2II66 Assignment 2 – Robbert Jongeling

We use the described experiments in the slides to answer the following questions:

## 1: For which noise type, and with which percentage of noise, does the ‘alpha miner’ provide the ‘worst’ model in terms of fitness and understandability?

Figure 1 shows the distribution of fitness for various noise levels and types. We see that the Remove Head noise type has the lowest performance in terms of fitness. Also, we see that Add Event has fitness 1 or no for all noise types.

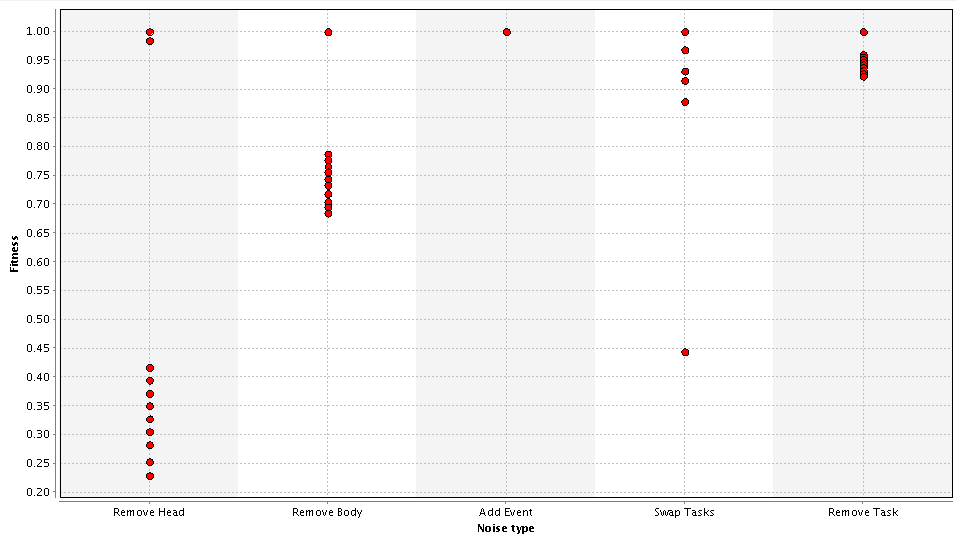


Figure 1: Fitness for various noise types for the alpha miner, 11 dots per noise type represent 0 ,10,..,100% noise

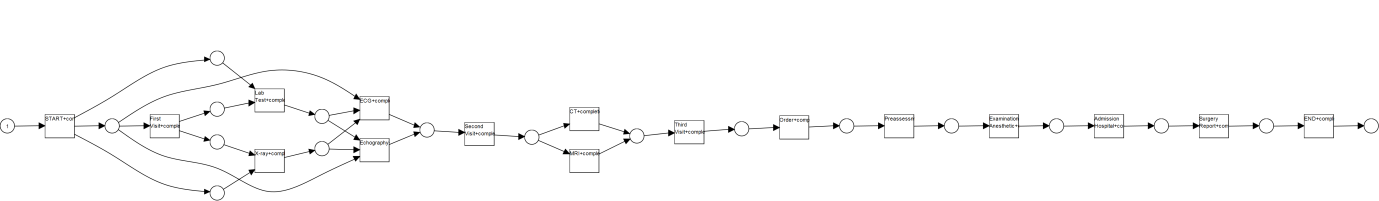
If we look at the generated Petri net for Remove head with 90% noise (the one with the lowest fitness) we see the net in Figure 2. This is a fairly simple to understand net. In comparison, we present the Petri net belonging to swap tasks (with 10% noise) in Figure 3.

