

Hi Tech Talent!

Thank you for signing up for Pivot Park Screening Centre's case! They are very curious to find out what your solution is. Please read the full description of their question and the deliverables below.

Artificial Intelligence in High Throughput Screening

Pivot Park Screening Centre is specialised in High Throughput Screening (HTS) to find starting points for the development of new medicines. In HTS, 100.000's of different samples are tested to see if any of them have the desired biological activity. For this purpose we use microtiter plates (dimension 8x12 cm) with 1536 wells that are filled with compounds, reagents and biological material to perform a biological assay. In each well we perform a single experiment and this way we can test 1536 compounds in one go. By testing hundreds of these plates we analyse 100.000's of compounds. This process is performed by robots in a fully automated manner: they transport all these microtiter plates from one instrument to the other (e.g.: get storage plate from store, centrifuge, remove seal, transfer compound to test plate, label plate, dispense reagents, incubate, measure activity). Ultimately, the results on the microtiter plates are analysed and interesting compounds are selected for further development.

The Issue

The robots operate 24/7 to process 100-200 plates per day. After the 1st plate enters the robotic system, it may take 4-6 hours before all the steps are performed and results can be analysed for that plate. Results may indicate that something went wrong during the process (inaccurate dispensing, loss of reagent stability, fluctuating temperature, etc). Scientists usually identify these issues by recognizing patterns in the results on the plates, and can take action accordingly. While this works fine during daytime, any issue will go undetected during the unattended hours of operation. This causes significant damage as the whole test may have to be repeated.

Another issue is instrument failure during a run. This may happen for a large number of reasons and will be detected by the robot system. Operators are notified by a text message from the robot and take action. In many cases this action involve checking the physical status of the instrument involved and pressing a "try again" button. Again this works fine during day time but less so during unattended hours.

The Challenge

It is proposed to investigate if and how AI technology can be used to resolve issues on the robotic system in a more automated manner

1. Regarding the problem of poor data on the plate: Can we detect automatically that a suspicious pattern occurs ? Can we then analyse what the source of the problem would be ? And finally, can the robot be re-instructed (by the AI system) to avoid the problem (e.g. use another dispenser)
2. Regarding instrument failures during a run: Can we analyse the physical situation (we do have video surveillance in place) using AI and issue a "retry" command without human intervention if that is the appropriate action?

If AI can be applied successfully for the above, this raises a new, open question:

3. Can AI be used in other, more sophisticated ways to improve quality and efficiency of the robot system ?

Deliverables

Deliverable should preferably be a PPT with as much as possible answers to the 2 challenges as described in the case including a plan of action.

An answer to the more open 3 open question would be highly appreciated!

About Pivot Park Screening Centre

<https://www.ppscreeningcentre.com>

Pivot Park Screening Centre provides drug discovery services in the field of assay development and (ultra) High Throughput Screening to find new leads for drug development. PPSC is located on Pivot Park in Oss, the Netherlands, an inspiring life sciences campus for open innovation in the life sciences with focus on pharmaceutical R&D