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Data Analysis Tool for Predicting Water Scarcity in Industry

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Abstract : Water is a fundamental resource for the industry. It is taken from the environment either from municipal distribution networks or from various natural water sources such as the sea, ocean, rivers, aquifers, etc. Once used, water is discharged into the environment, reprocessed at the plant or treatment plants. These withdrawals and discharges have a direct impact on natural water resources. These impacts can apply to the quantity of water available, the quality of the water used, or to impacts that are more complex to measure and less direct, such as the health of the population downstream from the watercourse, for example. Based on the analysis of data (meteorological, river characteristics, physicochemical substances), we wish to predict water stress episodes and anticipate prefectoral decrees, which can impact the performance of plants and propose improvement solutions, help industrialists in their choice of location for a new plant, visualize possible interactions between companies to optimize exchanges and encourage the pooling of water treatment solutions, and set up circular economies around the issue of water. The development of a system for the collection, processing, and use of data related to water resources requires the functional constraints specific to the latter to be made explicit. Thus the system will have to be able to store a large amount of data from sensors (which is the main type of data in plants and their environment). In addition, manufacturers need to have 'near-real-time' processing of information in order to be able to make the best decisions (to be rapidly notified of an event that would have a significant impact on water resources). Finally, the visualization of data must be adapted to its temporal and geographical dimensions. In this study, we set up an infrastructure centered on the TICK application stack (for Telegraf, InfluxDB, Chronograf, and Kapacitor), which is a set of loosely coupled but tightly integrated open source projects designed to manage huge amounts of time-stamped information. The software architecture is coupled with the cross-industry standard process for data mining (CRISP-DM) data mining methodology. The robust architecture and the methodology used have demonstrated their effectiveness on the study case of learning the level of a river with a 7-day horizon. The management of water and the activities within the plants -which depend on this resource- should be considerably improved thanks, on the one hand, to the learning that allows the anticipation of periods of water stress, and on the other hand, to the information system that is able to warn decision-makers with alerts created from the formalization of prefectoral decrees.

Keywords : data mining, industry, machine Learning, shortage, water resources
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