



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

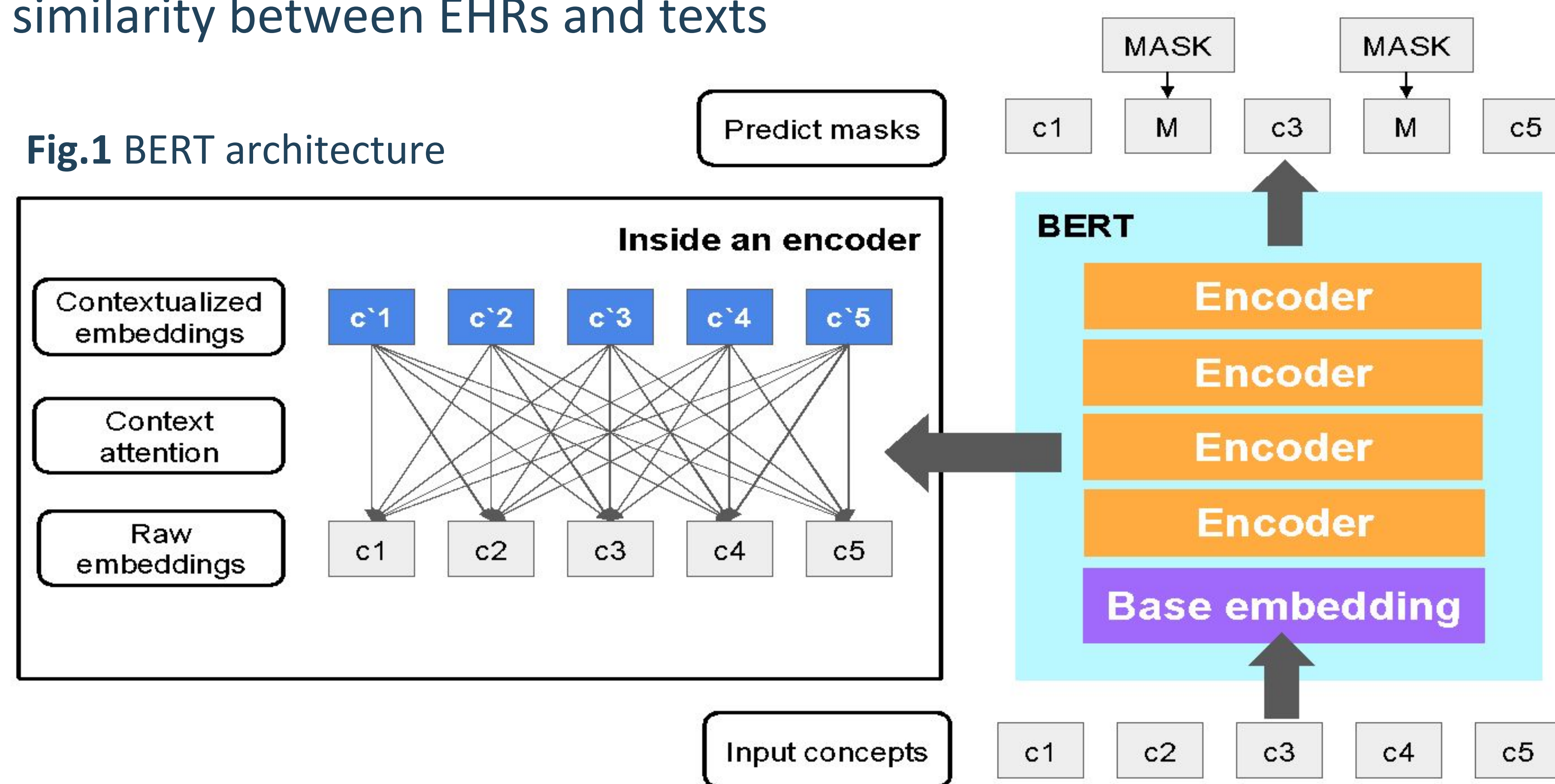
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Background

