Linked Fuzzy Inference System: A Novel Approach to Schizophrenia Diagnosis

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Schizophrenia is a mental disorder that affects the essence of what makes people human. It drastically alters a person's perception and actions until the patient becomes harmful to oneself or to others. The aim of this project was to develop a medical diagnosis inference system to accurately predict the likelihood of a patient having schizophrenia. Based on the PANSS psychiatric assessment results and MRI neuroimaging data, a comprehensive diagnostic tool was created. Fuzzy logic and neural networks were utilized as the programs for the diagnostic tool because of their ability to create outputs unlike Boolean logic, with an infinite number of values between 0 and 1. Three fuzzy systems and an ANFIS system were created. The PANSS system created clusters of PANSS questions and determined the likelihood based on the score for each cluster. The MRI system segmented each of the MRIs into grey matter, white matter, and cerebrospinal fluid. Afterwards, the volumes of each segment were calculated and the likelihood was determined based on the volume size. Initially, a linked fuzzy system was created that took both outputs from the PANSS and MRI systems and created an overall likelihood based on their outcomes. Later, an Adaptive Neuro-Fuzzy Inference System was created using the same inputs and was determined to have a higher accuracy than the original fuzzy system. A training set of 200 patient cases was utilized to further improve the program, and a testing set of 120 cases was utilized to test the accuracy. This project is a tool that can be utilized by diagnosticians and psychiatrists alike to solidify the diagnosis process and help eliminate the social stigma towards schizophrenia and mental illnesses worldwide.

Awards Won:

Fourth Award of $500