Figure 2: Petri net belonging to Remove Head, 90% noise

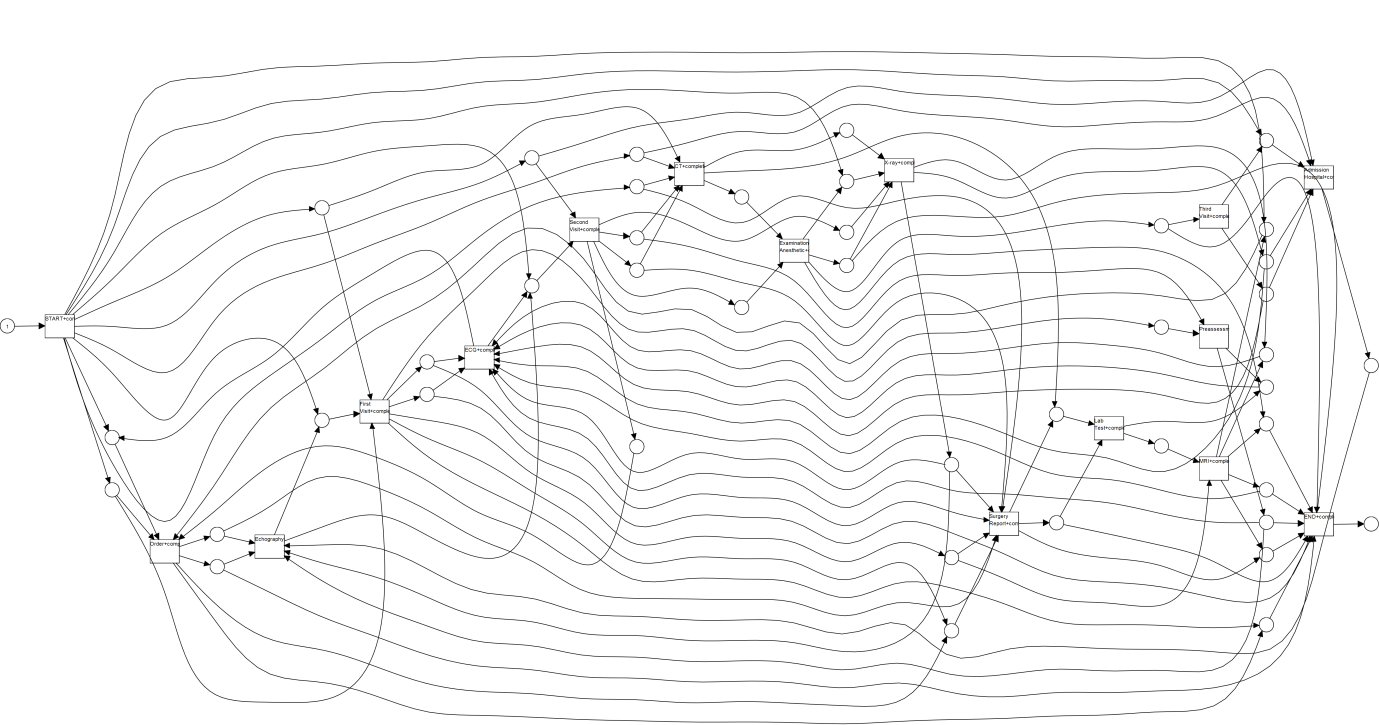


Figure : Petri net obtained by introducing noise type Swap Tasks at 10% using the alpha miner

The shown net is the net with the lowest fitness of noise type Swap Tasks and is a curious outlier considering the other noise percentages. It’s fitness is 0.44 where the others are all in the range 0.87-1. You could consider this to be the worst net in terms of understandability, but as this is an outlier in terms of fitness, we conclude that the Remove Head noise type at 10% noise products the worst model in terms of fitness and understandability.

## 2: For which noise type, and with which percentage of noise, does the ‘ILP miner’ provide the ‘worst’ model in terms of fitness and understandability?

