ARTIFICIAL INTELLIGENCE TO ASSIST AND OPTIMIZE FIRE BRIGADE SERVICES

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Abstract

Introduction. In France, the departmental fire and rescue service of Doubs (SDIS 25) has been affected by the increase in the number of interventions over the years. Therefore, our first objective is to develop a data-driven system based on artificial intelligence for the prediction of incidents in the short, medium and long term. Furthermore, due to the scarcity of its resources, the second objective is to detect failures through performance indicators, i.e., to identify the centres that present more breakdowns in the service and their causes (lack of engines or personnel). Consequently, a reorganization of the materials and personnel in the centres will be conducted through optimization techniques.

Methods. The studies developed for predicting interventions considered methods such as neural networks, decision trees, Bayesian optimization, local differential privacy and others. At the same time, to establish the basis for resource optimization, a methodology was created for the calculation of breakdowns, which includes the optimized search and construction of the adapted armament available.

Results. Up to now, the prediction of interventions has shown the need to include external variables such as weather, traffic, holidays, trends and others. The best predictions obtained were with the XGBoost technique for the year 2018 with 75.34% accuracy. In the case of resource optimization, the disruptions were calculated for the years 2017-2019, where most of them occurred in July in the last 2 years, and they were for lack of personnel.

Conclusion. Research is ongoing with data provided by SDIS 25. The measurement of the quality of the service for the last 3 years reflected an increase in the number of public service breakdowns, i.e., there were not enough engines or firemen in certain periods of time to cover simultaneous interventions, which shows the shortage of resources due to increased demand for the service.

Keywords: Service Disruption, Predicting Incidents, Machine Learning, Optimization, Civil Protection, Firemen Interventions.

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