

## Research internship.

**Work place:** IMT Atlantique, Nantes. Laboratoires des Sciences du Numérique de Nantes (LS2N), team SLP.

**Topic:** Robust/stochastic optimization for a reconfigurable assembly line with walking workers under uncertainty.

**General scope:** With the rise of mass customization, various manufacturing companies have transformed their dedicated manufacturing systems into multi/mixed-model assembly lines. Mixed-model lines can assemble different items in any arbitrary product orders entering the line. Such lines can benefit from the concept of reconfigurability (e.g. moving workers/equipment). Reconfigurable lines must be able to quickly adapt to new market changes, new products, and/or technologies. Market changes affect the product mixes in a mixed-model line, and it is a major source of uncertainty when designing the line.

**Research topic:** The intern will work on the EU funded project *ASSITANT*. The goal of the internship is to propose a model and solution method to design a line able to reconfigure to face demand changes and the introduction of new products during the life cycle of the line. The intern will build upon two previous studies on the topic ([Hashemi-Petroodi, et al. 2019](#); [Hashemi-Petroodi, et al. 2020](#)), where two Mixed-Integer Linear Programming (MILPs) models have been developed for two different assembly line balancing problems. We will rely on robust/stochastic optimization approaches to deal with the uncertainties. The model includes cycle time and precedence constraints. The goals of the internship are to: implement the developed MILP, propose and implement efficient (meta-)heuristics to solve large instances of such a complex problem, submit the first results to a conference, and finally submit an article to an international scientific journal.

**Required skills:** Knowledge of a programming language, knowledge of a linear programming solver, good English reading and writing skills. Knowledge on the following topics would be an advantage: assembly line balancing, reconfigurable manufacturing systems, robust/stochastic optimization, heuristics.

**Possible collaboration:** Stellantis.

**Start:** February 2022

**Duration:** 6 months

**Salary:** 3300 for the 6 months

**Supervisors:** Alexandre Dolgui, Simon Thevenin, S. Ehsan Hashemi-Petroodi.

**Contact:** CVs must be sent to [simon.thevenin@imt-atlantique.fr](mailto:simon.thevenin@imt-atlantique.fr) and [seyyed-ehsan.hashemi-petroodi@imt-atlantique.fr](mailto:seyyed-ehsan.hashemi-petroodi@imt-atlantique.fr) before November 30<sup>th</sup>.

## **References**

Hashemi-Petroodi, S. E., Thevenin, S., Kovalev, S., & Dolgui, A. (2020). *The Impact of Dynamic Tasks Assignment in Paced Mixed-Model Assembly Line with Moving Workers*. In *IFIP International Conference on Advances in Production Management Systems* (pp. 509-517). Springer, Cham.

Hashemi-Petroodi, S. E., Gonnermann, C., Paul, M., Thevenin, S., Dolgui, A., & Reinhart, G. (2019). *Decision Support System for Joint Product Design and Reconfiguration of Production Systems*. In *IFIP International Conference on Advances in Production Management Systems* (pp. 231-238). Springer, Cham.