CHIST-ERA Projects Seminar 2021
Big data and process modelling for smart industry (BDSI)

Speaker(s)

April 14, 2021

Programme co-funded by the
EUROPEAN UNION

Introduction: Projects of the Topic

Big data and process modelling for smart industry (*BDSI*)

FIREMAN (*Predictive maintenance in industrial processes empowered by IoT connectivity and Machine Learning*)

PACMEL *(Process-aware Analytics Support based on Conceptual Models for Event Logs): process mining, time series analysis, integration of heterogeneous data sources, integration of domain knowledge*

RadioSense *(Environmental sensing for Human-Robot collaborative spaces from Electromagnetic signals)*

SOON *(Social Network of Machines) - smart maintenance for Industry 4.0*

BIG-SMART-LOG: *The Use of Big Data Analytics for Process Modelling in Smart Logistics Operations*

SPuMoNI: *Smart Pharmaceutical Manufacturing*

Unifying elements- Keywords:

Anomaly detection
Process optimization
Process mining
Big Data processing
Industrial connectivity
Process monitoring
Industrial process related

Major Achievements and Outputs

Publications:

Int. peer reviewed venues and journals: **>100**

Demonstrators:

- Environmental Radio-sensing (localization, gesture, ranging)
- Failure monitoring and detection prototypes
- Smart Logistics (Long-term multi-factor forecasting)
- ALCOA Tool for Pharma quality

Open source software tools:

- ML/AI Algorithms
- Open data sets, Open source code (github), and containers (docker)
- Blockchain (ethereum)

Areas of impact

- Industrial process monitoring, optimization, validation
- Smart/Predictive maintenance
- Environmental protection & safety
- Pharma industry
- (Big) data processing
- Beyond-5G industrial connectivity enablers
- Products quality improvement
- Environment monitoring and assessment

Upcoming Challenges and Needs

Long-term vision:

- Keep the human in the loop (HMI-HRI)
- Advances in next generation networks
- Smart Logistics
- New sustainable way of manufacturing through digitization
- Smart manufacturing

Research methods:

- Limitations of current AI methods
- Convergence in cyber-physical system modeling approaches
- Experimental validation of theoretical achievements
- Long-term multi-factor forecasting

Interdisciplinarity:

- Exchange of knowledge among cross-disciplinary teams
- Interplay between industry and academia
- Expertise sharing at a transnational level

Implementation:

- Implementation in the wild
- Experiments at real-world industrial infrastructures

Results exploitation:

- Collaboration in times of social distancing

Possible Roadmap

How to tackle the challenges within the topic:

- Using new technologies from A.I., blockchain, data analytics, deep learning, BigData and beyond 5G communication

How to achieve the expected impact:

- Active participation in standardization efforts
- Interaction with industrial stakeholders
- Industry collaboration partner to implement the results

Where to make available the outputs after the project:

- Github, Dataport IEEE, Green open access databases
- Project webpages and social media

Potential users of the results:

- Maintenance teams, factory owners, network operators, service providers, equipment manufacturers, software developers

How potential users will be contacted:

- Networks of project partners
- Dissemination channels
- Open workshops

Role of the CHIST-ERA Support

Reaching the main achievements of the project

- Improvement the efficiency of industrial processes
- Fast responses by Chist Era personnel on requests
- Provided valuable time extensions in response to COVID-19 challenges
- Expanding the scientific research at the European level
- Involvement of academia in topic definition

Creating added value of implementing the project

- Video contest
- Future Tech Week Open research seminars

Satisfaction with the international and national implementation

- It is nice that the project size is virtually not limited by max budget since each partner is funded by national agency
- Yearly Chist Era project meetings are nice for exchange and informing of other’s process
- The two topical calls have been scientifically interesting (at least one of them) for a number of years in a row now.

Possible improvements

- National Agencies coordination for misalignment of national funding/start of the projects, or even possible lack of communication with CHIST-ERA
- Some countries missing (e.g. Germany, Italy not every year)
- Industrial partners are not funded most of the times

Responsible Research & Innovation

Integration of RRI practices in the projects

Consortium agreements describe the treating of some aspects

- Open Science: open data, standardized evaluation platforms, scientific "challenges"
- Science education: Academic courses and theses (BSc/MSc/PhD) on the addressed topics. Organization of training events.
- Public engagement: Raise public awareness via public webinars. Reach, stimulate and engage a critical mass of relevant stakeholders.
- Ethics: Responsibility towards environment, Discussions started with ethics experts on ethics in environmental sensing
- Governance: Discussion started with stakeholders in industry and TLC sectors

Major hurdles to RRI implementation in the projects

- Data processing and interpretation of the process under study may be non-trivial, especially when the RI targets are towards increased TRL levels.
- Industry partners may be fearful of disseminating data and internal process description publicly
- Gender imbalance in ICT
- Limited access to public engagement and talks due to COVID-19 pandemic.

Open Science

Open Science practices:

DMP: implemented by majority of projects
OA publications: green open access at public, University maintained database
Open data sharing: github, IEEE DataPort, OpenAIRE
Data repositories used: github, arxiv, Zenodo, TechRxiv

Obstacles to cope with good Open Science practices:

- Industry reticence to share data
- Rules for Open Access funds vary across national funding agencies
- No all publishers allow gold/green open access
- Data sets from industrial partners can sometimes not be shared

Costs of implementing the Open Science practices:

- Gold Open Access fees can be high (e.g., Elsevier's fee is 2,500 EUR)
- Supporting open data could be costly due to expensive technologies and challenging after the completion of the projects

Technology Transfer

Challenges linked to exploitation, and IPR:

- Software can’t be patented
- Problems in case of disseminating details before patenting

Steps taken towards commercialization:

IP Registration:

- invention disclosures formulated
- invention disclosure accepted for filing

Spin-offs:

- Towards commercialisation of machine learning-based research via a thorough customer discovery and value proposition.

Tension felt between technology transfer and Open Science

- Industrial, sensitive data

Questions ?