Heuristic Miner and Region-Based Mining

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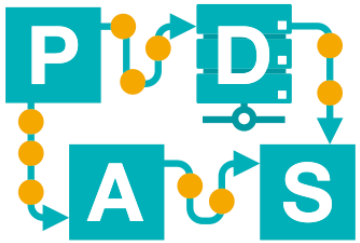
BPI-Instruction 5



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Heuristic Mining

Causal Net
Question 1

Consider the C-net in the figure on the right to work on the following tasks and questions.

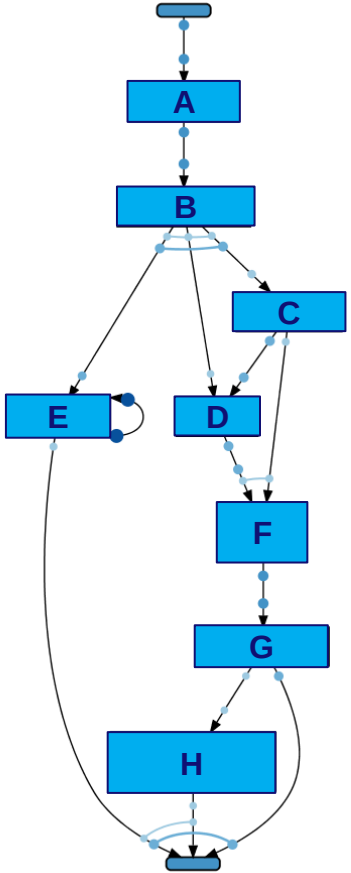
a) Provide a valid binding sequence for the following trace:

$$\sigma = \langle start, A, B, C, D, F, E, E, G, end \rangle$$

b) Is it possible to construct a valid binding sequence using the following binding:

$$(a, as^I, as^O) = (activity, inputB, outputB\ ) = (B, \{A\}, \{E, C\})$$

Explain your answer.



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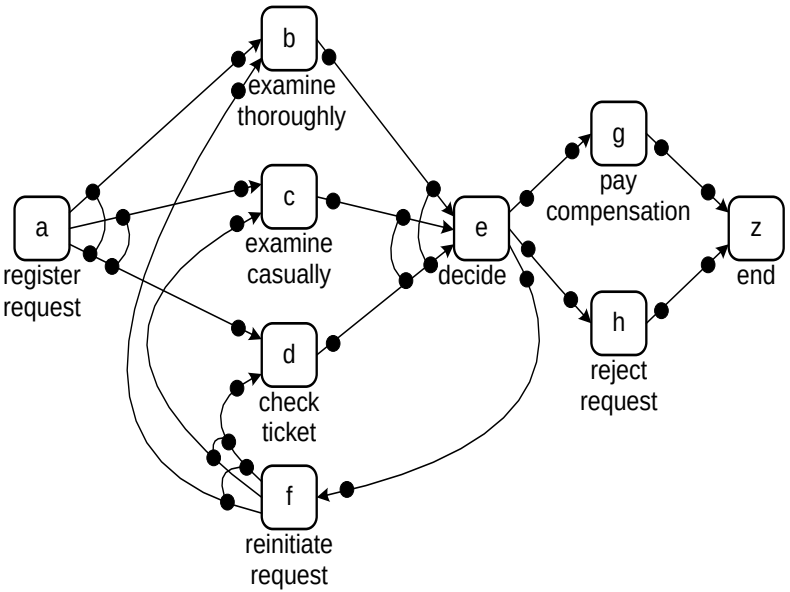
Causal Net
Question 2

Consider the C-net in the figure on the right and answer the following questions:

a) Does the C-net accept any activity sequence including both *g* and *h*?

b) Does the C-net accept any activity sequence where activity *e* occurs without *d* occurring first? If yes, give an example; if no, explain why not.

c) Give an activity sequence including activity *f* that is accepted by this C-net and starts with the occurrence of *a* with output binding {*c*,*d*}.



