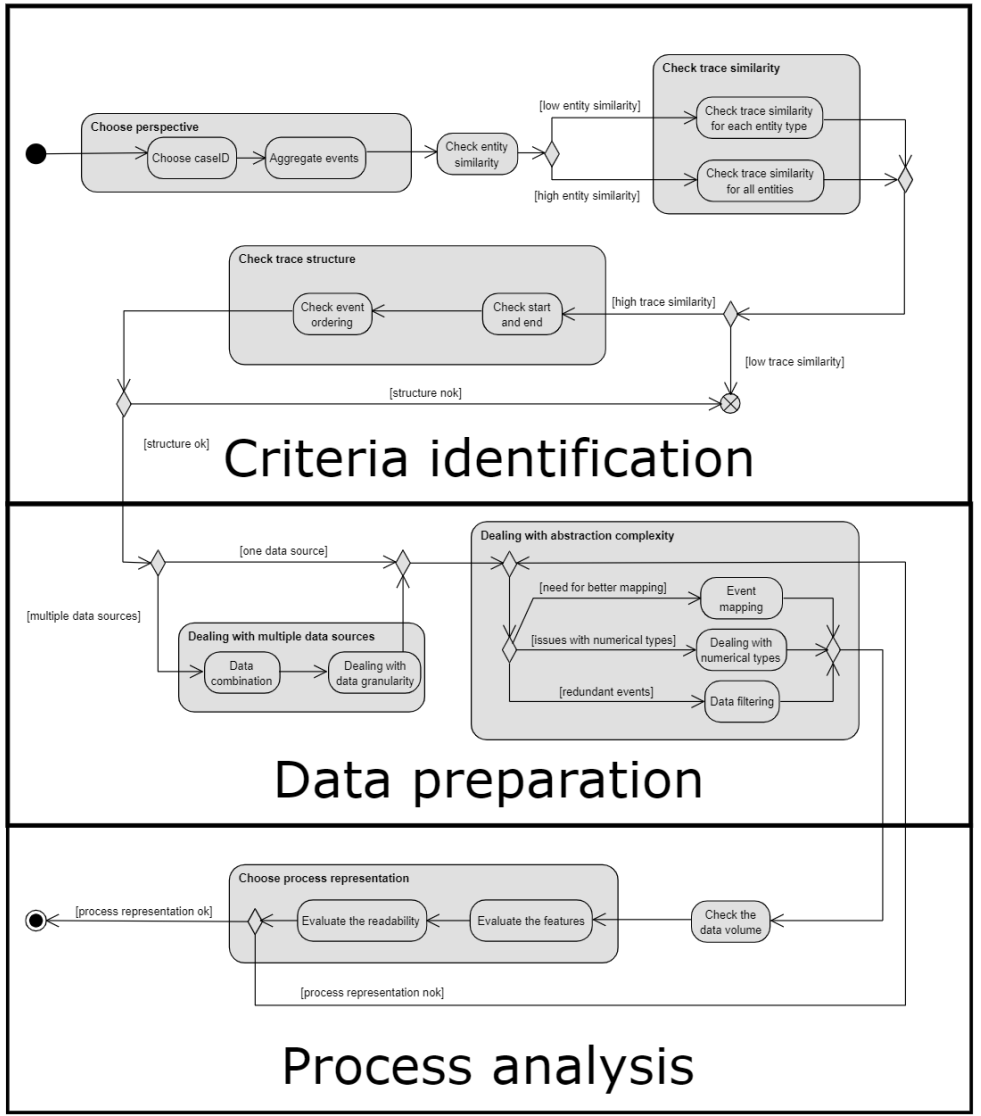
Process Mining Framework for Insider Attack Detection



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Criteria identification

1. Choose a process perspective
   - Personal perspective
   - Production perspective
   - Manipulation perspective
2. Check for similarity between entities
3. Check for similarity between traces
4. Check trace structure
   - Check start and end
   - Check event ordering

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Data preparation

1. Deal with multiple data sources
   - Data combination
   - Data granularity
2. Deal with abstraction complexity
   - Data filtering
   - Deal with numerical types
   - Data mapping

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Process analysis

1. Handle data volume
2. Choose a process representation
   - Evaluate the features
   - Evaluate the readability
     - Compactness, Intuitiveness, Interactive view, Storytelling, Rapid workflow

