Statistical Tests and Association Measures for Business Processes.

Sander Leemans, James McGree, Artem Polyvyanyy, Arthur ter Hofstede

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Teaching and Research Area of Business Process Management Foundations and Engineering

RWTH AACHEN UNIVERSITY

Frequencies in processes

$$L_1 = [\langle \text{register}, \text{check}, \text{accept} \rangle^{10000}, \langle \text{register}, \text{check}, \text{reject} \rangle^{10000}, \langle \text{register}, \text{accept} \rangle^{1}]$$

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$$L_2 = [\langle \text{register}, \text{check}, \text{accept} \rangle^{9500}, \langle \text{register}, \text{check}, \text{reject} \rangle^{1000} \langle \text{register}, \text{accept} \rangle^{95001}]$$

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L_2

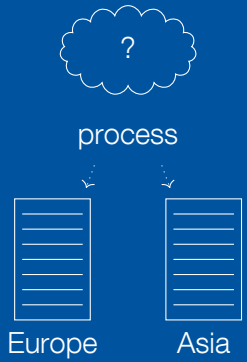
Statistical tests

Statistical tests

Europe

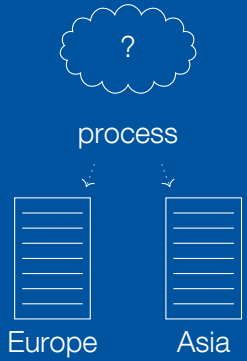
Asia

Statistical tests



Statistical tests

- Were two logs derived from the same underlying process?



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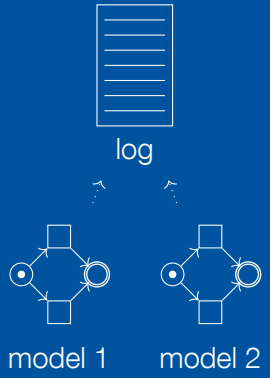

Statistical tests

- Were two logs derived from the same underlying process?
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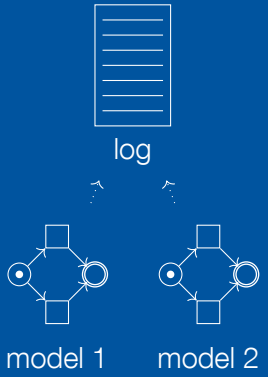
- Do two process models represent an event log equally well?



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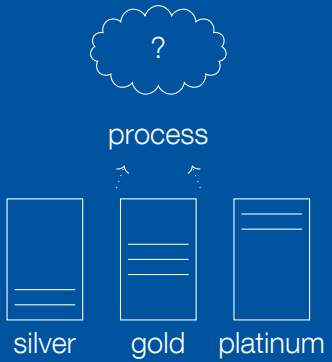

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- Are all sub-logs derived from identical processes?
  $\rightarrow$ can we be 95% certain all are equal?

Stochastic data vs. traces

⟨register, check, accept⟩

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- Numeric
- Ordinal
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Model: “that trace has probability 0”

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χ^2 ϟ

Log vs. Categorical Attribute test

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Input: event log with categorical trace attribute φ

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re-sample the log

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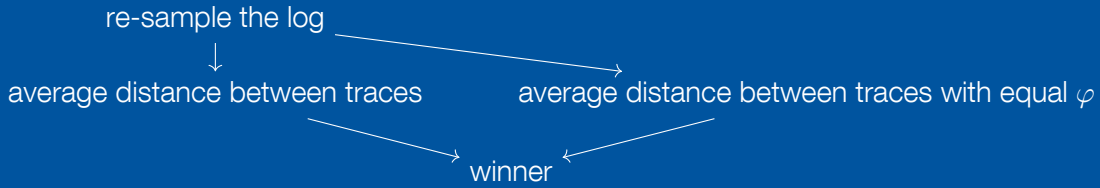

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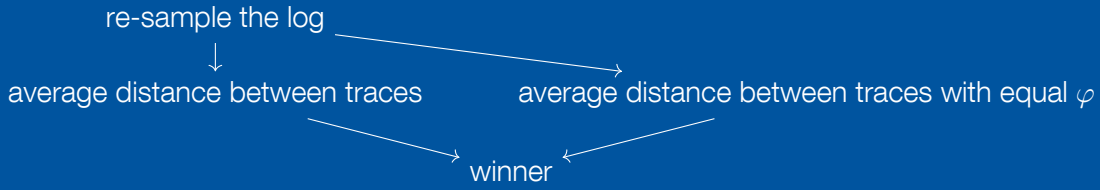

Repeat 500 times

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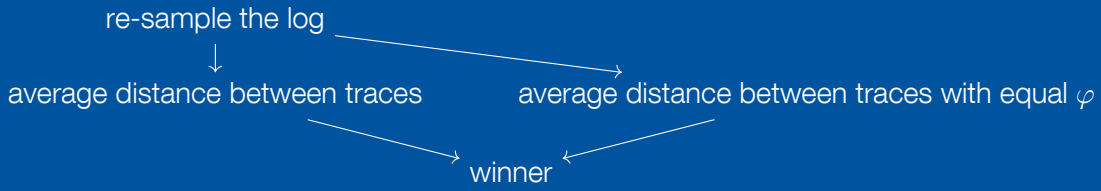

Repeat 500 times
If “with equal φ” wins 95% of the samples, then we have seen enough evidence that considering φ gives information on the process, so we can reject the hypothesis.

Association measure for processes

Road traffic fines log
What is the dependence between the requested loan amount and the process followed?

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Return correlation between trace distance and loan amount distance

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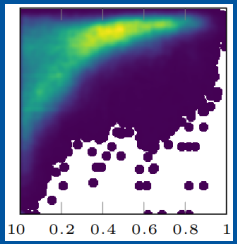

An example application

Queensland University of Technology, Brisbane, Australia
PhD journey through milestones

Improving PhD Student Journeys with Process Mining: Insights from a Higher Education Institution. Kanika Goel, Sander J.J. Leemans, Moe T. Wynn, Arthur H.M. ter Hofstede, Janne Barres. International Conference on Business Process Management industry track 2021.

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*in terms of journey steps, trajectories and their frequencies

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Future work

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Future work

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Future work

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- Holy grail: medical trials

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