# Mapping Unseen Words to Task-Trained Embedding Spaces

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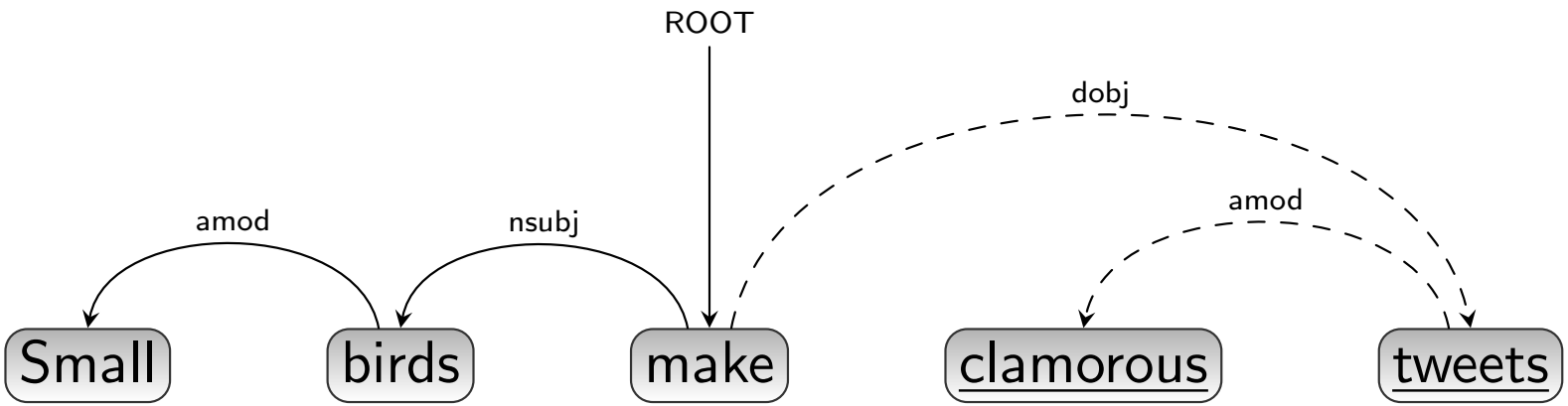
# Consider an example for syntactic parsing:

- Setting: Supervised neural network based model → uses and updates word embeddings.
- '*clamorous*' and '*tweets*' are rare or unseen words.




- Problem: What embeddings to use for 'clamorous', 'tweets'? Their default embeddings don't match the task-trained embedding space!

# Proposal:

- A neural network based mapper that maps initial embeddings to the task-trained embeddings space.
- We propose a weighted multiple-loss criterion.
- Our architecture allows to have some control over different domains by tuning hyperparameters.

# Mapper Architecture

- Basic Architecture:

$$G(e_i^o) = W_2(\text{hard}\tanh(W_1 e_i^o + b_1)) + b_2$$

— Multi-loss Criterion:

$$loss(y, \hat{y}) = \alpha \sum_{j=1}^{n} |y_j - \hat{y}_j| + (1 - \alpha) \sum_{j=1}^{n} |y_j - \hat{y}_j|^2$$

- Regularization

$$F(\theta) = L(\theta) + \lambda_1 \|\theta\|_1 + \frac{\lambda_2}{2} \|\theta\|_2^2$$

