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An Artificial Intelligence-based service to automatize the INFN CNAF User Support (remote Presentation)

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The INFN CNAF User Support unit plays the role of the first interface to the user of the data center, which provides computing resources to over 60 scientific communities in the fields of Particle, Nuclear and Astro-particle physics, Cosmology and Medicine.

While its duties span from repetitive tasks to supporting complex scientific-computing workflows, many of them can be automatized or simplified and made efficient through Artifical Intelligence (AI) techniques, which have shown promising accuracy in the text multi-labeling classification problem. Indeed, part of the users' requests cannot be directly addressed without the intervention of one of the other INFN-CNAF units, which act as a second level of support. In these cases, automatic labeling is exploited to address the relevant units of the request.

Over the many years of activity of the User Support group, several thousands of users' e-mail bilingual messages, both in Italian and English, have been collected, and have been used to provide training samples to Machine Learning algorithms, and validate them with new coming users' requests. These messages can be organized in threads which comprise user requests and the corresponding solutions, as well as the messages to and from the involved second-level support unit, which are implicitly labelled by the recipients list of the e-mail.

In this study, we have applied a set of Machine Learning classification models, such as Support Vector Machine, Naive Bayes, and Convolutional Neural Network, to the extracted features of the pre-processed text messages that we have obtained with Natural language Processing solutions. The defined models have been compared by considering various feature extraction techniques, such as Bag of Words, Term Frequency - Inverse Document Frequency, Bag of n-Grams, and WordEmbedding, to improve their performance. The best models have been exploited by our AI-based service that is involved in the Virtual User Support Assistant. It receives text in a chat-like user interface and provides a reply on the base of the training knowledge base.

The prototype has been implemented in Python through the usage of several AI libraries, among them nltk and scikit-learn. A set of the INFN-CNAF users have been selected to test the prototype and give their precious feedback to the User Support unit.

In conclusion, our study not only showcases the technical prowess of AI in enhancing the INFN-CNAF user support activities, but also emphasizes the broader considerations of user satisfaction, scalability, and future readiness.

Future developments also foresee the study of Large Language Models such as GPT-3.5 and LLAMA 2 for providing a more natural user experience.

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