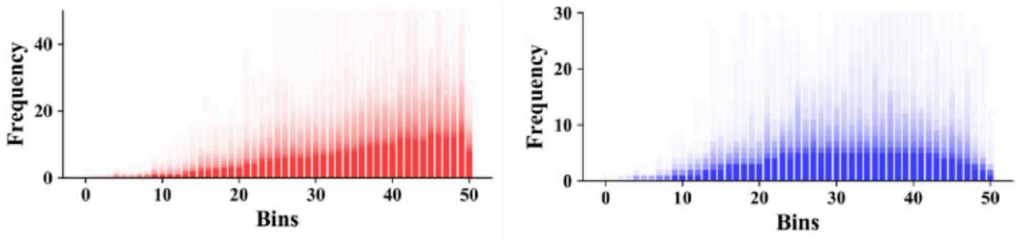
Proposed Method

Interest Sustainability Prediction - Predictive Model and Feature

- To examine the benefit of the frequency bins, Fig.3 show the distribution of the frequency bins that belong to $y_i = 1$ or $y_i = 0$.
- Observe that the values in the frequency bins:
  - $y_i = 1$ tend to gradually increase over time
  - $y_i = 0$ tend to decrease in recent periods



(a) $y_i = 1$ (b) $y_i = 0$

Fig. 3: Distribution of frequency bins corresponding to 10,000 randomly-sampled items that belong to $y_i = 1$ (a) or $y_i = 0$ (b) on Yelp dataset.

- Therefore, use the features that capture the consumption patterns changing over time (sequence of frequency bins) to predict items will be consumed in the future.

Proposed Method

Interest Sustainability Prediction - Predictive Model and Feature

- Based on the frequency bins, design a RNN as a sequence encoder, adopt BILSTM, which has been effective to model sequential data.
- Design the predictive model with BILSTM as follows:
  - $M(f_i;\theta) = \sigma(\mathbf{w}^\top(\overrightarrow{LSTM}(f_i)\|\overleftarrow{LSTM}(f_i)) + c)$
  - $f_x = [b_1, b_2, \cdots, b_B] \in \mathbb{R}^B$: sequence of frequency bins of item i
  - σ: sigmoid function, $\mathbf{w} \in \mathbb{R}^{2l}$: trainable weight, $\mathbf{c} \in \mathbb{R}$: bias

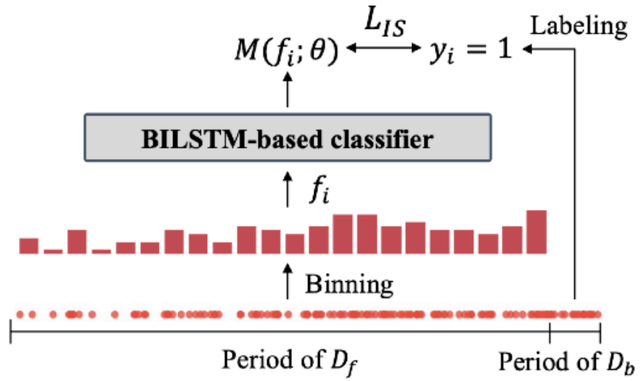


Fig. 2: Training process of a propose classifier on the interest sustainability prediction.

- Each LSTM encodes the feature f_i into l-dimentional vector, which obtained from their last hidden state.