AI Knowledge Discovery Tool

GMU-22-002

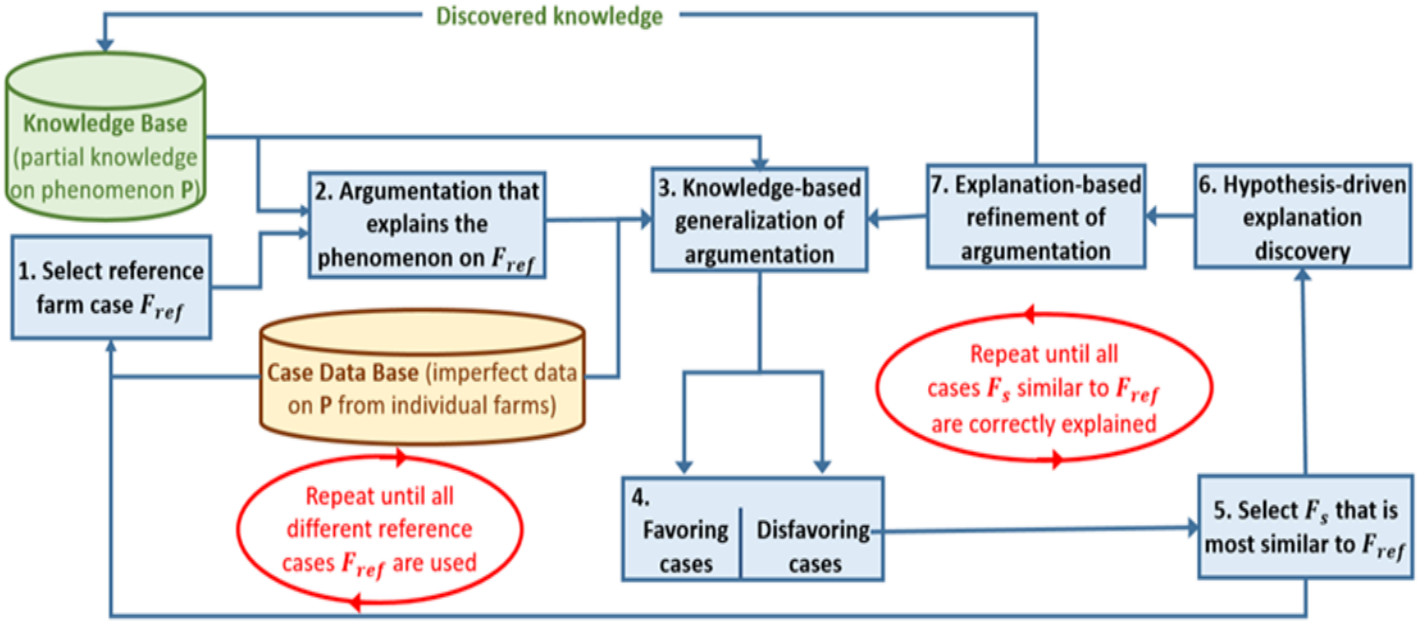
AI Discovery of New Knowledge from Incomplete Data and Partial Prior Knowledge

The AI Knowledge Discovery Tool is a novel process for learning new knowledge from an incomplete data set and prior knowledge. This innovation processes a few studies to formulate hypotheses that explain an observed phenomenon. The hypotheses are tested on additional studies. This invention also empowers users to efficiently process massive amounts of data with less intensive computing.

George Mason researchers synergistically blended abduction, problem solving, machine learning, and probabilities to utilize both existing incomplete domain knowledge and imperfect data to generate new proven hypotheses. In contrast, the vast majority of existing knowledge discovery of data (KDD) approaches generate statistics from massive amounts of data to discover new knowledge. The new knowledge was then used to create predictive models. These older methodologies exhaust valuable computing and time resources.

GMU researchers tested this invention to understand a real-life agricultural phenomenon when only an incomplete amount of information was available. This phenomenon involved a biomass accumulation of cover crops. The incomplete information included imperfect data for specific combinations of values of domain variables, incomplete inconclusive, ambiguous, and dissonant data having various degrees of accuracy. The incomplete data was obtained from field trials and previously collected farm data. Using this invention, the incomplete domain knowledge with imperfect data was iteratively applied to generate a predictive model. The predictive model was iteratively applied to additional data to lead to discovery of new knowledge and an improved predictive model relevant to the cover crops phenomenon. This improved predictive model, using the newly discovered knowledge, can now identify crop water stress and water-resilient crop traits.

This AI Knowledge Discovery Tool may efficiently solve problems in various fields such as biomedical, marketing, and engineering.



Knowledge Discovery from Data Through Artificial Intelligence

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