

Motivation

- Making *Discriminant Chronicles Mining* introduced in [1] more useful for pattern mining by extending its possible use-cases:
 - the original method was generalized from scalar values to vector values,
 - the original method was altered to operate with real numbers instead of being limited to integers.

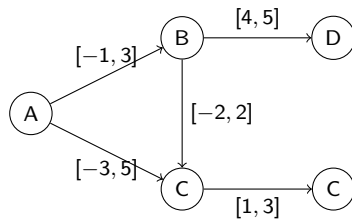


Figure: Chronicle – a pattern based on inter-event distance constraints [1]

Proposed Solution

- The theoretical basis of the original method introduced by Dauxais et al. in [1] has been extended to multiple dimensions and values as real numbers,
- *DCM* algorithm introduced in [1] implementing the original method has been reused to a great extent and further extended to handle multidimensional data by adding:
 - preprocessing before rule induction – i.e. splitting an n -dimensional input dataset into n scalar sub-datasets,
 - postprocessing after rule induction – i.e. merging n scalar rulesets into a single n -dimensional ruleset by introducing an innovative algorithm for numerical induction rules merging.

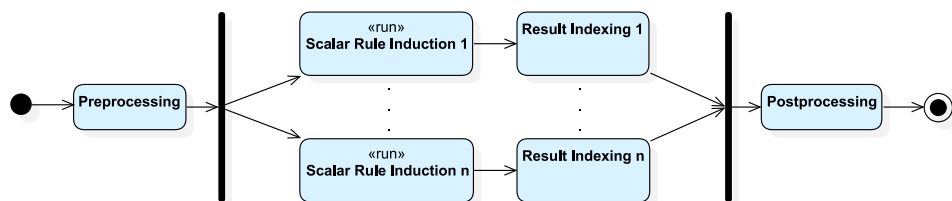


Figure: Extensions to the method: big picture

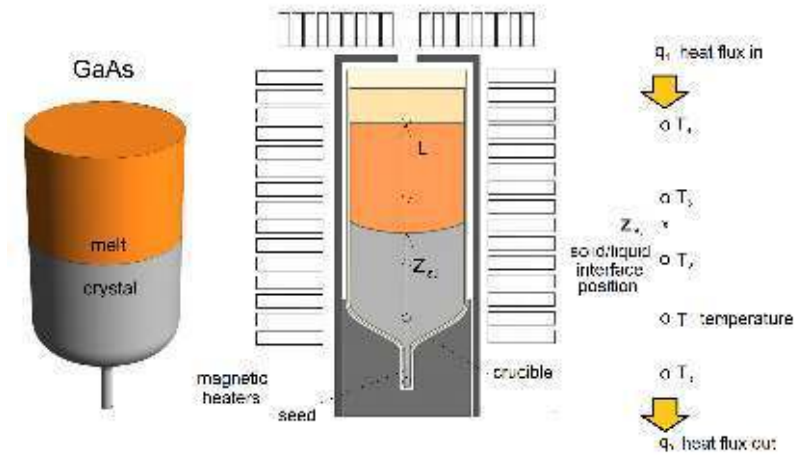


Figure: VGF (Vertical Gradient Freeze) GaAs crystal manufacturing method illustrated [2]

Application of the Method

- Applied to data gathered in the German Research Foundation (DFG) project “Model-based control and regulation of the VGF crystal growth process using distributed parametric methods”.
- Such an application might help in reducing the cost of VGF, a manufacturing process of GaAs crystals used in semiconductor industry by detecting crystals of insufficient quality in early stages of their growth.

Results

- The method produced both patterns describing growing crystals of sufficient quality and patterns describing growing crystals of insufficient quality.

Publication

A research paper ([2]) accepted at WCIDM ITAT 2020, will be published in CEUR-WS proceedings.

[1] Yann Dauxais, Thomas Guyet, David Gross-Amblard, and André Happe. Discriminant chronicles mining. 2017.

[2] Radek Buša, Yann Dauxais, Stefan Ecklebe, Natasha Dropka and Martin Holeňa. Extraction of Classification Rules from Sequences of Crystal Growth Data. WCIDM ITAT 2020.