# What if you could eliminate your biggest threat? Get ahead of your manufacturing competitors.


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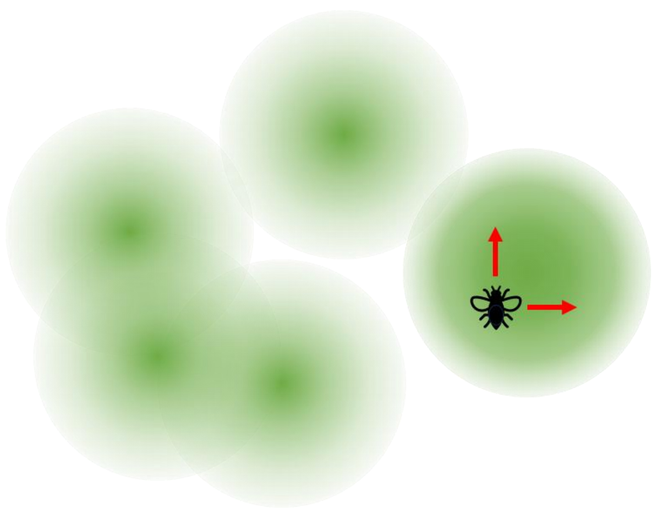
## Manufacturing Schedules

- Assignment of manufacturing tasks (jobs) to available resources (machines & workers) throughout time
- Wide research: Combinatorial mathematics optimization problem that inspired one of the **Millenium prize problems**[1]. An average problem has **more solutions than the number of atoms in the universe**.
- Economical Value: **$277.81 Billion (2022)** market, growing at a Compound Annual Growth Rate **(CAGR) of 13.1%** to **$658.41 Billion (2029)**[2]
- Challenge: Economy shifting from mass production to **mass customization** (dynamic manufacturing environments)[3]

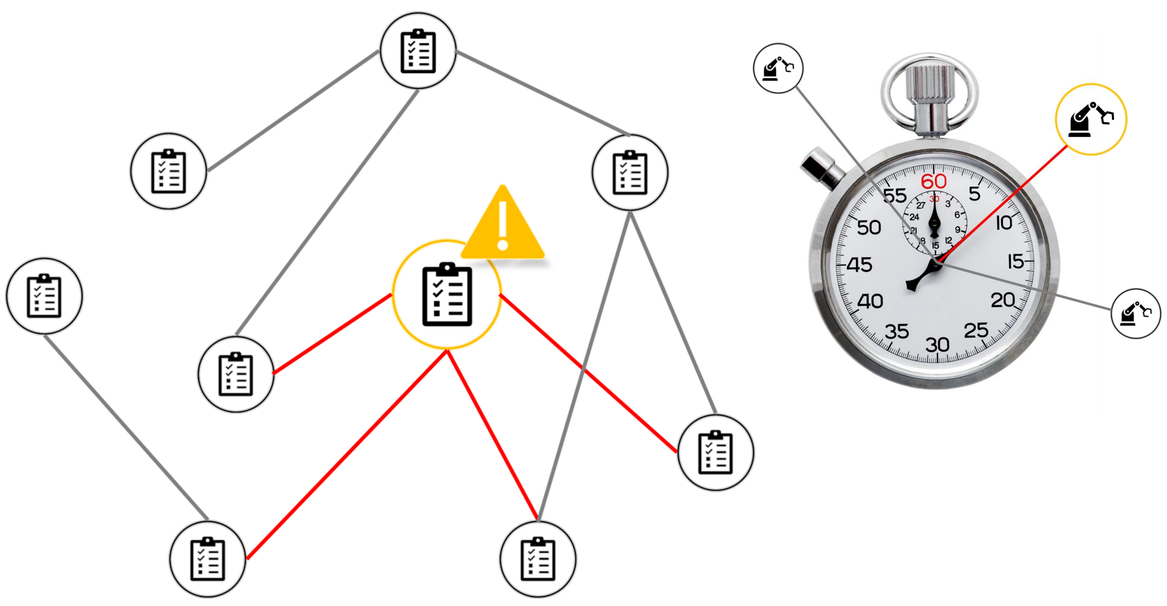
## State-of-the-art

- Metaheuristics: **versatile** for different manufacturing scenarios and capable of finding **good (non-optimal) solutions** in **large search spaces** [4]
- **Knowledge-Guided Fruit Fly Optimization Algorithm (KGFOA)**[5] proved to achieve **high performance results** by balancing global exploration (knowledge-guided search) and local exploitation (smell-based search)
- Current **limitations**:
    - Limited **solution quality** (far from optimal)
    - **Time demanding** for dynamic environments
    - **Dataset availability** (hard to compare)