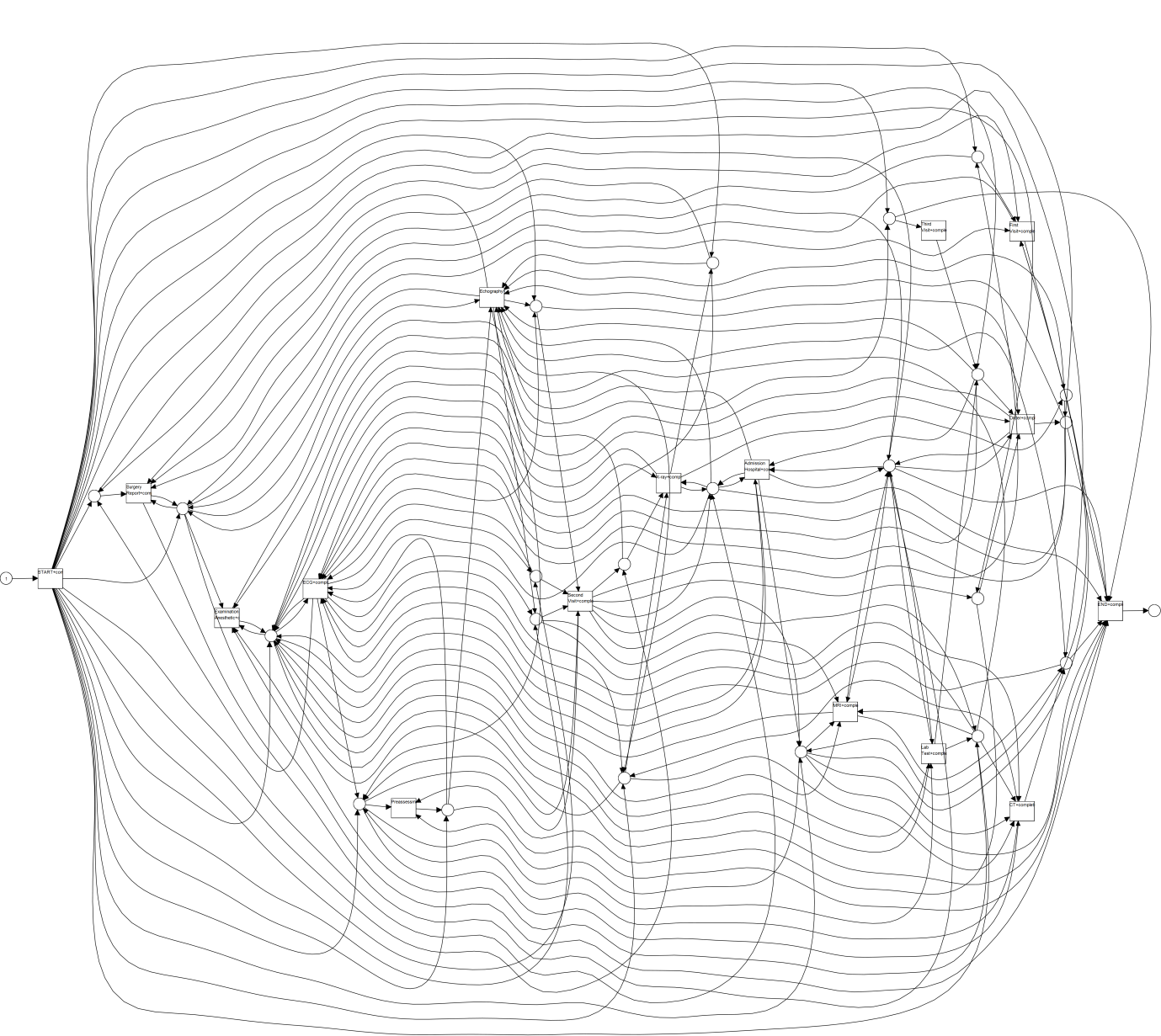
The ILP miner gives a model with fitness 1.0 for each noise type and each percentage tested. In terms of understandability, the Add Event type with 10% noise gives the most chaotic picture, as shown in Figure 4.

Figure : Add Event 10% ILP miner

## 3: For which noise type, and with which percentage of noise, does the ‘passage miner’ provide the ‘worst’ model in terms of fitness and understandability?

Figure 5shows the distribution of fitness for various noise levels and types. We see that it is very similar to the results of the alpha miner, this can be explained by the fact that we set the property *Mine petri net* of the passage miner to *Alpha Miner.* The other options are *Basic Log relations* and *20.*

