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Electronic board production process knowledge extraction for global optimization

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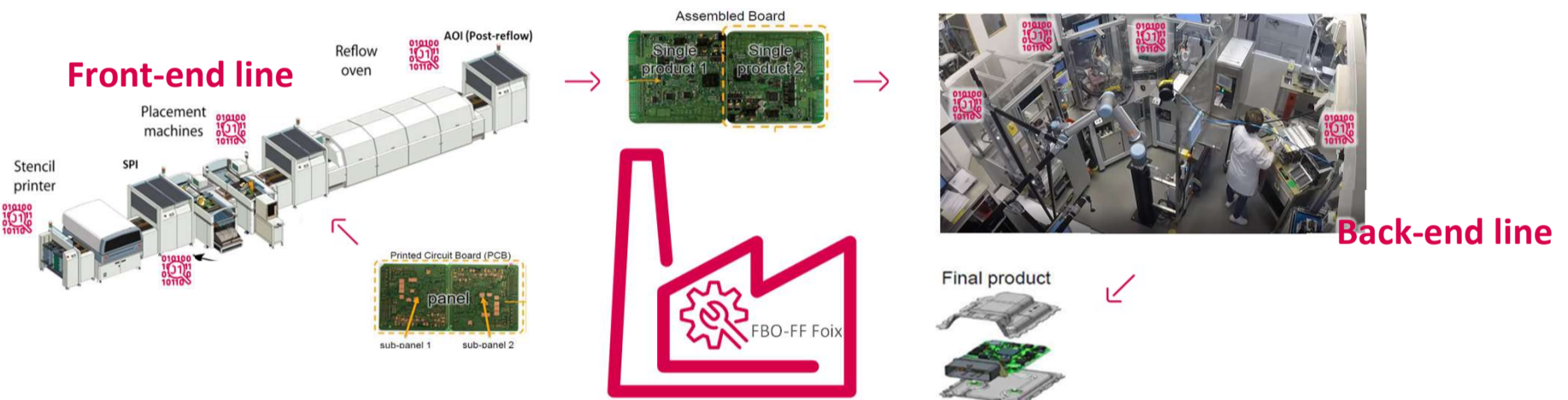
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Electronic board production process knowledge extraction for global optimization

Le Toan Duong (PhD)

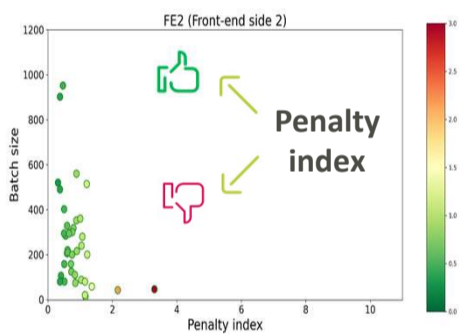
Supervisors: L. Travé-Massuyès, A. Subias, N. Barbosa

- Assess product quality from the analysis of event logs
- Optimize the production process to reduce production cost and improve product quality



Penalty index of a batch b_j of phase ϕ_k

$$p_k(b_j) = \sum_{\alpha=1}^{m_k} r_{\alpha|k}^j \times \tilde{p}_{\alpha|k}$$



3. Product investigation

Good quality

Data source: event logs

Source: MES

```
SS|mid00000|Ope15_Line0|FamilyC128|Board_730|Operation_15|P|1546860302|
PS|mid00003|Ope4_Line3|FamilyC128|Board_544|1548866935|
...
SF|mid00000|Ope2_Line0|FamilyC128|Board_566|Operation_2|002|P|1548858285|||
```