Heuristic Miner

Question 3

$$L_1 = [\langle a, b, e \rangle^{10}, \langle a, c, e \rangle^{12}, \langle d, b, f \rangle^{8}, \langle d, c, f \rangle^{15}]$$

a) Compute the dependency measures matrix.

b) Construct the dependency graph with the following thresholds: At least 10 direct successions and a dependency of at least 0.9.

c) Construct the C-net based on the dependency graph. Use a window size of 2.

d) Give an activity sequence that is possible in the C-net, but is not included in the event log.

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Heuristic Miner

Question 4

$$L_2 = [\langle a, c, d \rangle^{45}, \langle b, c, d \rangle^{42}, \langle a, c, e \rangle^{38}, \langle b, c, e \rangle^{22}]$$

a) Compute the dependency measures matrix.

b) Construct the dependency graph with the following thresholds: At least 30 direct successions and a dependency of at least 0.8.

c) Construct the C-net based on the dependency graph. Use a window size of 2.

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Question 5

$$L_3 = [\langle a, b, e, f \rangle^2, \langle a, b, e, c, d, b, f \rangle^3, \langle a, b, c, e, d, b, f \rangle^2, \langle a, b, c, d, e, b, f \rangle^4, \langle a, e, b, c, d, b, f \rangle^3]$$

a) Compute the dependency measures matrix.

b) Construct the dependency graph with the follwoing thresholds: At least 10 direct successions and a dependency of at least 0.8.

c) Construct the C-net based on the dependency graph. Use a window size of 2.

d) Give an activity sequence that is possible in the C-net but is not included in the event log.

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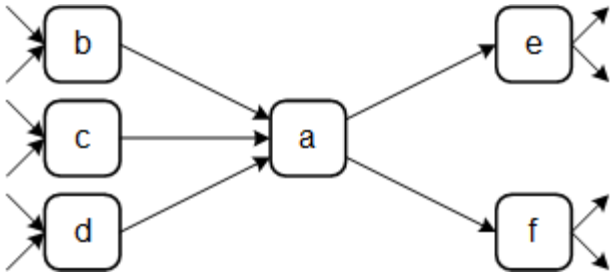
Question 6 a)

Consider the partial traces and the fragment of a dependency graph shown below. Add the input and output bindings for activity ***a*** based on the partial traces. Use window size of 5 and no thresholds.

<...c,l,b,k,c,l,m,a,e,f,l,l,k,n,m...>
<...d,m,l,m,d,k,k,a,f,e,l,l,l,k,m...>
<...a,b,l,c,m,d,l,a,f,k,l,m,n,m,l...>
<...d,k,b,c,l,k,m,a,f,l,l,m,k,l,k...>
<...k,l,b,c,d,l,k,a,e,k,l,m,n,m,f...>

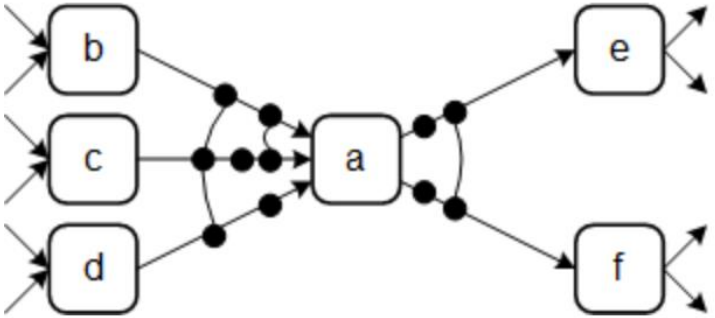


Heuristic Mining

Question 6 b)

Consider the partial traces below and assume a window size of 5 and no thesholds. Which input and output bindings of the activity ***a*** in the (partial) C-Net below are **incorrect** and why?