# The Pipeline

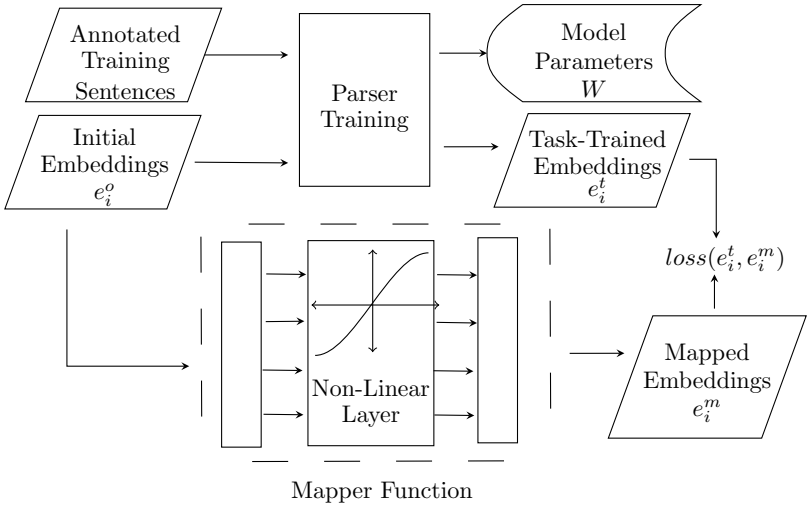



Figure: Mapper training

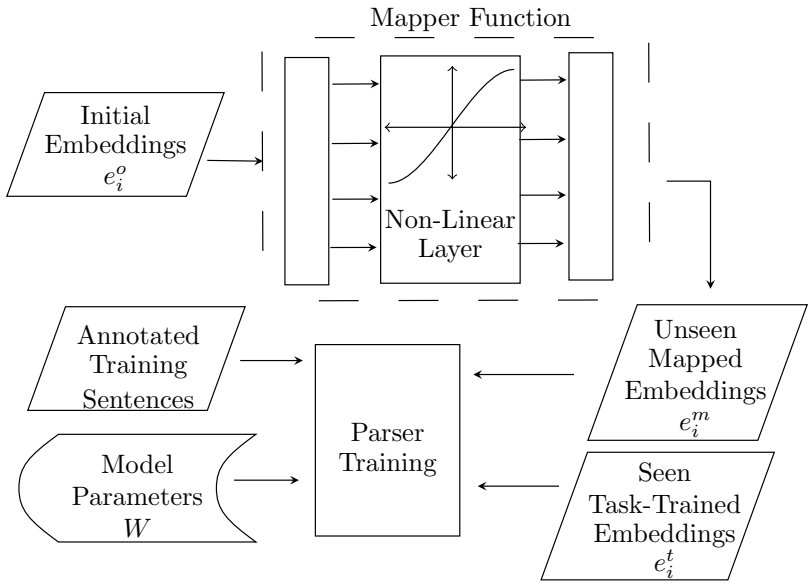
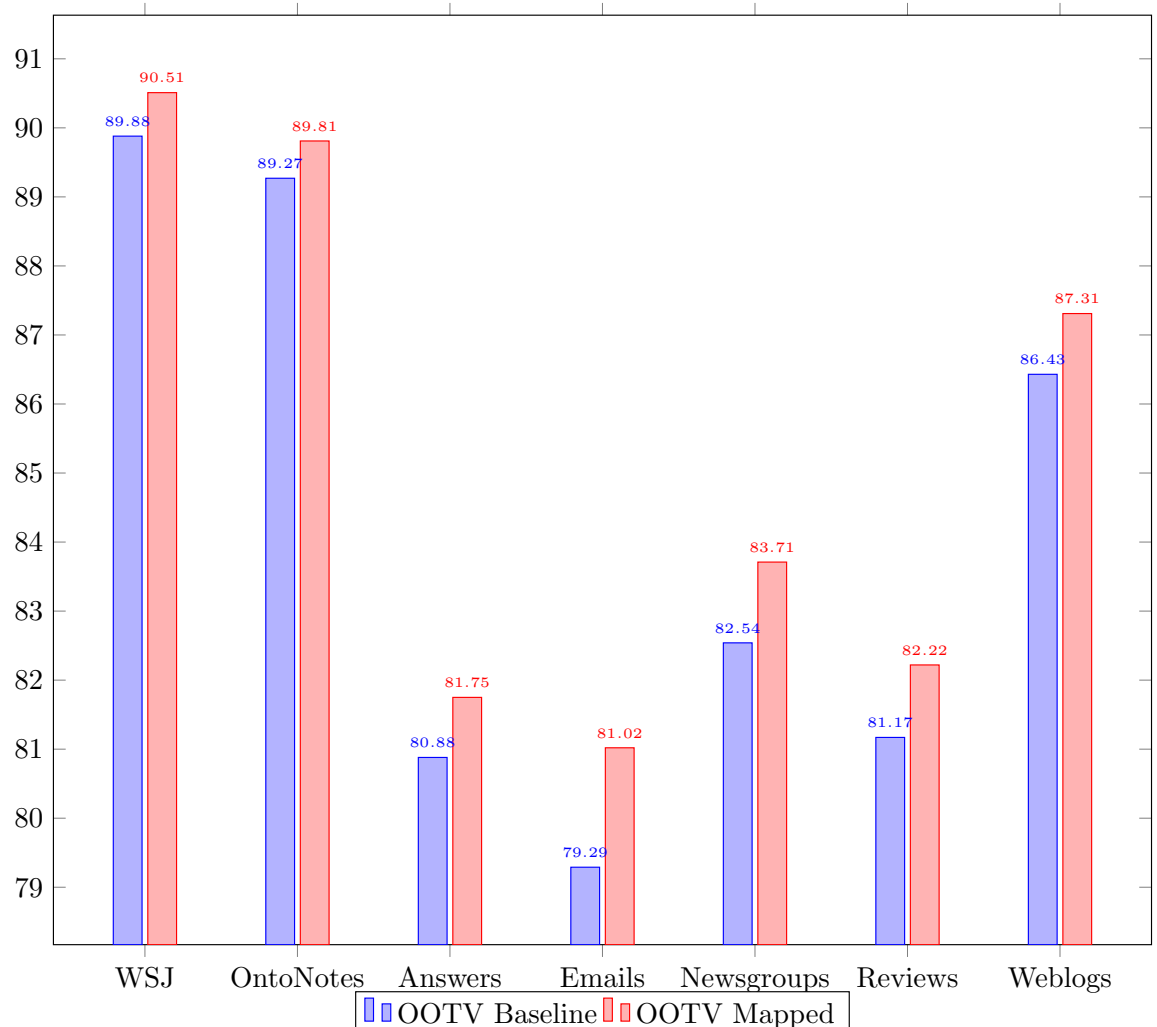