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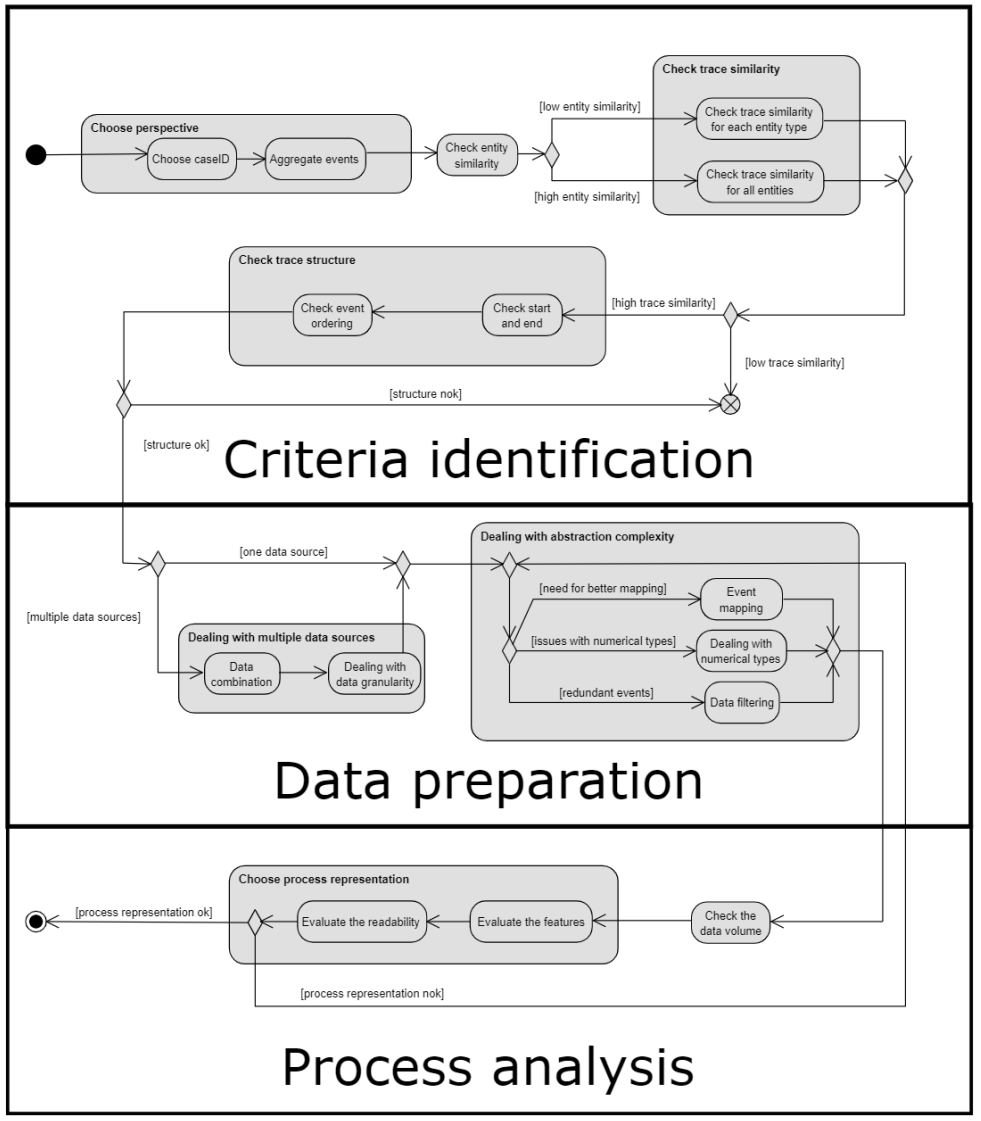
Conclusion


Choose perspective
Choose caseID
Aggregate events
Check entity similarity
[low entity similarity]
[high entity similarity]
Check trace similarity
Check trace similarity for each entity type
Check trace similarity for all entities
Check trace structure
Check event ordering
Check start and end
[high trace similarity]
[low trace similarity]
[structure nok]
[structure ok]
Criteria identification
[one data source]
[multiple data sources]
Dealing with multiple data sources
Data combination
Dealing with data granularity
Dealing with abstraction complexity
[need for better mapping]
Event mapping
[issues with numerical types]
Dealing with numerical types
[redundant events]
Data filtering
Data preparation
Choose process representation
[process representation ok]
Evaluate the readability
Evaluate the features
Check the data volume
[process representation nok]
Process analysis