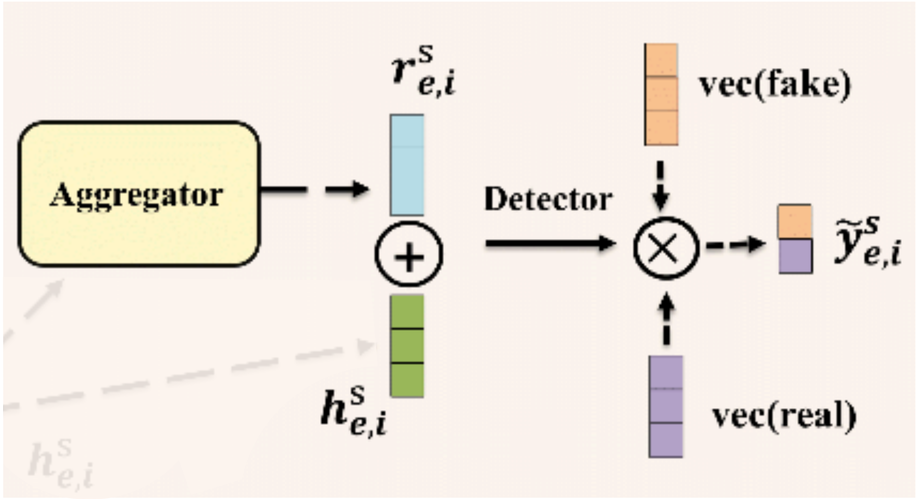
Methodology

Detector based on Label Embedding



- Existing works like CNP and ANP usually simply concat the input feature and numerical label values together as input.
- These works discard the fact that label variables are categorical, and underestimate the importance of labels as dimension of input features is usually significantly larger than single dimensional numerical value.
- Propose to embed labels into fixed dimension vector inspired by word embedding.

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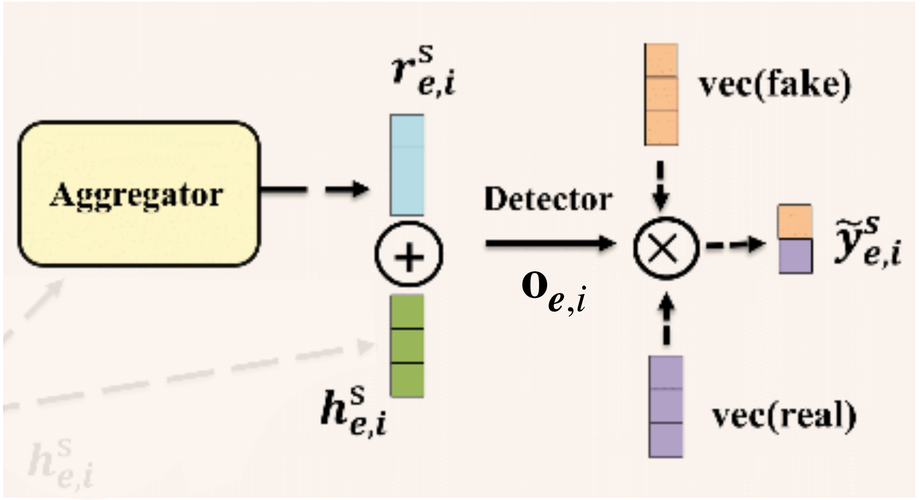

- Define two embeddings **vec(fake)** and **vec(real)**.
- To ensure that the label embedding can capture the semantic meanings of corresponding labels, propose to use embeddings **vec(fake)** and **vec(real)** in the detector as metrics and output prediction are determined based on metric matching.
- The detector is fully connected layer output vector $\mathbf{o}_{e,i}$.
- similarity $\left(\mathbf{o}_{e,i}, \text{vec(fake)}\right) = \|\mathbf{o}_{e,i} \circ \text{vec(fake)}\|$,
  similarity $\left(\mathbf{o}_{e,i}, \text{vec(real)}\right) = \|\mathbf{o}_{e,i} \circ \text{vec(real)}\|$
- The two scores then mapped into [0,1] as probabilities via softmax.