Week Report

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Problem Formulation

Definition 1. Structure-based Representations

h_s and t_s are the structure-based representations for head and tail which can directly represent entities.

(*William Shakespeare*, book/author/works_written, *Romeo and Juliet*)

William Shakespeare was an English poet, playwright, and actor, ...

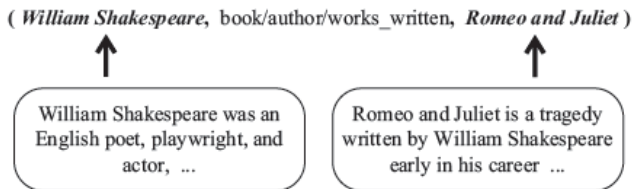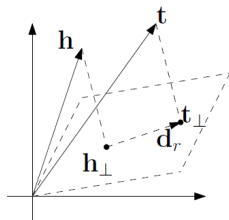Romeo and Juliet is a tragedy written by William Shakespeare early in his career ...

Figure 1: Example of entity descriptions in Freebase.

Two basic assumptions

1. If a relation is important to an entity, most of its connections will be connected through that relation

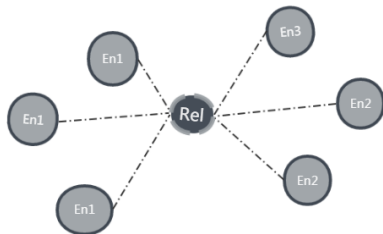2. If an entity is important to a relation, the relation can be well defined by the entity.

Relation Importance to Entity
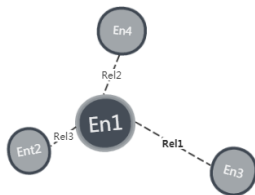
$$\alpha_j = \frac{En_j \cdot Rel_i}{\sum_{i=1}^{k} En_j \cdot Rel_i} \tag{1}$$

Entity Importance to Relation

$$\alpha_j = \frac{En_i \cdot Rel_j}{\sum_{i=1}^{k} En_i \cdot Rel_j} \quad (2)$$

Objective function and gradient update

Objective function

$$f_r(h, r, t) = ||r^T hr + d_r - r^T tr|| \tag{3}$$

$$\mathcal{L} = \sum_{(h,r,t) \in T} \sum_{(h',r',t')} [f_r(h, t) + \gamma - f_r(h', t')]_+ \tag{4}$$

gradient update

$$h = h - \alpha_{(h,r)} \frac{\partial L}{\partial h} \tag{5}$$

$$r = r - \alpha_{(h,r)} \frac{\partial L}{\partial r} \tag{6}$$