Towards applying a time-aware Bert model to structured EHR records to generate contextualized concept embeddings

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Background

Several attempts have been made to apply Bidirectional Encoder Representations from Transformers (BERT) to EHR data due to the similarity between EHRs and texts.

Methods

Temporal dependency distinguishes EHR from text data. Time needs to be incorporated when applying BERT to EHR data.

Embedding visualizations

Visualization of embeddings for Disease due to coronaviridae both non-contextualized and contextualized.

Fig. 1 BERT architecture

Fig. 2 Combine temporal self attention with BERT context self attention

Time and context attention visualizations

The visualizations of the time attention distribution for several conditions and the BERT self attention for a covid patient are provided below.

Fig. 3 Non-contextualized base embedding for Disease due to Coronavirus and its top 10 neighbors

Fig. 4 Contextualized embeddings Disease due to Coronavirus for each patient (orange: ventilated)

Fig. 5 Examples of time attention distributions

Fig. 6 BERT self attention visualization for a covid patient

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