1SC4194 – Application of data analysis for the improvement of steel manufacturing processes

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Department: DOMINANTE - GRANDS SYSTÈMES EN INTERACTION
Language of instruction: ANGLAIS
Campus: CAMPUS DE METZ
Workload (HEE): 40
On-site hours (HPE): 27,00

Description

ArcelorMittal is the world's leading producer of steel and mining, with an industrial footprint in 19 countries and a presence in 60 countries. The group is the leading supplier of quality steel for major industries such as automotive, building, energy and packaging. In France, ArcelorMittal has 17,200 employees spread over 40 production sites, distribution and service centers and four R & D sites. ArcelorMittal produced 10 million tons of liquid steel in 2015 in France (ie around 10% of the group's worldwide production) which it then converts into coils, sheets, rounds, bars ...
ArcelorMittal's research and development (R & D) has a significant presence in the country, with 780 researchers out of the 1,300 researchers employed by the ArcelorMittal group worldwide and more than 65 million euros invested in 2015. The largest site R & D group is also located in France, in Maizières-lès-Metz. This site brings together several research centers, including one for steelmaking processes. The aim of the center is to improve, make the tools for making steel more reliable and adapt them to the production of new steels.
Within this process center, a very transversal department works on measurement and control issues. This department develops solutions for all steel manufacturing processes. The developments concern the instrumentation and the control of the factories as well as the characterization of the products, whether it is the property of the surfaces or the materials. One group is dedicated to data analysis work in the framework of developing models for predicting product quality and improving the reliability of manufacturing tools. This last point is very important for the group, a challenge is to be able to anticipate the failures so as to avoid or limit the stops of the chain of production. These activities are part of the themes of the digital industry or industry 4.0 which are part of a scientific excellence in the field of data analysis.

Quarter number

ST4

Prerequisites (in terms of CS courses)
Statistics and probability

Syllabus
Part 1: Introduction to concepts and issues (a participant from ArcelorMittal).
Part 2: Implementation on a practical example of steel manufacturing processes
Part 3 : work of one or two groups of students on data provided by our industrial partner, ArcelorMittal.

Class components (lecture, labs, etc.)
Teaching by project

Grading
Oral presentation in group. The mark is individualized.

Resources
1 room for 25 élèves, overhead projectr, partition by groups
Software : Python/PyCharm on school machines.
2 academic supervisiors + 1 expert from ArcelorMittal

Learning outcomes covered on the course
At the end of this course the students will be able to :

- to understand the issue of resilience and predictive maintenance as well as the potential benefits of such an approach
- to analyse a complex system and develop the elements of reflection leading to a representation model (physical, statistical, etc.) of the phenomena whose identification is the subject of the study
- to conduct the modelling process with an appropriate choice of modelling assumptions and to understand the limits of the models
- apprehend and use signal processing methods and machine learning algorithms to extract information useful for predictive maintenance from raw data
- conclude and decide on the relevance of the approach and on the performance of the algorithms evaluated

Description of the skills acquired at the end of the course
C4 : Have a sense of value creation for his company and his customers
C6. Be operational, responsible, and innovative in the digital world
C7 : Know how to convince
C8 : Lead a project, a team