

AIR PUMP FAILURE DETECTION

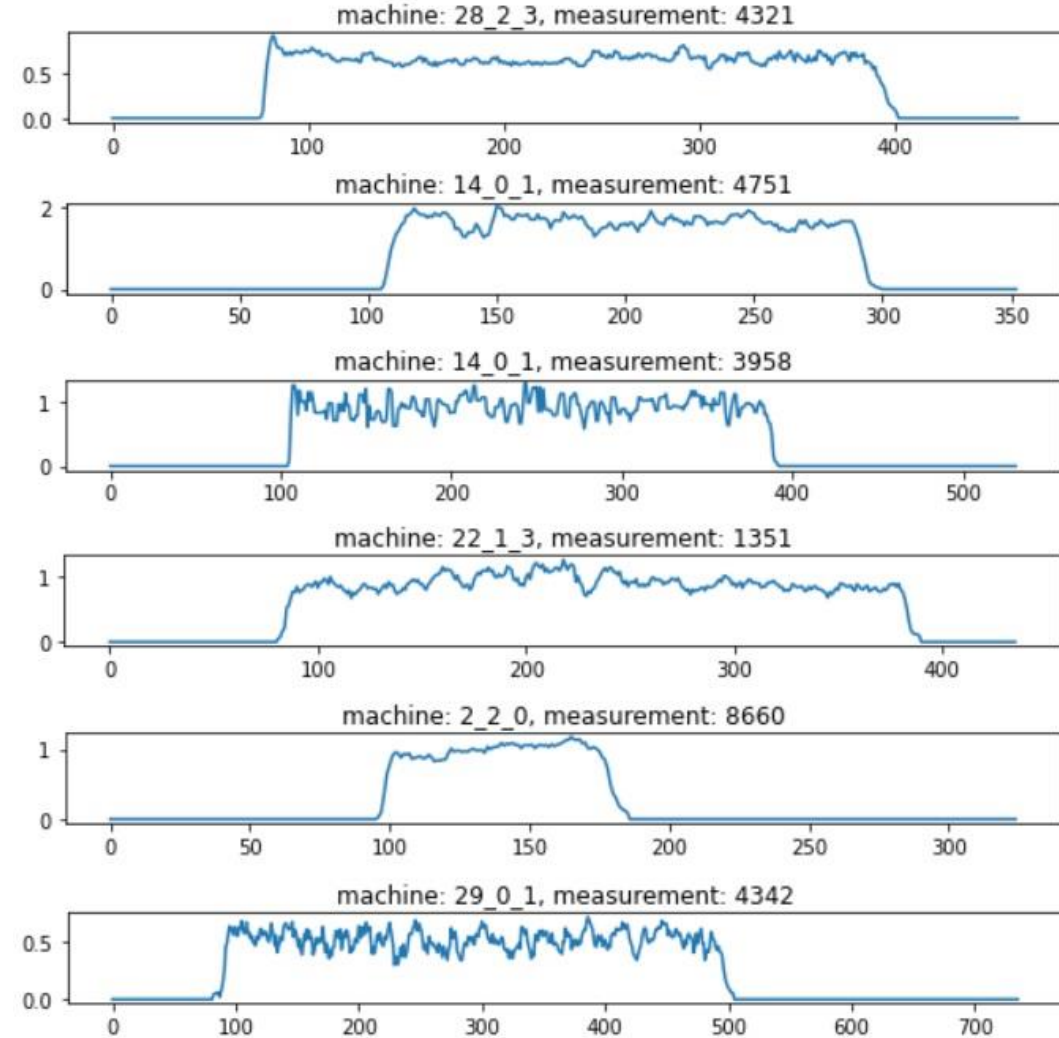
Solution to help detect
failure of air pumps in
machines

WHAT IS AIR PUMP CYCLE?

Devices that we work with contains air pumps. When device is running, air pumps are running as well, providing ideally constant pressure during whole running cycle.

We measure pressure through the running cycles, and record how pressure is changing over time.

Look at charts on right side of this slide. They represent pressure over time during six different machine cycles.



