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Local Linear Forests as a Solution for Online Process Control

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In this study, we propose to use the Local Linear Forest (R. Friedberg et al., 2020) to forecast the best equipment condition from complex and high-dimensional semiconductor production data. In a static context, the analysis performed on real production data shows that Local Linear Forests outperform the traditional Random Forest model and 3 other benchmarks. Each model is finally integrated into an online advanced process control solution, where predictions made from continuous learning are used to automatically adjust the recipe parameters of a production operation in real time. Through the distribution of simulated process output, we demonstrate how Local Linear Forests can effectively improve the quality of a mixed production process in terms of variance reduction and process capability index improvement. We compare the results with the control system in production and demonstrate how this Machine Learning technique can be used as a support for Industry 4.0.
Reference: Rina Friedberg, Julie Tibshirani, Susan Athey, and Stefan Wager. Local Linear Forests. Journal of Computational and Graphical Statistics, 30(2), 2020.

Keywords

Local Linear Forests, Machine Learning, Semiconductor industry

Classification

Both methodology and application

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