Computational Semantics for Natural Language Processing

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Assignment 1

4. FastText Embeddings

4.1

a) 40'000

b) 2e6

4.2

a) i) $\frac{\partial L}{\partial u_c} = \frac{\partial}{\partial u_c}\left(-\log(\sigma(s(w_t, w_c))) - \dots\right)$ (doesn't depend on u_c)

$$= \frac{\partial}{\partial u_c} -\log\left(\sigma\left(\sum_g z_g^T u_c\right)\right)$$

$$= -\frac{1}{\sigma\left(\sum_g z_g^T u_c\right)} \frac{\partial}{\partial u_c} \sigma\left(\sum_g z_g^T u_c\right)$$

$$= -\frac{1}{\sigma\left(\sum_g z_g^T u_c\right)} \left(1 - \sigma\left(\sum_g z_g^T u_c\right)\right) \sigma\left(\sum_g z_g^T u_c\right) \sum_g z_g$$

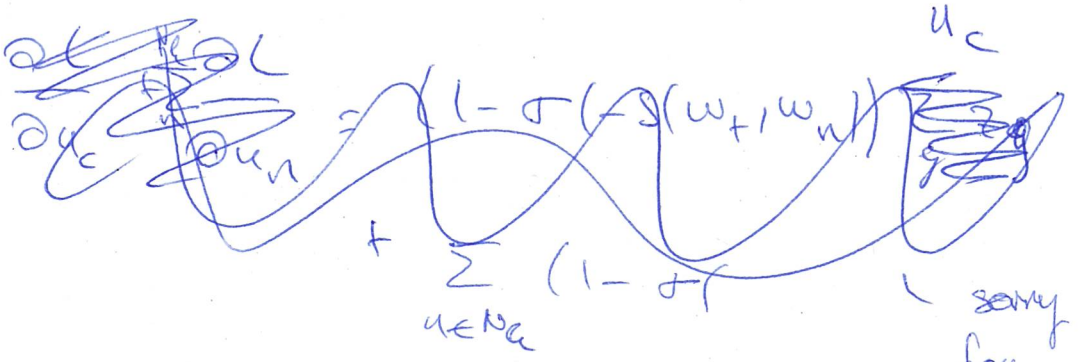
$$= \left(\sigma\left(\sum_g z_g^T u_c\right) - 1\right) \sum_g z_g$$

a) ii) $\frac{\partial L}{\partial u_n} = \frac{\partial}{\partial u_n} \underbrace{- \log(\dots)}_{=0} - \sum_{u \in N_u} \log\left(\sigma\left(-s(w_+, w_n)\right)\right)$

$$= \frac{\partial L}{\partial u_n} - \sum_{n \in N_u} \log\left(\sigma\left(-s(w_+, w_n)\right)\right)$$

Solve as i) but with a negative sign

$$\Rightarrow \frac{\partial L}{\partial u_n} = \left(1 - \sigma\left(-s(w_+, w_n)\right)\right) \sum_g z_g$$

b) $\frac{\partial L}{\partial z_g} =$ 

$$= \sum_{u \in N_u} \left(1 - \sigma\left(-s(w_+, w_n)\right)\right) u_n$$

$$+ \left(\sigma\left(s(w_+, w_c)\right) - 1\right) u_c$$