Tutorial: Use Cases

Group No. 6

Names

Nils Selbach
Thorsten Beumer
Ugur Yerlikaya
Atharv Paranjape
Harshith Srinivas
Edgard Hois

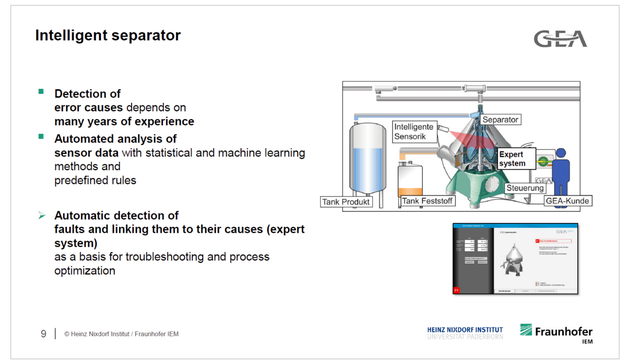
TASK

1. Assign the two use cases below to a use case group according to our lecture.
2. Assign the use cases to the analytics levels and mark the corresponding row in the table.
3. What is the input and output for the models? Fill in the corresponding fields in the table.
4. Describe what the use case would look like in the other analytics levels.
What would the input and output look like in each case?

Elements can be the same for all levels, but do not have to be. An example for the intelligent seperator is given.

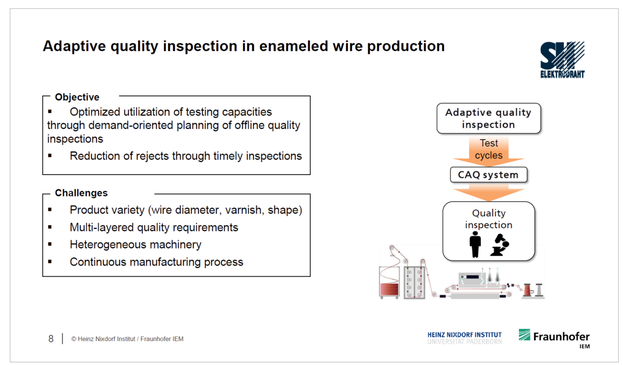
Example: Intelligent Seperator
Engineering Analytics: Intelligent Product

	Input data	Model description	Output data	Business Benefit
Descriptive	Sensor data: Microphone sensor data	Model describes whether the machine state is ok or causes an error	Current machine state	The current machine state, which was only possible to be identified by experts, can now be identified by everyone. The parameters can then be adjusted manual to receive a good seperation and thus optimize the quality of the end product.
Diagnostic	Process parameter: Inflow, dran pressue and rotation speed Sensor data: Microphone sensor data	Model describes whether the machine state is ok or causes an error and if there is an error state it also describes which paramter is not well adjusted	The current machine state and the parameters that are well or not well adjusted	The product quality can be optimized faster and not only by experts because the paramters which have to be adjusted are known.
Predictive	Process parameter: Inflow, dran pressue and rotation speed Sensor data: Microphone sensor data	Model describes whether the machine state is ok or causes an error and predicts how to adjust the parameters to receive a good machine state	The current machine state and in case of an error a recommendation of how the paramters have to be adjusted to receive a good state	The knowledge of how to adjust the parameters to achieve a good process becomes available for everyone to optimize product quality and increase customer satisfaction.
Prescriptive	Process parameter: Inflow, dran pressue and rotation speed Sensor data: Microphone sensor data	Model adjusts the paramters itself to receive a good machine state, which is optimal for the process	Direct control information of how to adjust the parameters	The machines can operate on their own. That reduces efforts for the machine operator and leads tostable processes with a good product quality.



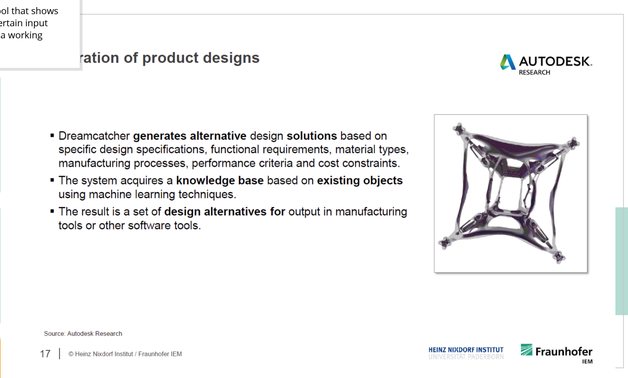
Adaptive quality inspection in enamaled wire production
Manufacturing Analytics: Smart Quality

