

ENSEMBLE METHODS OF MACHINE LEARNING: OPPORTUNITIES AND PROSPECTS

In light of the rapid technological progress and constant expansion of machine learning capabilities, the use of ensemble methods in machine learning is becoming increasingly relevant. These methods are complex algorithms that combine multiple models to achieve better accuracy and stability than single models.

Ensemble methods have a number of advantages that make them a valuable tool for solving complex machine learning problems. First, they allow to take into account the diversity of data and compensate for the shortcomings of individual models. This becomes especially important when solving problems where single models may not be accurate enough. Second, ensemble methods increase the stability of a machine learning system, making it less susceptible to errors. Thirdly, ensemble methods can effectively work with various types of data, which makes them extremely useful in the modern information society [1].

Ensemble methods have a wide range of applications in various fields, including finance, medicine, business, and entertainment:

In finance, ensemble methods are used to predict prices of stocks, currencies, and other financial assets, detect fraud, and manage risks. These methods allow companies to make more informed decisions about investments and risk hedging, given the increased accuracy of results due to the ideas behind used ensemble methods and their algorithms. The end results of an effectively trained model can even be compared with the collective decisions, made by a group of trained professionals as well [2].

In medicine, ensemble methods are used to develop new diagnostic methods and medicines. For example, ensemble methods are used to develop machine learning algorithms that can detect heart failure [3], identify and study the development and impact of depression on the body, etc. Studies has shown the effectiveness of such models, as Decision Trees, Random Forest and XGBoost, considering different amounts of resources needed to every one of these methods.

In business, ensemble methods are used to segment the market, forecast demand, and make marketing decisions, for example, to recommend goods and services to customers [4]. The ensemble methods are able to combine different machine learning models inside one algorithm, which provides better results that are refined with each step of the ensemble, providing the best of all the models and methods used instead of using results of just one “good enough”.

The wide range of capabilities of these methods allows them to help solve complex problems and improve the efficiency of decision-making in various industries. In the future, ensemble methods are likely to be used both to solve increasingly complex problems, such as autonomous driving, development of new materials, personalized medicine, and to optimize and improve existing systems and methods for developing artificial intelligence systems.

The drawback of using the ensemble methods have their price as every added method and algorithm adds to the needed resources, restricting the maximum amount of models used in the same system or requiring investment in the hardware to sustain its work. The resources may include computational resources of hardware, time used by all the models of the system, in most cases both as the complexity multiplies.

Considering these drawback, the ensemble methods still have enough potential to be used as tool that has the power to transform many industries. Implementation of these methods in machine learning opens up new opportunities to solve complex problems and improve the quality of life.

References

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