CHIST-ERA: Industrial big data and process modelling for smart factories (IBDSF)

“Advanced Decision Support Tools for Long-Life Cost-Effective of Large Scale Systems”

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Context & aims

- In increasing number of real world applications, data samples arrive continuously online through unlimited streams or flows often at high speed and impacted by environment changes and novelties

- Developing **innovative advanced decision support tools** in order to generate models that can predict efficiently the behavior of a wide range of real applications in order to optimize their performance or/and to increase their safety and security

Context & aims

- Two case studies can be targeted:
  - Monitoring and Smart Design of Onshore/Offshore Large-Scale Wind Farms in order to obtain a significant cost reduction in wind farm exploitation and maintenance, as well as providing insights for better design of components of wind turbines and foundations (structure, seabed).
  - Active Dynamic Demand Side Management with PV-WT in order to ensure a reliable electrical energy supply by removing the chance of surpluses, shortages and the resulting power failures

Impacts

- The developed innovative advanced decision support tools can be used by:
  - Component designers and manufacturers in order to extend the component's life-time by understanding the impacts of driver design parameters, technology, environment conditions and failure occurrences
  - System operators to perform and schedule actions that optimize the system's performance as well as its safety
- These developed tools are flexible in the sense that they can be adapted to the system's installation and can evolve according to the development of its technology over time

Contribution and progress beyond the state of the art

- Model design
  - The model is continuously updated online in order to extract the new information carried out by the new arriving data,
  - The model update is performed using limited processing and memory resources,
  - The model update is performed by sequential access to data samples
  - The data streams are treated using a distributed structure
- Decision making
  - Restricted time processing and memory size
  - Detecting changes and novelties in the system environments
  - Alarming users about any change or novelty and its characteristics
- Helper-making decision tools design, implementation and evaluation
  - Providing explaining decision under comprehensive form (natural language)
  - Graphical user interface fostering the situation awareness
  - Quantified evaluation and impact metrics