Ph.D. position in a Horizon Europe project: Combining reinforcement learning and operation research approaches for assembly line design.

We are looking for a Ph.D. student to work at IMT Atlantique (within the Horizon European funded ALICIA project) on combining reinforcement learning and operation research approaches for process planning.

Description of IMT Atlantic

IMT Atlantique is a top-level engineering school, a technical university, under the aegis of the Ministry of Industry and the digital sector formed from the merger of two renowned schools (Télécom Bretagne and École des Mines de Nantes). It focuses on digital technology, energy, and the environment with the objective of contributing to economic development through education, outstanding research and innovation. Since its creation on January 1, 2017, IMT Atlantique has inherited all of the research and innovation activities of Télécom Bretagne and École des Mines de Nantes. This new establishment comprises 13 departments of teaching and research, involved in six research labs. With more than 1000 publications each year (400 of which are A Rank), the research at IMT Atlantique is carried out by 290 permanent researchers and lecturers, 110 non-permanent researchers and over 300 doctoral students. The research production places IMT Atlantique among the top 10 in France.

Description of the Thesis

The assembly line design problem includes decisions such as the number of stations, the assignment of tasks to stations, the assignment of equipment to stations, and the selection workers' profile, among others. The objective is to ensure the line achieve the desire throughput at minimum costs. The input of the problem is the family of products to assemble on the line. More precisely, for each model variant, we are given the set of tasks, the durations of the tasks, and the required pieces of equipment. However, nowadays, assembly lines are modified every 6 months to account for modifications of the product family. The modification of the product family is unavoidable (to follow the technological improvements of the product, because of changes in supplies, ...). The challenge is thus to design a line that can smoothly be reconfigured over the next 10 years to follow the changes in the product requirements.

The assembly line design problem involves line balancing, and operation research methods such as branch-and-price, or dynamic programming often perform well to solve the deterministic problem. These methods must be adapted to solve the stochastic and dynamic variant of the problem, where the future variants of the products are unknown. Reinforcement learning is broad field that gather methods from different communities, and that are usually well suited to solve stochastic dynamic problem. In this thesis, we will develop approaches that combine reinforcement learning and operation research to solve the process planning problem in a stochastic dynamic environment.

Description of the research project ALICIA

The Ph.D. will take place in the Horizon Europe funded research project ALICIA. ALICIA is a research and innovation action, and the thesis has a clear focus on academic research. Nevertheless, the Ph.D. student will have the opportunity to validate the developed tools on several use cases from the projects, and to discuss with technology providers that might further develop the tool in view of commercialization (after the thesis). In addition, the thesis involves traveling a few times per year in Europe to meet with the partners of the project.

Profile

The successful candidate must:

• Hold a Master's degree in operational research, computer science, industrial engineering, applied mathematics or in any other related field.

• Have a good knowledge of operational research (mathematical programming, stochastic optimization, metaheuristics, etc.).

• Have good computer programming skills.

• Have good organizational and communication skills (ability to speak and write in English).

Contract:

- The Ph.D. is expected to start in October 2023, but the starting date is flexible.
- The duration of the contract is 36 months.
- Gross annual salary 25000-28000 euros.

Application deadline: April 10, 2023**.**

To apply, please send a CV, a cover letter, and your master's transcripts to simon.thevenin@imt-atlantique.fr

Contact for information on the job and application:

Simon Thevenin, simon.thevenin@imt-atlantique.fr

Milad Elyasi, milad.elyasi@imt-atlantique.fr