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

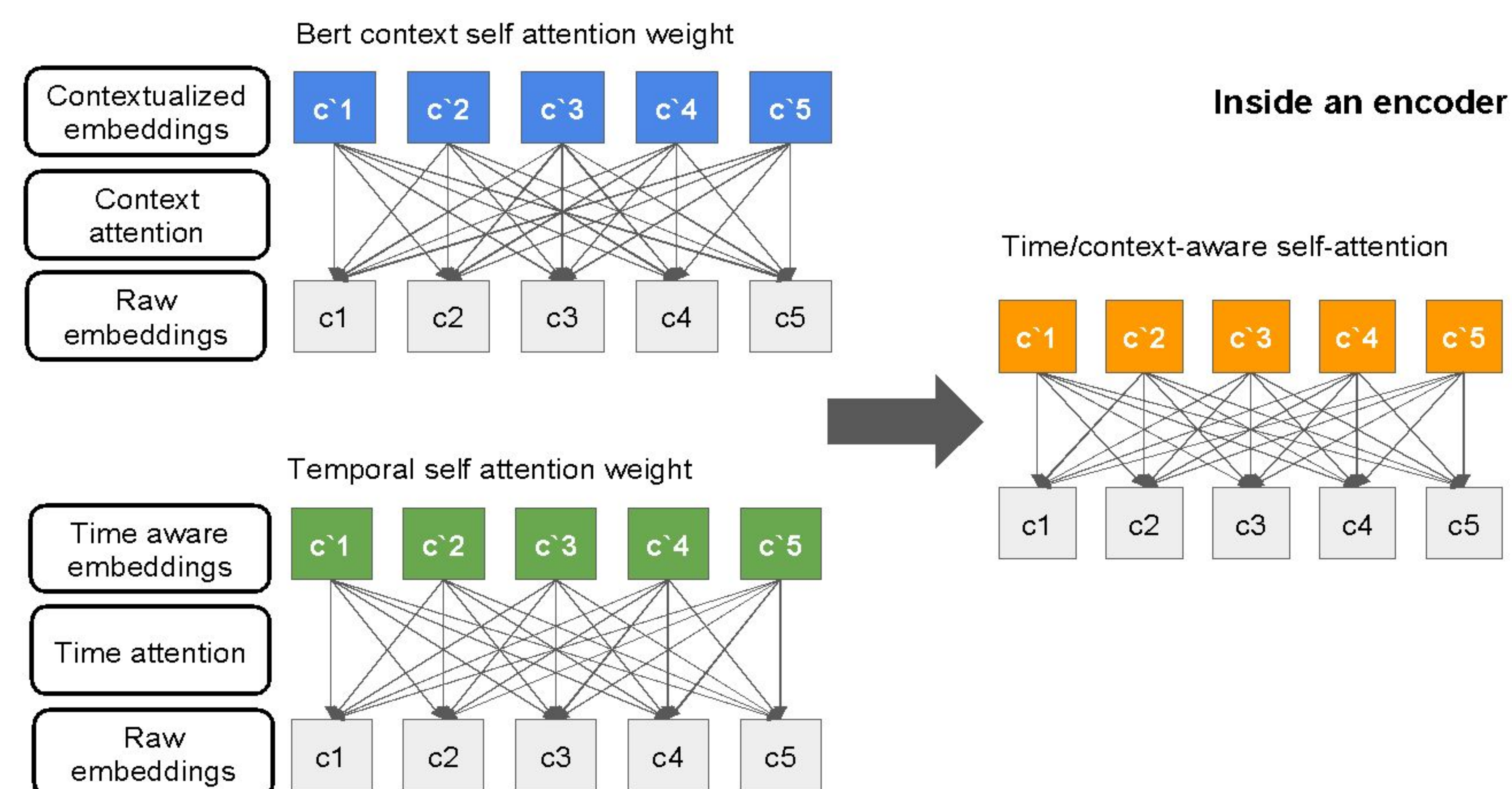
Fig.1 BERT architecture



Methods

