

# Clustering Students According to their Academic Achievement Using Fuzzy Logic

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**Abstract:** The software for clustering students according to their educational achievements using fuzzy logic was developed in Python using the Google Colab cloud service. In the process of analyzing educational data, the problems of Data Mining are solved, since only some characteristics of the educational process are obtained from a large sample of data. Data clustering was performed using the classic K-Means method, which is characterized by simplicity and high speed. Cluster analysis was performed in the space of two features using the machine learning library scikit-learn (Python). The obtained clusters are described by fuzzy triangular membership functions, which allowed to correctly determine the membership of each student to a certain cluster. Creation of fuzzy membership functions is done using the scikit-fuzzy library. The development of fuzzy functions of objects belonging to clusters is also useful for educational purposes, as it allows a better understanding of the principles of using fuzzy logic. As a result of processing test educational data using the developed software, correct results were obtained. It is shown that the use of fuzzy membership functions makes it possible to correctly determine the belonging of students to certain clusters, even if such clusters are not clearly separated. Due to this, it is possible to more accurately determine the recommended level of difficulty of tasks for each student, depending on his previous evaluations.

**Index Terms:** Clustering methods, K-Means, Data Mining, Fuzzy Logic, Educational Data, Python.

## **1. Introduction**

At present, large volumes of data are processed in education, which are obtained at various stages of the educational process [1-4]. For example, the parameters of students and the results of their studies in various subjects are

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