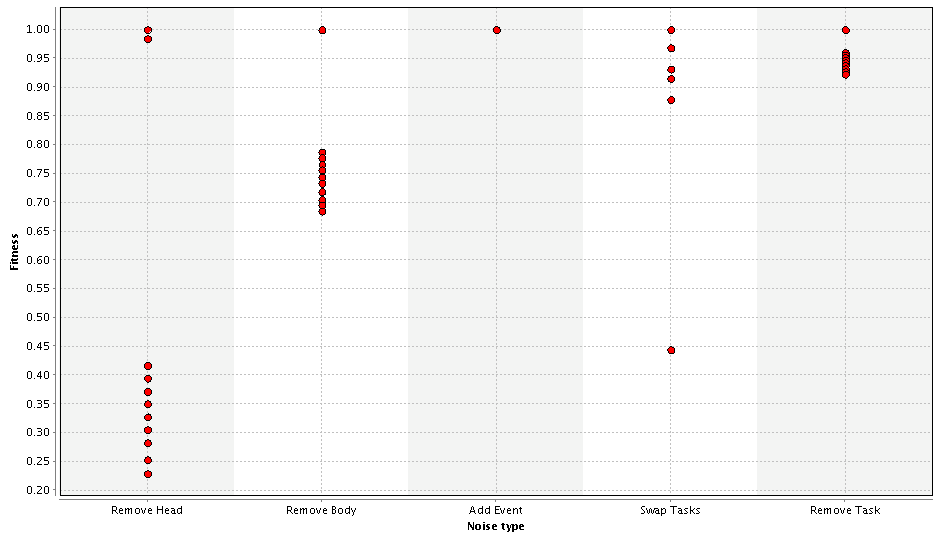


Figure : fitness by noise type passage miner

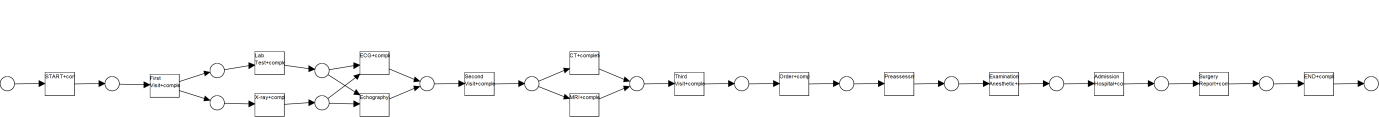
The Petri net for Swap Tasks 10% is not similar to that of the alpha miner though. It is shown in Figure 6. This is a much more understandable image than the same net generated by the alpha miner. 

Figure : Swap Tasks 10% passage miner

Similarly to the alpha miner, the passage miner performs worst on noise type Remove Head. … shows the generated Petri net for that type and 90% noise.

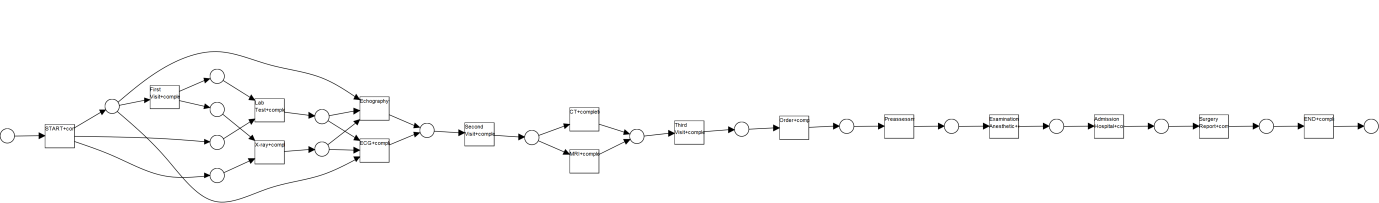


Figure : Remove Head 90% passage miner

We conclude that again, the Remove Head noise type performs worst.

## 4: For which noise type, and with which percentage of noise, does the ‘inductive miner’ provide the ‘worst’ model in terms of fitness and understandability?

