

Chapter 12

Intelligent data engineering

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12.1 Data analysis in monitoring and decision making

Our objective has been to develop methodologies for failure management in nuclear power plant, and apply them in practice in solving typical problems on this application area [1]. Data-analysis with nuclear power plant data has been one important basic research methodology that we have used. We have developed and applied different case-based data-analysis methods and visualizations to help to detect and analyze various failure cases. Early detection of faults with data-based methods has been an important focus area. We have also used such methods as prediction and modelling to help our research [2]. To study the information value of SOM Maps (Self-Organizing Map method) for the operator with comparisons to other visualization methods is also our interest.

The fault dynamics and dependencies of power plant elements and variables have been inspected to open the way for modelling and creating useful statistics to detect process faults [3]. We have succeeded in using data mining to learn from industrial processes and finding out dependencies between variables by Principal Component Analysis (PCA) and Self-Organizing Map (SOM). In addition to industrial data also methods were developed with the voting advice application data of the Parliamentary elections [4].

In Finnish Metals and Engineering Competence Cluster (FIMECC), we have participated in Energy and Life Cycle Cost Efficient Machines (EFFIMA) Programme. The programme target has been to develop new technology and solutions that enable new machines, devices and systems with dramatically lower life cycle costs — and especially lower energy consumption — than what is the international state-of-the-art of today. Our contribution has been to develop and apply machine learning methods in measurement data analysis in order to achieve the above EFFIMA goals. As a result, a toolbox of adaptive data analysis methods have been developed for the industrial partners.

References

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