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

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



Embedding visualizations

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

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

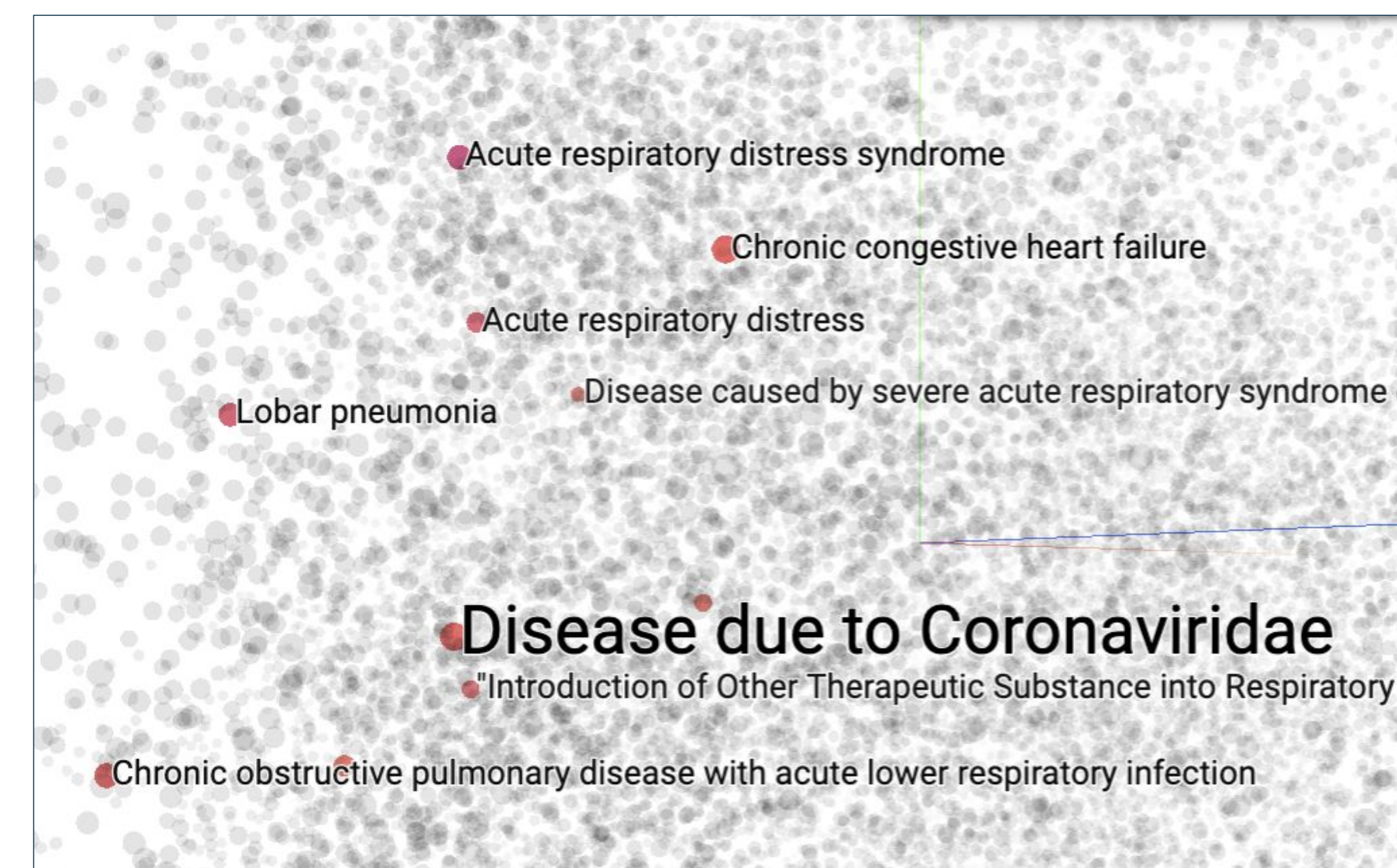
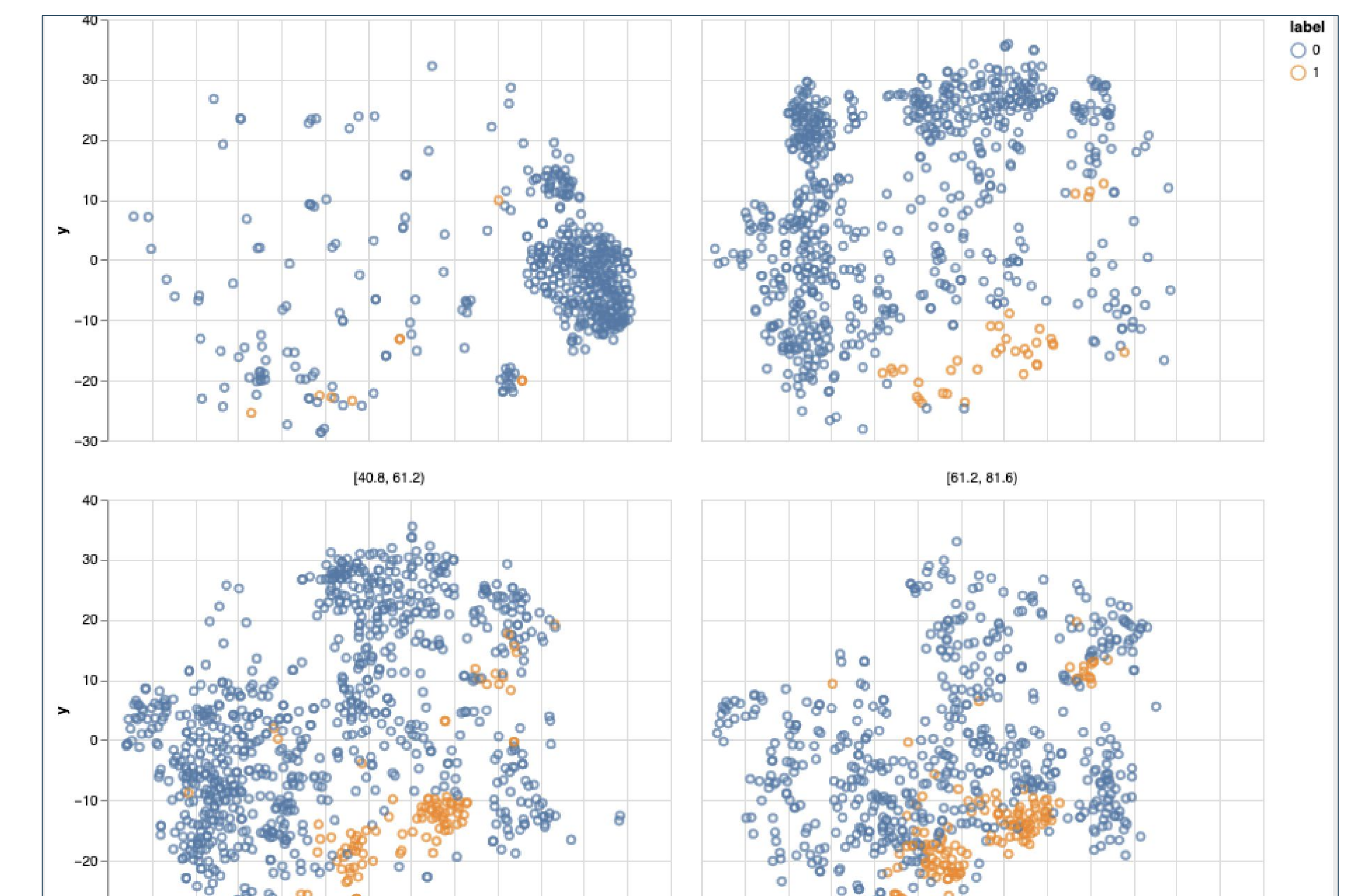


