

INSAIGHT

AI-based Data Analysis for Knowledge Discovery in Manufacturing Processes



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MOTIVATION & GOALS

In the era of Industry 5.0, intelligent systems generate massive volumes of multivariate sequential data across distributed environments. To transform this data into actionable insights, we need advanced tools that support intuitive, scalable, and explainable knowledge discovery. We propose the development of a next-generation toolbox that:

- Supports subsequence search in high-dimensional, multivariate data
- Prioritizes visual and semantic similarity to ensure meaningful pattern recognition
- Leverages intuitive, user-friendly algorithms, minimizing setup complexity and maximizing accessibility
- Facilitates human-in-the-loop workflows, empowering domain experts to effectively guide data labeling, behavior prediction, and anomaly detection

Project FactBox

Project Name INSAIGHT
Project ID MFP A.2
Duration 48 Months

Area 3
Area Analytics

Project Lead
DI Dr. Belgin Mutlu

APPROACH

We employ a robust pipeline combining advanced preprocessing, similarity search, and adaptive thresholding methods. To facilitate fast and robust pattern recognition, we integrate both Machine and Deep Learning methods, allowing for efficient behavior analysis and root cause identification.

CONTRIBUTION

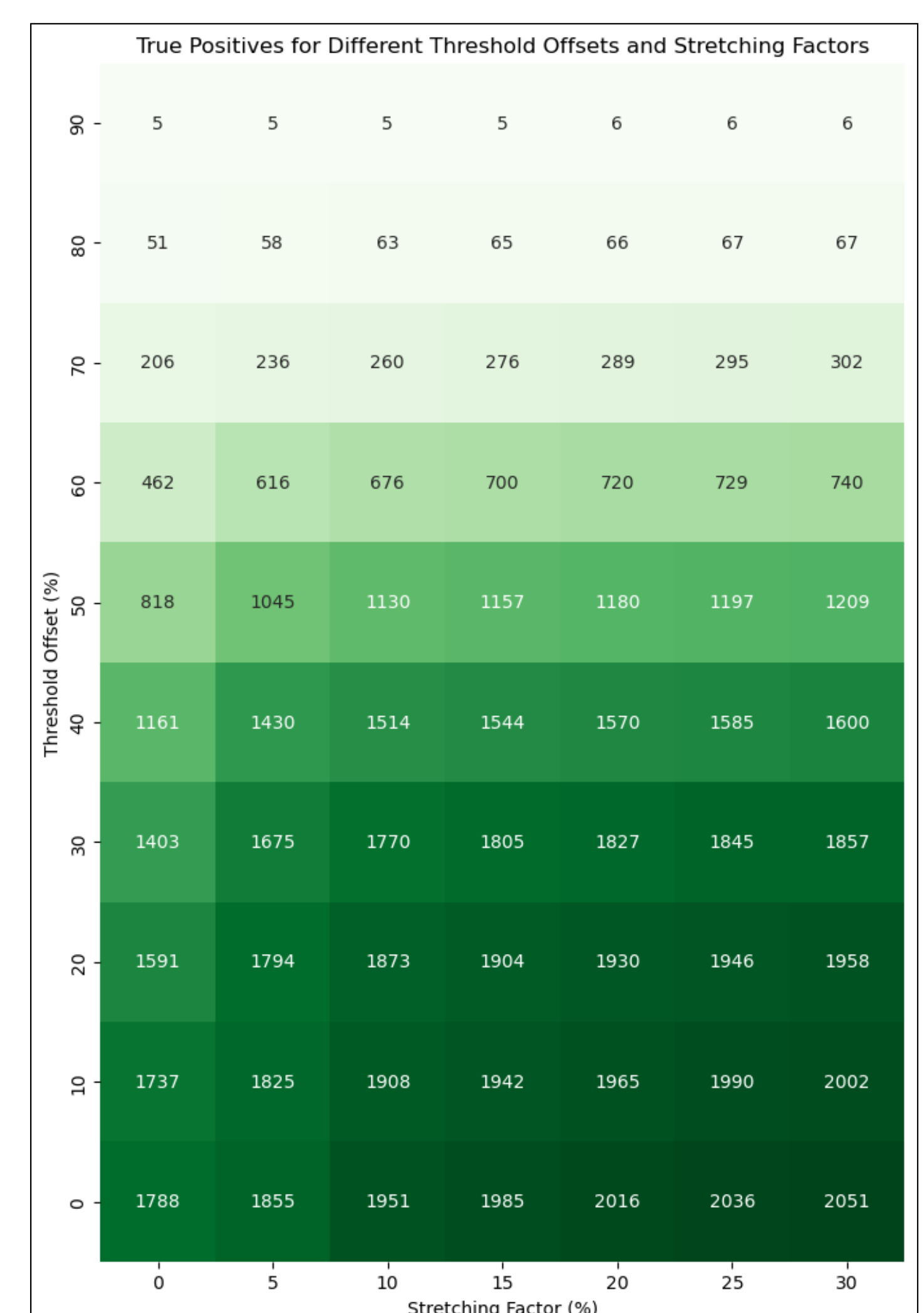
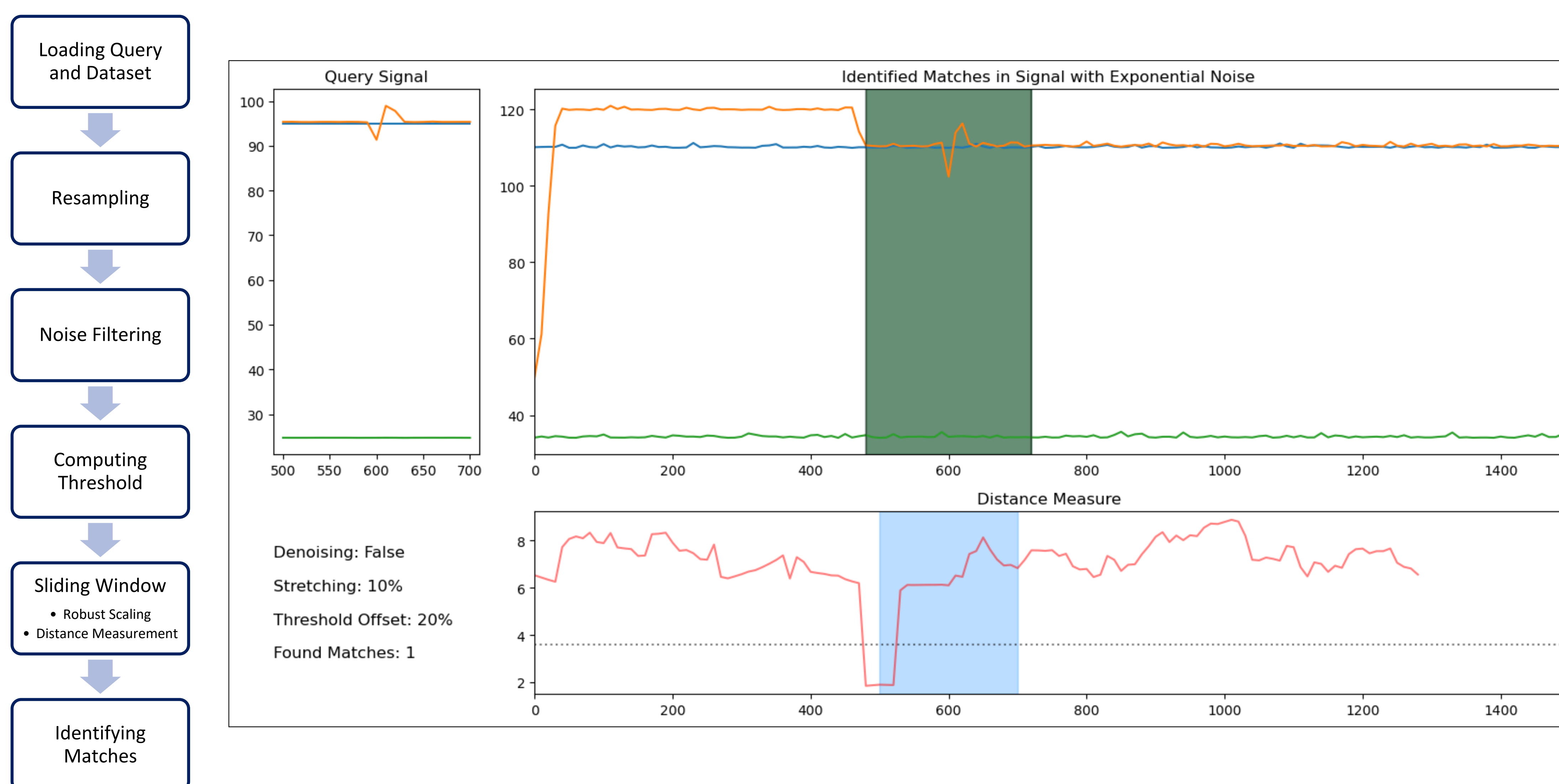
Scientific contribution

- Identification of key requirements for similarity search in industrial sequential data.
- Evaluation of state-of-the-art subsequence search algorithms on real-world multivariate datasets.
- Enhanced knowledge discovery by integrating domain-specific expertise into the analysis pipeline.

Economic contribution

- Support engineers in data-driven decision-making.
- Uncover new insights into the dynamics of industrial processes.
- Enabled retrospective analysis of anomalous behavior in historical data.
- Facilitate root cause identification of past system faults.

SYSTEM ARCHITECTURE



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