Reference Number: 025418/0060

Title of the Invention

A METHOD FOR SOLVING THE PROBLEM OF CLUSTERING USING CELLULAR AUTOMATA BASED ON HEAT TRANSFER PROCESS

Invention

This invention is related to a computer–implemented method, which enables the data to be clustered without being required to perform any distance calculations among the points of the dataset, and comprises the steps of assigning the points of a dataset to the cells of a cellular automaton; assigning each cell, to which a data point is assigned, to a distinct state value and a constant temperature value; and assigning all of the cells, to which a data point is not assigned, to a unique state value different from the state values utilized for cells that contain a data point and to a temperature value lower than the said constant temperature value; selecting a cell in the cellular automaton randomly; calculating the average temperature value of the selected cell and its neighbor cells; setting the temperature of the cells, which do not contain a data point, as the average temperature; if a neighbor cell temperature is above the predetermined threshold value, moving this neighbor cell to the state of the selected cell; terminating the process if the number of distinct states has fallen (is equal) to the number of clusters used to group the dataset; otherwise, going back to the step "selecting a cell in the cellular automaton randomly".

Advantages

Today, various applications have to process vast amounts of data. The proposed algorithm in this invention clusters a dataset without being required to perform any distance calculations among the data points that exist in the data. Therefore, complexity of the proposed algorithm does not depend on the number of points in the dataset. Hence, the efficiency of the proposed algorithm is not affected by the size of the dataset and this in turn enables to cluster huge datasets efficiently.

Contact:
Yeditepe Üniversitesi Teknoloji Transfer Ofisi (YUTTO)
İnönü Mah. Kayışdağı Cad. 326A 26 Ağustos Yerleşimi Rektörlük Binası Kat:2 Teknoloji Transfer Ofisi 34755 Ataşehir – İSTANBUL
Tel: +90 216 578 00 00 (3980)
e-mail: tto@yeditepe.edu.tr

By means of the method of the present invention, it is possible to perform clustering using Cellular Automata (CA) without any distance calculations. The algorithm of the invention maps the data points with the cells of a CA and then performs clustering via a method inspired by the heat transfer process in nature. Initially, each CA cell that contains a data point is considered a distinct cluster. Then, larger clusters are revealed by making use of the interactions between cells. As mentioned above, the propagation of clusters in CA is obtained by a method inspired from the heat transfer process in nature. The CA cells that have data points are considered as heat sources. The virtual heat transferred by the cells causes the cluster regions that consist of the data points in CA to warm up in the automaton. On the other hand, a second cellular automata rule is utilized simultaneously and this rule combines hot neighborhood cells into the same cluster. In the beginning of the process, each cell having a data point is considered as a distinct cluster. Yet, by using the second rule, the said cells unite and enable the clusters to start spreading in the cellular automata.

Current Status

TURKEY: Registered

U.S.A: Pending

Keywords

Data clustering,Cellular Automata, Big Data Analysis, Data Science

TRL: 7

Contact:
Yeditepe Üniversitesi Teknoloji Transfer Ofisi (YUTTO)
İnönü Mah. Kayışdağı Cad. 326A 26 Ağustos Yerleşimi Rektörlük Binası Kat:2 Teknoloji Transfer Ofisi 34755 Ataşehir – İSTANBUL
Tel: +90 216 578 00 00 (3980)
e-mail: tto@yeditepe.edu.tr