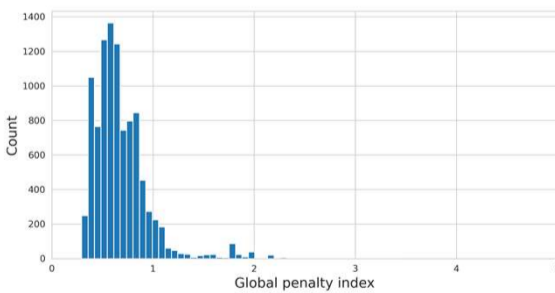
1. Process discovering

Timed process model construction

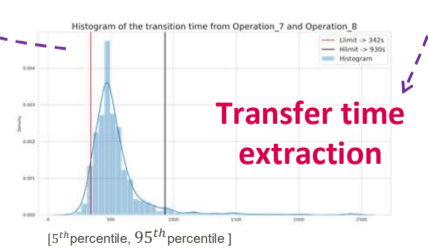
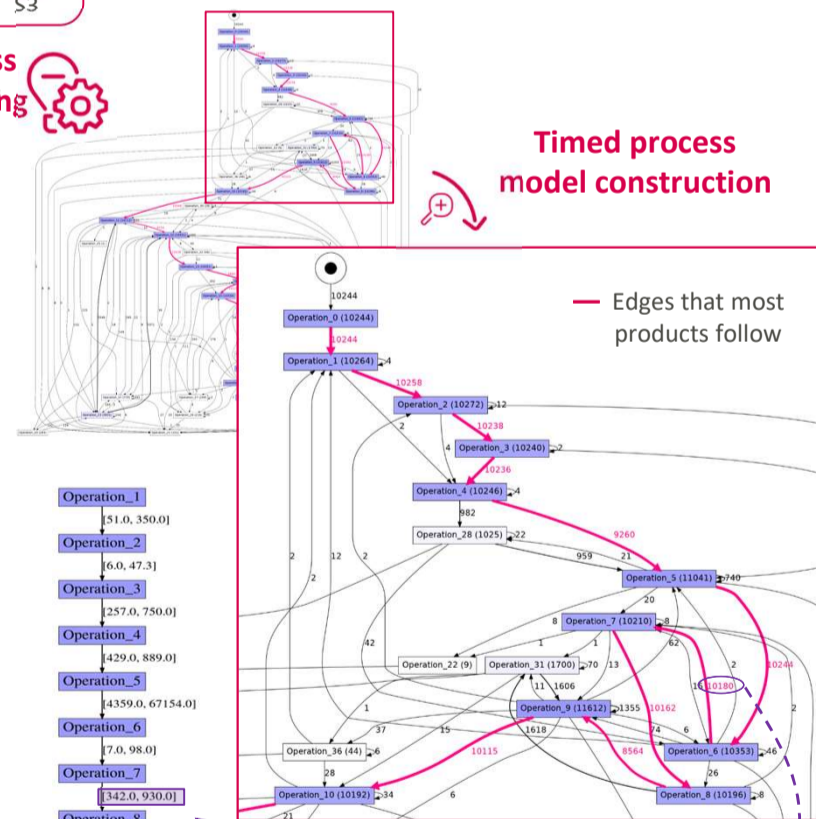
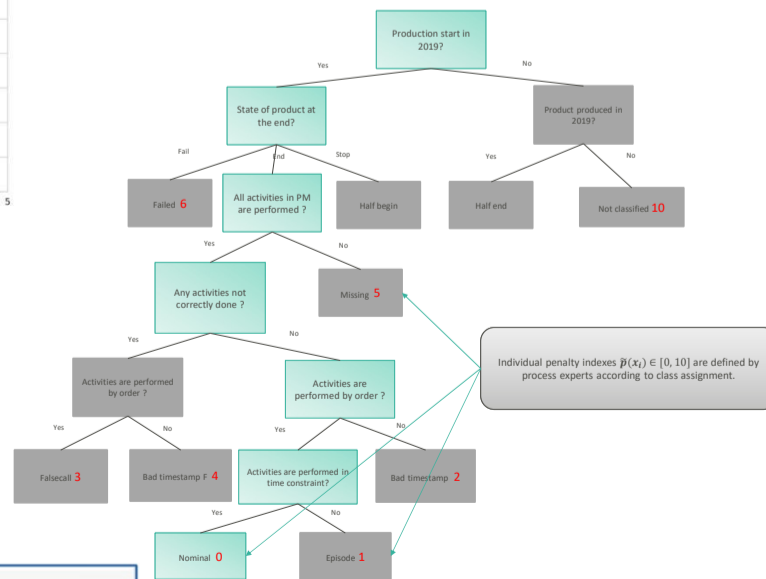
Global penalty index of product x_i

$$p_g(x_i) = \sum_{k=1}^{|\phi|} \gamma_k \times (\lambda \times \tilde{p}_k(x_i) + (1 - \lambda) \times p_k(b_j))$$

$\lambda, \gamma \in [0, 1], \sum_{k=1}^{|\phi|} \gamma_k = 1$



Product path
2. Conformance checking
Timed process model



Transfer time extraction

- Parameter adjustment
- Work-in-progress (WIP) management
- WIP prediction models



Want to know more about it?

Le Toan Duong, Louise Travé-Massuyès, Audine Subias, and Nathalie Barbosa Roa. Assessing product quality from the production process logs. The International Journal of Advanced Manufacturing Technology, 117(5):1615–1631, 2021.

- Distributed data-based diagnosis and prognosis of equipment and subset toolings
- Predictive maintenance and diagnosis of cobots