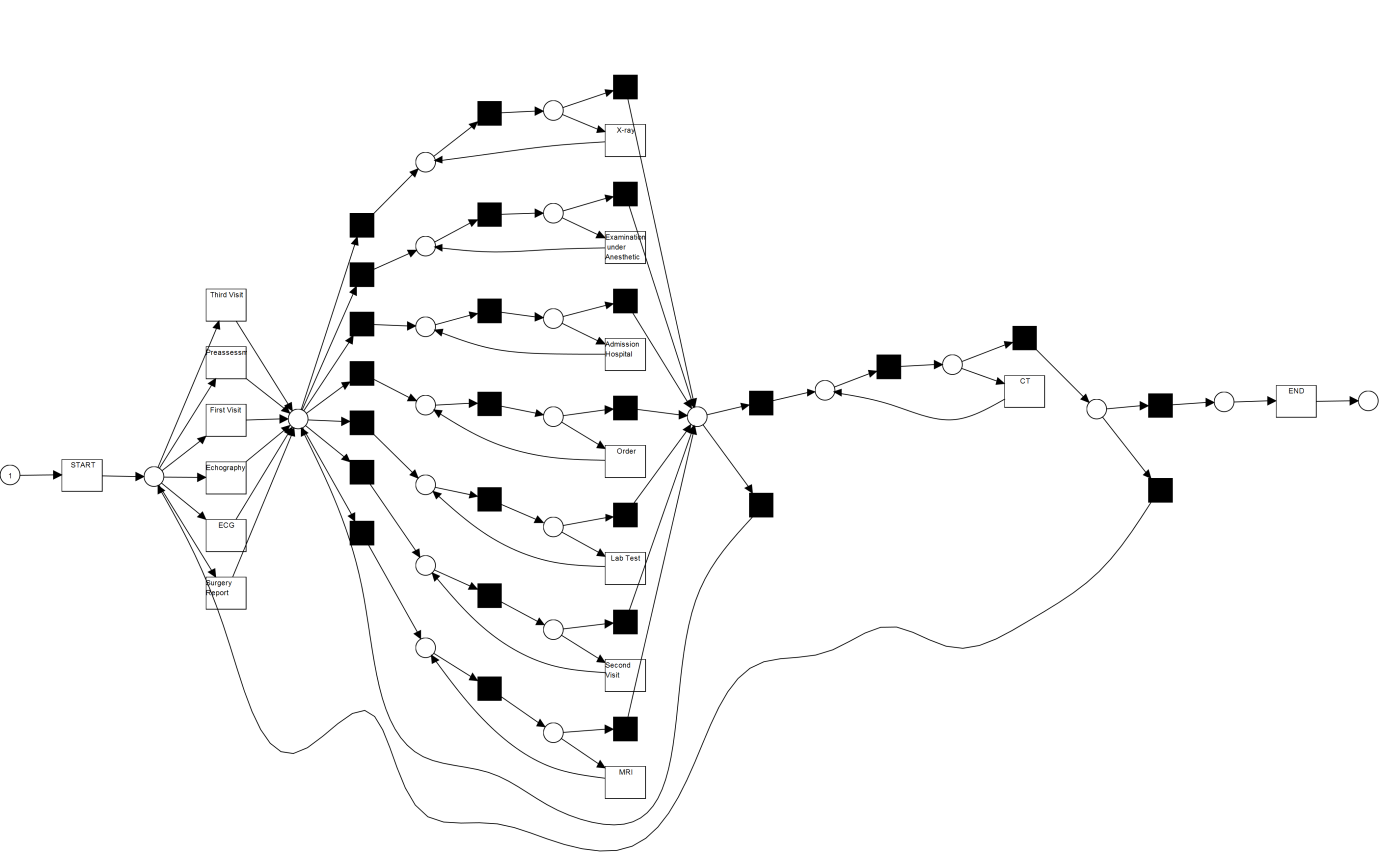
The inductive miner, like the ILP miner generates a net with fitness 1.0 for each noise type and each percentage investigated. We use the setting *Define Inductive Miner: “*Mine Petri Net with Inductive Miner.”We in this experiment did not check the Add Event type for noise percentages 80, 90 and 100. As the nets are all equal in terms of fitness, we have a look at the understandability. As in the test with the ILP miner, the Add Event type gives the most unreadable net, shown in Figure 8.

Figure : Add Event 10% Inductive Miner

The Remove Head task here performs a net with a better understandability. For this miner, we conclude that the Add Event type with 10% noise performs the worst.

## 5: Based on the results of the previous questions, can you indicate for each type of noise which is the most robust control-flow miner? Additionally, can you indicate which control-flow miner is the most robust against noise and which control-flow miner is the least robust against noise?

We cannot conclude that one of the tested minders is the most robust control-flow miner. We would have to perform more experiments on different datasets to come to such a conclusion. What we do note is the similarity between the results of the alpha miner and the passage miner on the one hand and the ILP miner and the inductive miner on the other. The fact that in our experiments the latter two miners provided only nets with fitness 1.0 raises questions on the validity of these experiments.

In terms of a noise type, we see that Remove Head is the least resilient against introducing large amounts of noise. We can though not speak of a most robust miner for a type of noise as the experiments are not enough to draw such conclusions. If we determine this from our results only, not considering any of the above concerns, we would determine the ILP miner to be the most robust against any of the investigated noise types.