Indium: Using Novel Machine Learning Algorithms to Develop a Nondisease-specific Personalized Medicine Engine

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In medicine today, treatments for patients are based on the diagnosis, not the patient individually. It has been shown that this is only effective for about 60% of people. To help treat more patients I developed Indium, a nondisease-specific personalized medicine using novel machine learning algorithms. I divide this problem into 3 distinct steps: diagnosis, prognosis and individualized treatment creation. To truly create a completely generalized diagnostic system I developed a powerful natural language processing (NLP) engine that analyzes how language acts on itself. I then connect this NLP to PubMed, a database of medical research papers, to extract features and biomarkers that are indicative of certain diseases. Analyzing the effectiveness of my system, I have found that my generalized algorithm is more effective, by about 3 standard deviations, than the state of the art techniques and physicians. My prognostic software works by utilizing fuzzy lagged data co-clustering, an NP-complete problem. To circumvent this problem I developed a Monte-Carlo approximation that runs in polynomial time. Lastly, dealing with treatment creation I developed a Q-learning algorithm that dynamically adjusts for the specific patient parameters. To deal with the problem of censored data, I created an SVM system to maintain a constant belief state of the subject. I demonstrated the performance of the proposed algorithmic framework through the analysis of real clinical trials. The personalized medicine system I developed not only operates in non-optimal environments, but it is more effective than the state of the art techniques. Since my algorithm is offloaded into the cloud I am able to help patients around the world regardless of their socioeconomic status.

Awards Won:
First Award of $5,000