Fig.4 Contextualized embeddings *Disease due to Coronaviridae* for each patient (orange: ventilated)



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.5 Examples of time attention distributions

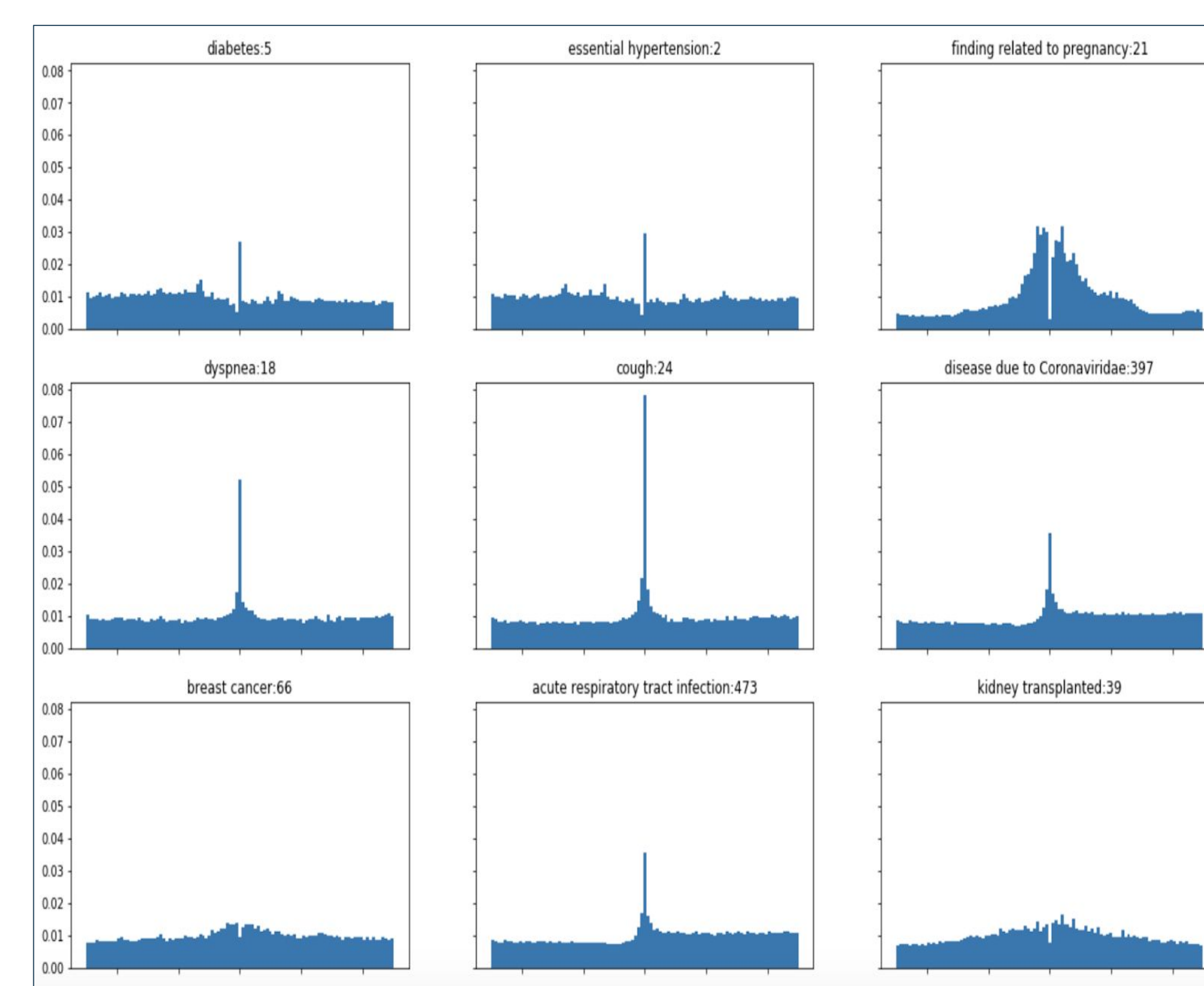


Fig.6 BERT self attention visualization for a covid patient

