Disease Progression Modeling (#6466)

Disease staging model for the tracking and visualization of diseases

Inventors at Georgia Tech have developed a two-dimensional (2D) continuous-time hidden Markov model (2D CT-HMM) that combines longitudinal structural and functional measurements together to capture a patient's severity in different aspects more precisely. The disease staging model provides intuitive trajectory visualization for disease monitoring. Joint analysis of longitudinal structural and functional measurements enables the identification of true disease stages even with measurement variability and noise. The method can also be used to detect time segments of fast progression using the learned model. Fast progression detection can find time segments of a patient's data that degenerate faster than the population average, providing an alternative way to detect patients with local high risk.

Benefits/Advantages

- **Accurate -** Provides continuous time modeling, which is more appropriate for medical data due to patients being monitored at irregular intervals
- **Multipurpose -** Could be used for disease staging, characteristic progression pattern discovery, prediction of the future state of disease, fast local progression detection, and to enable understanding of disease progression

Potential Commercial Applications

- Glaucoma monitoring
- Longitudinal medical data
- Progression modeling for other chronic diseases

Background/Context for This Invention

Diagnosis and treatment of slow progression diseases is generally dependent on a clinician's ability to monitor and detect changes in a patient. Many chronic diseases have defined stages of progression; however diagnosis or determination of the various stages can be subjective and prone to errors. Markov models in continuous time are often used to model the course of a disease; however, current one-dimensional modeling systems generally model only a few clinical stages. The current modeling techniques are too crude to identify subtle and asynchronous changes in different aspects of disease progression, such as structure and function.

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For more information about this technology, please visit:
https://industry.gatech.edu/technology/disease-progression-modeling