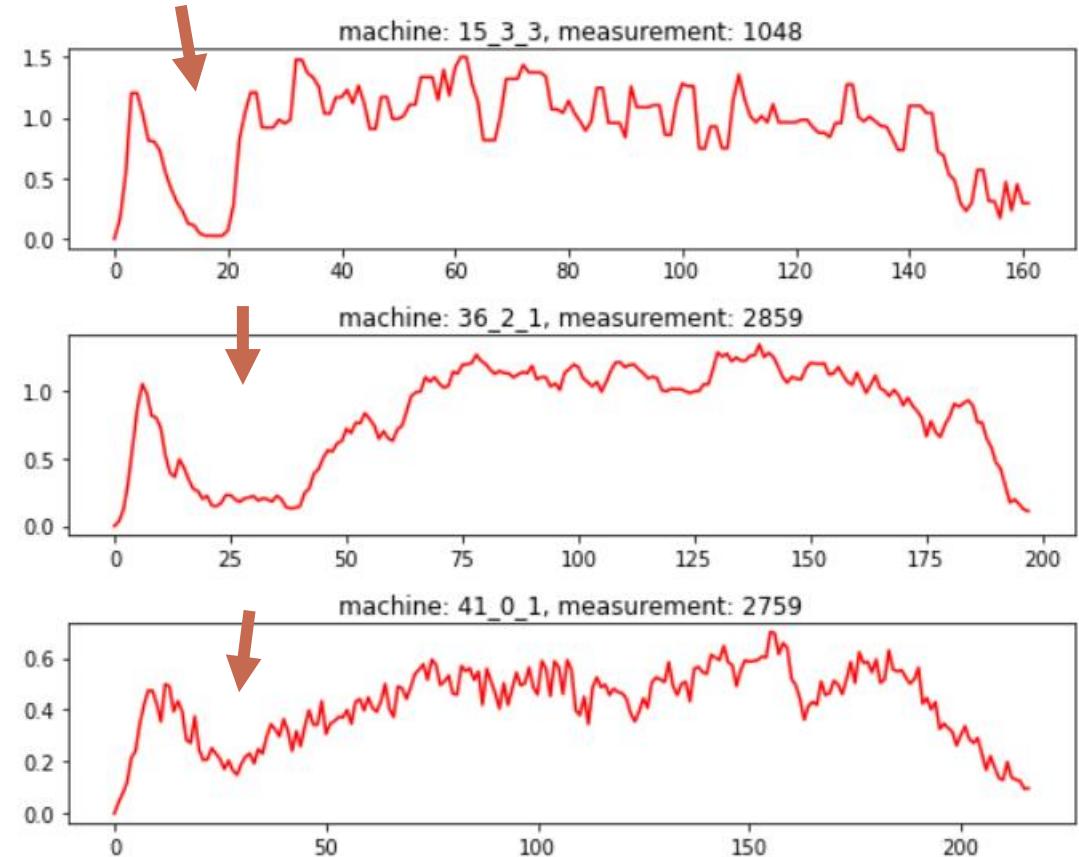
FAILURE CYCLES

Sometimes, there is air pump failure during the machine cycle.

Usually, it looks like that pressure temporary drops.

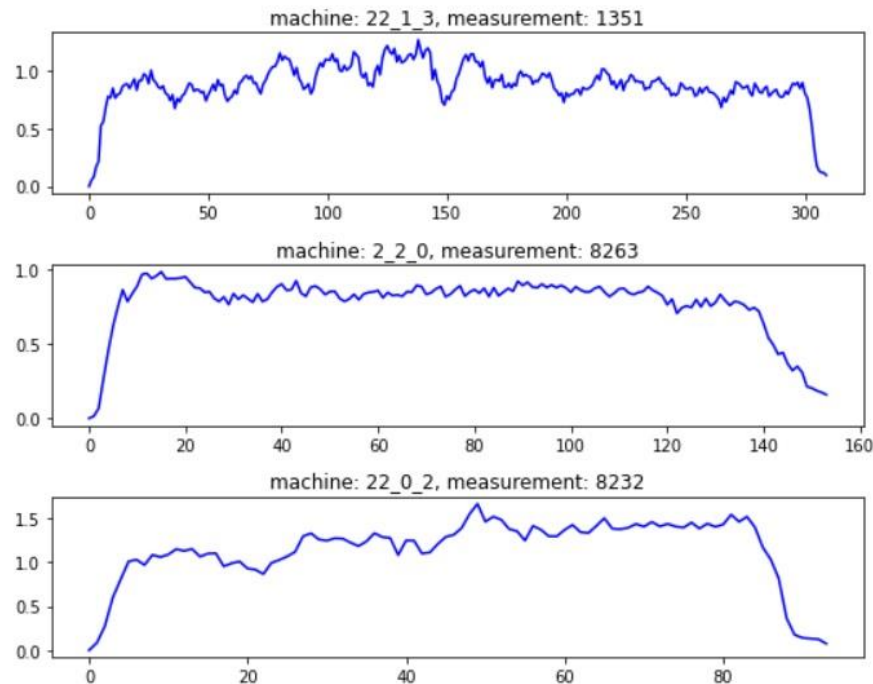
On the right side you can see few examples of air pump failures.

Note how pressure drops and then raises again, although it's not always so obvious, for example last chart is not so clear as the first one.

