Summary for Learning that Graphical Structure of Electronic Health Records with Graph Convolutional Transformer

This paper reports on a new approach to modeling electronic health record data for use in predicting medical conditions. The researchers introduced a new deep learning framework designed for use on data with a hierarchical graph structure. The objective of their work was to evaluate this new model for the task of predicting heart failure given data from medical records. This idea makes sense because of the inherently graphical structure of health record data - visits are separated from one another in time, and events like symptoms, tests and diagnoses are causally linked.

The main novelty in this paper is the combination of the transformer architecture and the GCN. The motivation for doing so is that information linking the various events in each visit might be incomplete. Adding the single-head attention feature from the transformer architecture means that the network will learn which connections are relevant over time. Interestingly, the researchers formulate their problem as a generalization of the GCN to networks in which the adjacency matrix is not known a priori. They use the transformer to find the most relevant set of edges to construct the adjacency matrix and then apply graph convolutions to the resulting graph.

Using this architecture, the researchers then perform a series of graph and node-level classification tasks on the EHR data. They can predict future ICU admission and certain diseases with accuracy better than random.