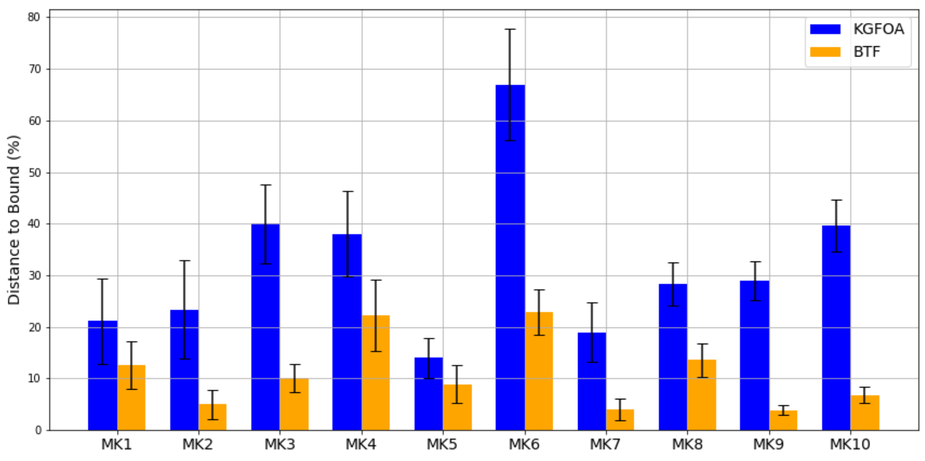
## Biggest Threat First (BTF)

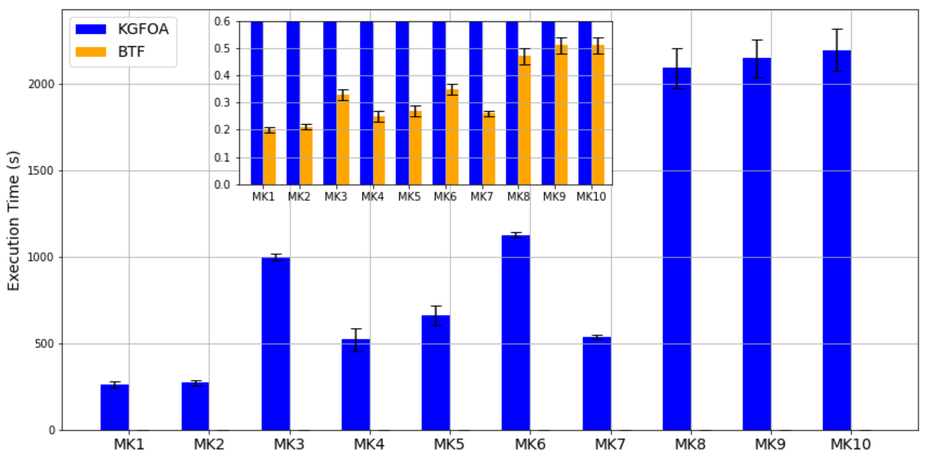
- Goal: Minimize total processing time (**makespan**)
- Rational: eliminating your biggest threat you get much closer to your goal
- Biggest threat: job with the highest remaining processing time
- 2 vector solution **encoding**:
    - **Blacklist** - sorts threats in descending order of magnitude
    - **Deployment** - assignment to most readily available resources




## Results

- BTF and KGFOA compared for MK1-10 benchmark dataset (the lower the better)




## Research Findings

- BTF generates **extremely high quality** (in most cases, close to optimal) solutions
- **Minimal execution times** make the BTF suitable for dynamic manufacturing environments

## Major Contributions

- Generated instances for MK1-10 dataset released online[6]
- Reignite scientific interest in **heuristics** for scheduling in manufacturing
- Potential of **millions of dollars** in increased **profits** for companies


Funded by:

References:

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