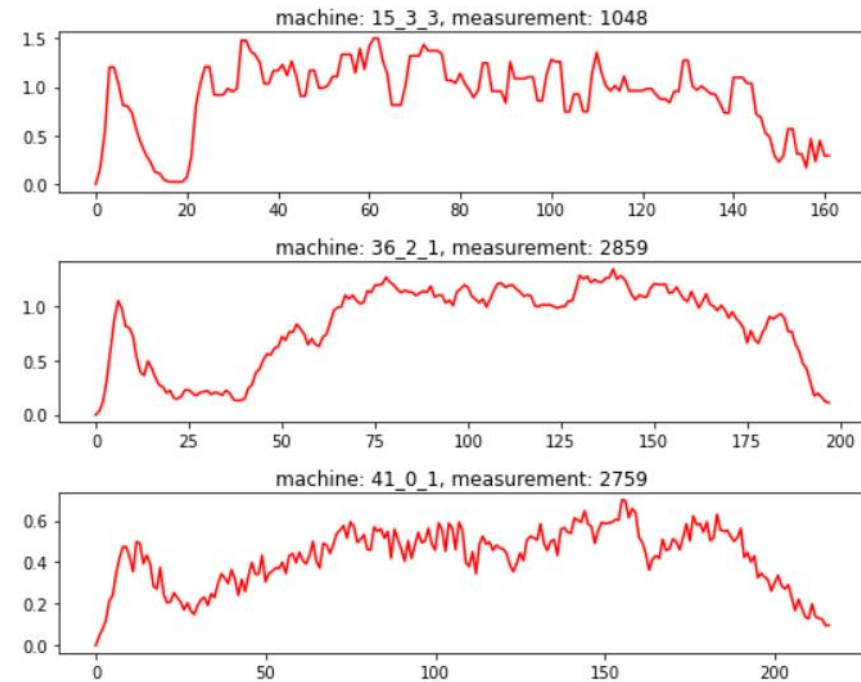


COMPARISON OF FAILING AND CORRECT CYCLES

Correct air pump cycles

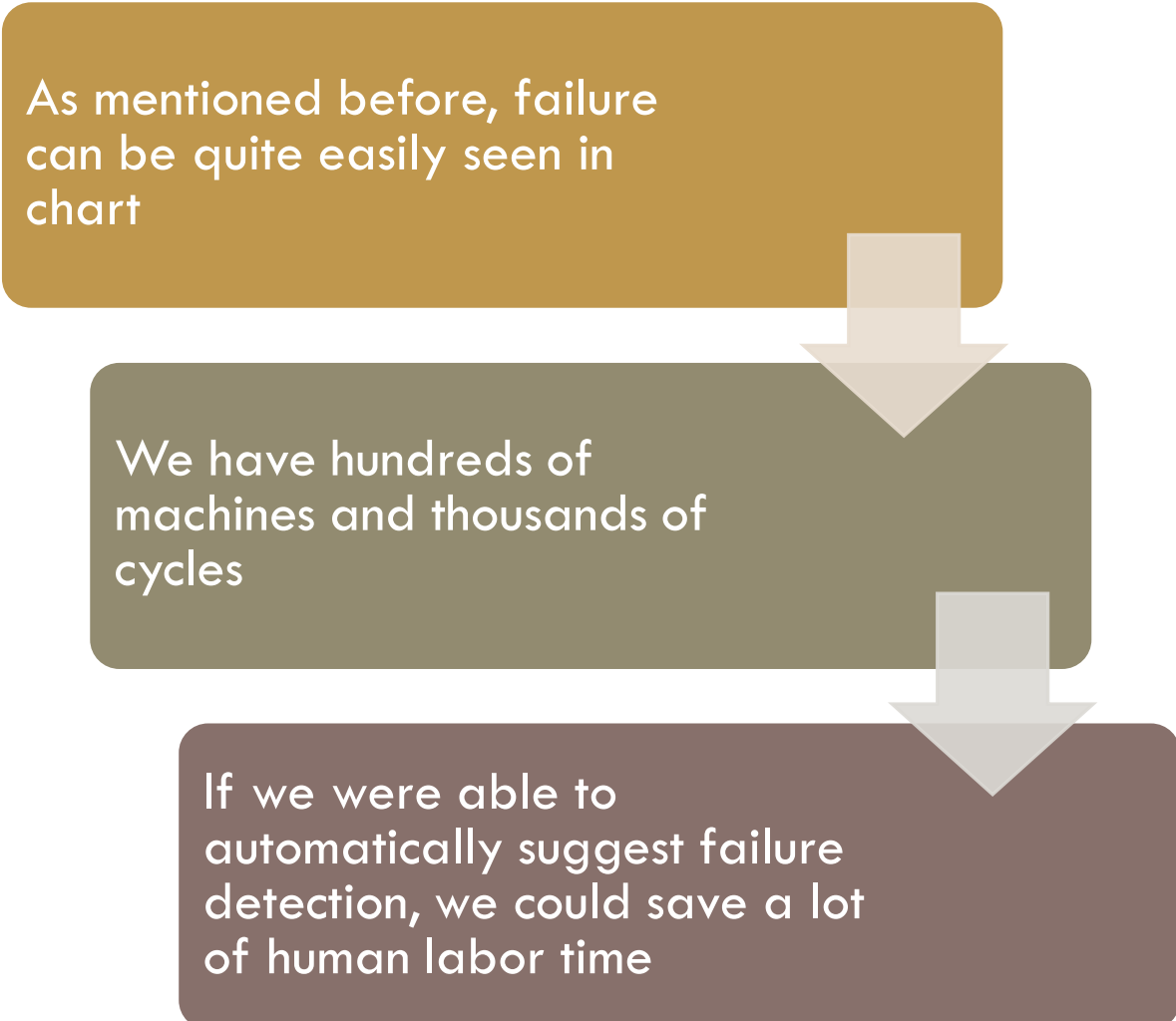


Failure air pump cycles



HOW DO WE RECOGNIZE FAILURE?

As mentioned before, failure
can be quite easily seen in
chart



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graph TD; A[As mentioned before, failure can be quite easily seen in chart] --> B[We have hundreds of machines and thousands of cycles]; B --> C[If we were able to automatically suggest failure detection, we could save a lot of human labor time];
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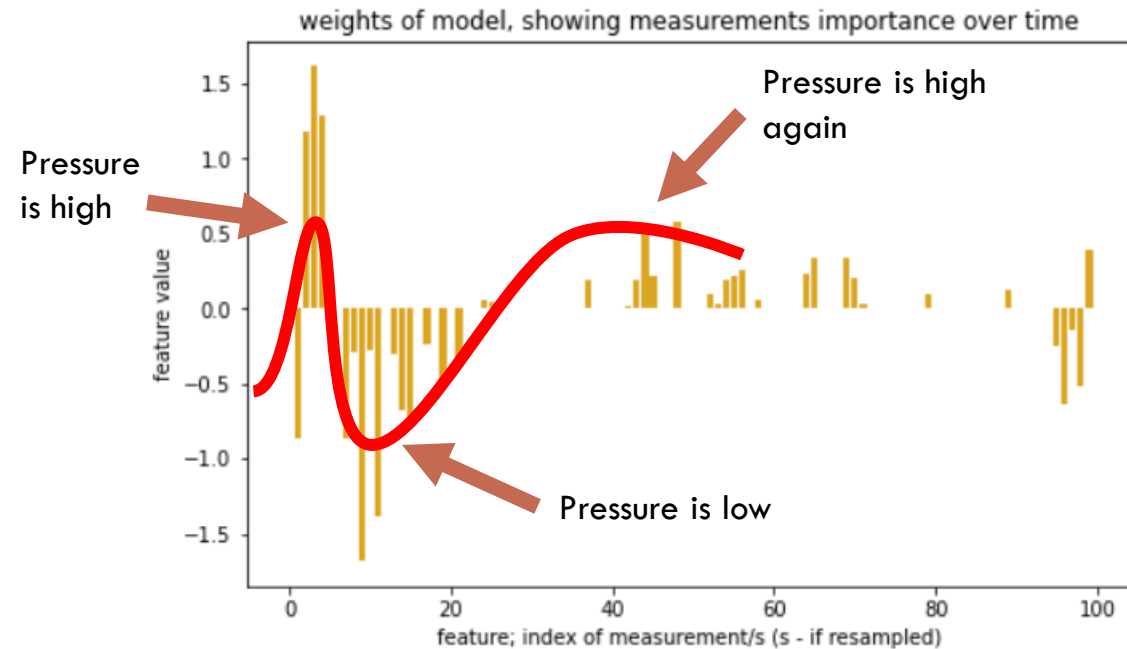
If we were able to
automatically suggest failure
detection, we could save a lot
of human labor time

WHAT WAS THE APPROACH?

We developed a model, that finds the general pattern of pump failure.

Chart on right side represents **general pattern that model found** for failure cycle.

Orange bars shows expected relative pressure at given time. The more is pressure cycle like this pattern, the more likely there was failure.



HOW GOOD THE MODEL IS?

The model can help to identify cases of pump failures.

Although it's not perfect, it can help to save time and energy to human worker, by analyzing cycles, and providing failure detection suggestions.

Numbers on right side shows how well model performed on more than **3k** analyzed measurements from **94** machines, where failure occurred in **16%** of measurements

Note that none of these cycles were provided to model during training process, nor any other cycles from these machines.

Nearly 90% correct evaluations

More than 60% of failures found

More than 60% of detections were real failures