Industrial Oven Scheduling Optimization

Description of Overall Goal & Task	In a production facility for compressed air elements, there are a total of 4 industrial painting robots and 16 industrial ovens. The robots apply paint on rotors. All rotors are placed on a standard-size pallet manually fed into the Kuka cells. One pallet can contain between 8 and 12 parts which make a batch. Every robot has a program counter which keeps track when a program starts and ends. The duration of the program is determined by the type of rotors that must be painted. After paining, every pallet containing the batch must be cured in one of the ovens. At any given time, 10 ovens are already occupied with other parts. For the remaining 6 ovens, create an optimal schedule based on the output from the robots considering the program temperatures. By default, pallets are not stackable, i.e., each oven can take only one pallet.

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Sub-Tasks

- Primary Task:
  - Design an algorithm providing suggestions for production order placement in the available ovens according to the specified program durations
  - Provide a suitable visualization for the algorithm output e.g., a Gantt chart
  - (optional) depending on the algorithm and/or software library, used provide integration options, e.g., storing the output to an SQL database.
- Secondary Task:
  - Optimize the schedule by introducing a stacking parameter λ where $1 \leq \lambda < 4$. For some orders, pallets could be stacked to optimize oven occupancy. Consider λ=2 (two stacked pallets) or λ=3 (three stacked pallets) of one and the same product type. Parameter value by default is 1 (no stacking, single pallet).
- Tertiary Task:
  - When the scheduled output changes (i.e., Kuka painting robot breaks down, and a new pallet will not be coming out at the expected time), how can the planning be further optimized in terms of putting the ovens on standby?

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Included Hard- & Software	
	▪ Specification for oven program durations and temperatures ▪ Sample data set for Kuka output for February 2022