	Input data	Model description	Output data	Business Benefit
Descriptive	Historical Data of inspections	Model describes that an adjustment to the inspection interval is necessary	Current need for inspection interval adjustments.	The Model tells whether an adjustment is needed upon inspection which then the user can make accordingly and not worry out incorrect output
Diagnostic	Historical data of inspections Next inspection intervals	Model describes that an adjustment to the inspection interval is necessary, it also describes at which point the interval was not optimal.	Current need for adjustments of the inspection interval and the current point where the interval was not optimal anymore.	The model gives out a status that a further adjustment is needed and it also tells in which exact position the interval was not optimal. This helps the engineer to plan and make accurate intervals
Predictive	Process parameter: Customer demand, historical data of inspections, the next inspection interval	Model describes whether further quality inspections are necessary and suggests an optimized inspection interval.	Recommend utilization of test capacities Prediction of rejects	The model inspects the quality which proves to be useful for the user and the user won't have to work manually on the same task Predcting rejects helps to keep track of raw materials in stock with respect to demand-supply.
Prescriptive	Process parameter: Customer demand, historical data of inspections, the next inspection interval	Model adjust the next inspection intervals to optimize the reduction of rejects	Direct control information of how to adjust the inspection interval.	The inspections are planned and executed autonomously. That reduces efforts and leads to stable processes with a good product quality.



Generation of product designs
Engineering Intelligence; Generative Design

	Input data	Model description	Output data	Business Benefit
Descriptive	Design Specifications, Functional Requirements, ´material type, manufacturing process, performance criteria, cost constraints	Model describes that the current design solution is not optimized.	Solution is optimal or not.	The model tells whether the design is optimal or not which helps the user in deciding whether to discard or make changes to the current design
Diagnostic	Design Specifications, Functional Requirements, ´material type, manufacturing process, performance criteria, cost constraints	Model describes that solution is not optimal a arts need to be adjusted for an optimal solution.	Parameters that need to be adjusted for an optimal solution.	The model is showing, not only that the solution is not optimal, but it also shows areas where it can be improved. This helps the engineer to find an optimal solution.
Predictive	Design Specifications, Functional Requirements, ´material type, manufacturing process, performance criteria, cost constraints	Model describes where there is optimization potential, and generates alternative design solutions that are optimized in that regard	Generate Alternative Design solutions Knowledge Base (real world data) is created	The model tells in which areas the design can be more improved and also gives out an alternative more optimised solution for the same which helps the engineer Real world Data generates revenue
Prescriptive	Design Specifications, Functional Requirements, ´material type, manufacturing process, performance criteria, cost constraints. Existing object models. Existing knowledge base	Model generates alternative design solutions and starts the manufacturing process for them	Direct control information of how to produce the alternative solution.	The model can alter the design when it detects optimization potention according to the parameters which results in more higher quality products and more efficient manufacturing.



JB Jonathan Brock Jan 17, 2022 at 9:03 AM (edited)

You are limiting yourselves to the generation of design solutions. More simplistic, something like this could work aswell;

A report of how certain design specifications (e.g. thicker material) and different material would effect the costs would be more suitable here

Also a vizualization tool that shows trade-offs between certain input parameters could be a working solution here

JB Jonathan Brock Jan 17, 2022 at 8:53 AM (edited)

Predictive and Prescriptive solutions are hard to differentiate. Arguably, Dreamcatcher would be prescriptive, because it can generate working design solutions from scratch.

JB Jonathan Brock Jan 17, 2022 at 8:58 AM (edited)

The knowledge base is actually the input for Dreamcatcher to learn about how the input parameters interact and should already be used in earlier stages.

JB Jonathan Brock Jan 17, 2022 at 8:55 AM (edited)

How do you know what an optimal solution is?
If it is trained from previous design solutions, it contains the flaws and errors from engineers who worked on these solutions manually.

Possible solution:
Descriptive: Visualization Tool / Report that shows how different design choices, goals or limitations effect other parameters

Diagnostic: Given Goals and Constraints, is this solution feasible?

Predictive: Model predicts how certain changes to the design would effect target goals (like costs or manufacturing processes)

Prescripitve: Based on the goals and constraints the model generates working design solutions, with the most likely one being recommended.

Business Goals could be something like that:
- Gaining more intell into how certain design choices effect the later solution
- Having a quick scan to avoid costly errors
- Being able to faster evaluate changes to a design solution
- Not having to engineer a design solution from scratch, but rather picking up an artifically generated solution