Towards Heterogeneous Temporal Clinical Event Pattern Discovery:
A Convolutional Approach

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Temporal pattern discovery problem in the EHR (electronic health records) is studied in this paper. As heterogeneity, sparsity and scalability problems are faced by temporal pattern discovery in EHR, the paper uses an event matrix, which is the novel idea of the paper, to represent EHR of each patient, where x-axis is the time stamps and y-axis represents event values of different types of event factors. They model the pattern mining problem as factorizing the original EHR matrix iteratively.

Strengths
Convolution only occurs along the time axis but not on the event factor axis.

a. The paper models the HER as an event matrix, and uses matrix factorization mechanism to compute the approximate optimized factorization of the original EHR matrix of a patient;
b. It has been proved theoretically that the iterations of updating pattern matrices and time vectors will finally converge to a fixed value;
c. Experiment shows both synthetic data and real data.

Weakness
a. No time efficiency and time scalability experimental results are shown, compared to the baseline method, although the memory cost is a constant. I think this point is the biggest weakness which is also very important when dealing with big EHR data;
b. The method is a little parameter-dependent, for we need to select the value of beta, the number of iterations, and the regularization parameters;
c. With the number of hidden patterns increasing, the time complexity increase.
d. The data size of the real data is not large enough, and cannot show the scalability of the method.

Research points
a. Two-sided convolution needs to be studied when the event factors are also changing.