<...c,l,b,k,c,l,m,a,e,f,l,l,k,n,m...>
<...d,m,l,m,d,k,k,a,f,e,l,l,l,k,m...>
<...a,b,l,c,m,d,l,a,f,k,l,m,n,m,l...>
<...d,k,b,c,l,k,m,a,f,l,l,m,k,l,k...>
<...k,l,b,c,d,l,k,a,e,k,l,m,n,m,f...>



State-based regions

Transition System

Question 1

$$L_2 = [\langle a, c, d \rangle, \langle b, c, d \rangle, \langle a, c, e \rangle, \langle b, c, e \rangle]$$

Given the event log above, create a transitions system using the following abstractions:

a) past with sequence abstraction

b) past with multiset abstraction

c) only last event abstraction

d) future with sequence abstraction

Transition System

Question 2

$$L_5 = [\langle a, c, d, f \rangle, \langle a, d, c, f \rangle, \langle b, c, e, f \rangle, \langle b, e, c, f \rangle]$$

Given the event log above, create a transitions system using the following abstractions:

a) past with set abstraction

b) past with multiset abstraction

c) only last event abstraction

d) future with sequence abstraction

Regions
Question 3

$$L_2 = [\langle a, c, d \rangle, \langle b, c, d \rangle, \langle a, c, e \rangle, \langle b, c, e \rangle]$$

a) Create a transition system and detect **all** its regions using the past with sequence abstraction.

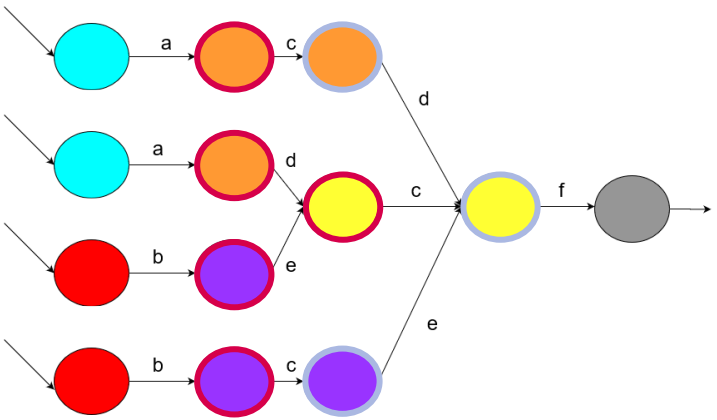
b) Create a transition system and detect its non-trivial minimal regions using the only last event abstraction.

Regions
Question 4

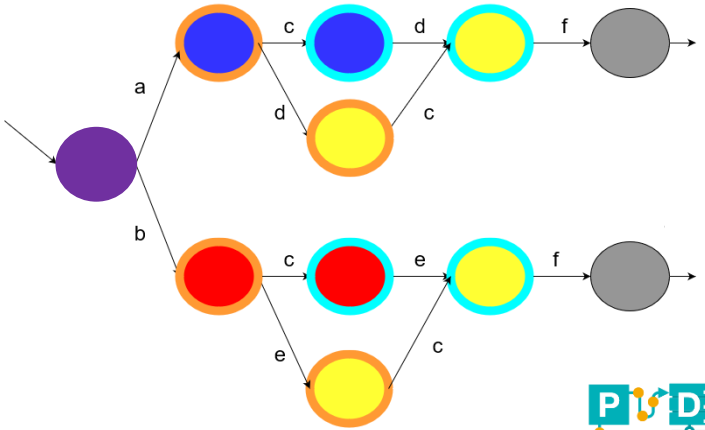
$$L_6 = [\langle a, c, d, f \rangle, \langle a, d, c, f \rangle, \langle b, c, e, f \rangle, \langle b, e, c, f \rangle]$$

Consider the following two transition systems, their non-trivial, minimal regions, and the log above. For each of them, name the applied abstraction function and provide the resulting Petri net.

a)



b)



Petri net

Question 5

For the event log below, create the transition system using past with sequence abstraction. Find the non-trivial minimal regions and construct the corresponding Petri net.

$$L_2 = [\langle a, c, d \rangle, \langle b, c, d \rangle, \langle a, c, e \rangle, \langle b, c, e \rangle]$$