Large-Scale Multi-Modality Attribute Reduction with Multi-Kernel Fuzzy Rough Sets

Objective:

The objective of this system designs an efficient attribute reduction algorithm for large scale multi-modality fuzzy classification.

ABSTRACT:

In complex pattern recognition tasks, objects are typically characterized by means of multi-modality attributes, including categorical, numerical, text, image, audio and even videos. In these cases, data are usually high dimensional, structurally complex, and granular. Those attributes exhibit some redundancy and irrelevant information. The evaluation, selection, and combination of multi-modality attributes pose great challenges to traditional classification algorithms. Multi-kernel learning handles multi-modality attributes by using di_erent kernels to extract information coming from di_erent attributes. However, it cannot consider the aspects fuzziness in fuzzy classification. Fuzzy rough sets emerge as a powerful vehicle to handle fuzzy and uncertain attribute reduction. In this paper, we design a framework of multi-modality attribute reduction based on multi-kernel fuzzy rough sets. First, a combination of kernels based on set theory is defined to extract fuzzy similarity for fuzzy classification with multi-modality attributes. Then, a model of multi-kernel fuzzy rough sets is constructed.

INTRODUCTION:

In current applications, most pattern recognition tasks involve data that are heterogeneous and exhibit multimodality. Those include categorical, numerical, image, text, audio, and even video information. In the era of big data, it is widely accepted that more than 80% of information is carried by heterogeneous and unstructured data. For example, in medical diagnosis systems, there exit categorical attributes of the examination index, numerical attributes of blood pressure, time series of ECG, and images of B ultrasonic and CT imaging. It becomes a challenging task to evaluate, select, and combine these attributes. Although doctors easily exploit such information,

existing machine learning algorithms cannot process it e_ectively. By 2020, data content will comprise a mixture of text, speech, still and video images, histories of interactions with friends, information sources and their automated proxies, and tracks of sensor readings from Global Positioning System devices, medical devices, and other embedded sensors in our environment . Thus, it becomes highly desirable to develop an e_ective representation model and an evaluation strategy for multi-modality pattern recognition tasks.