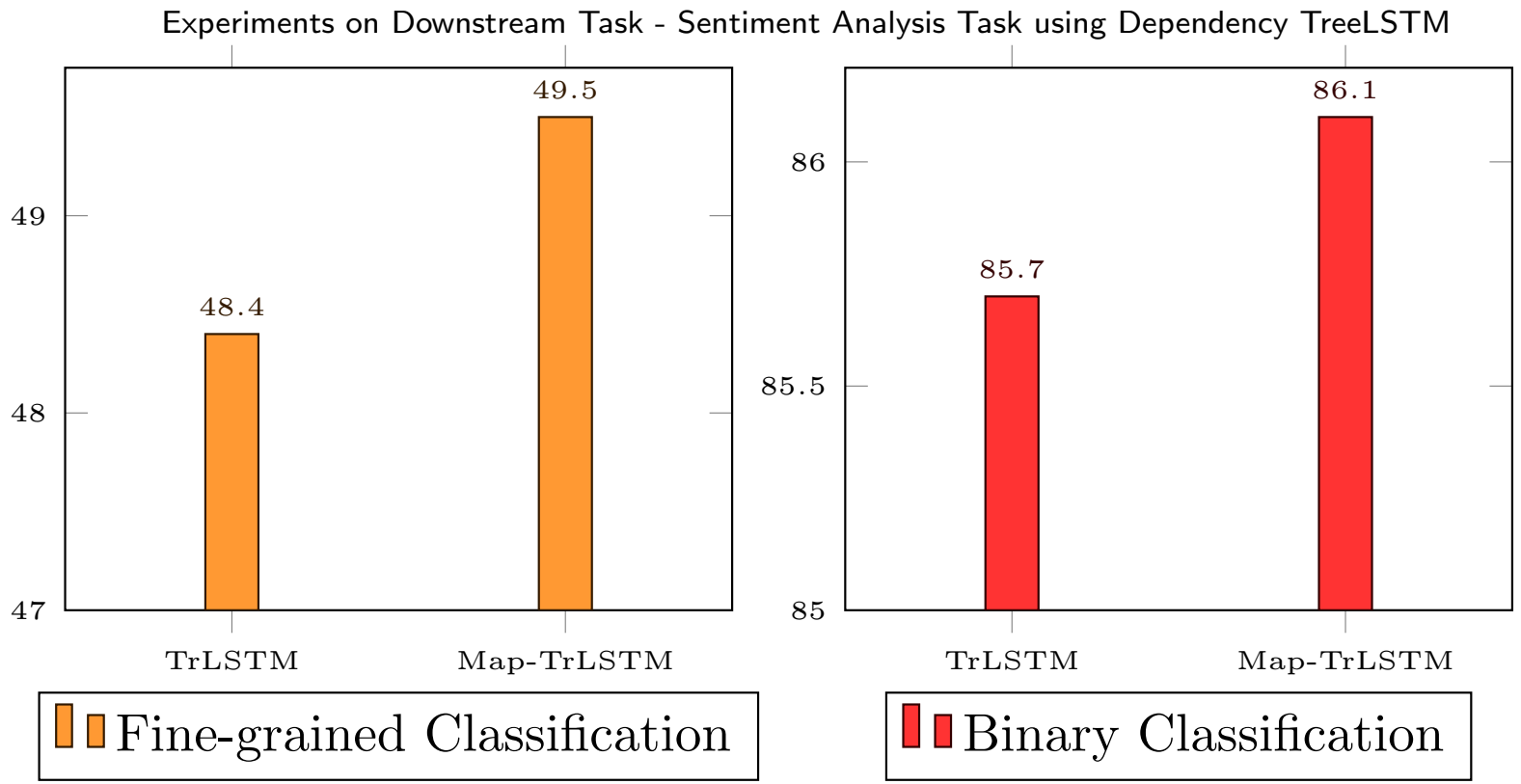

Figure: Parsing with Mapped Embeddings

# Results on Dependency Parsing

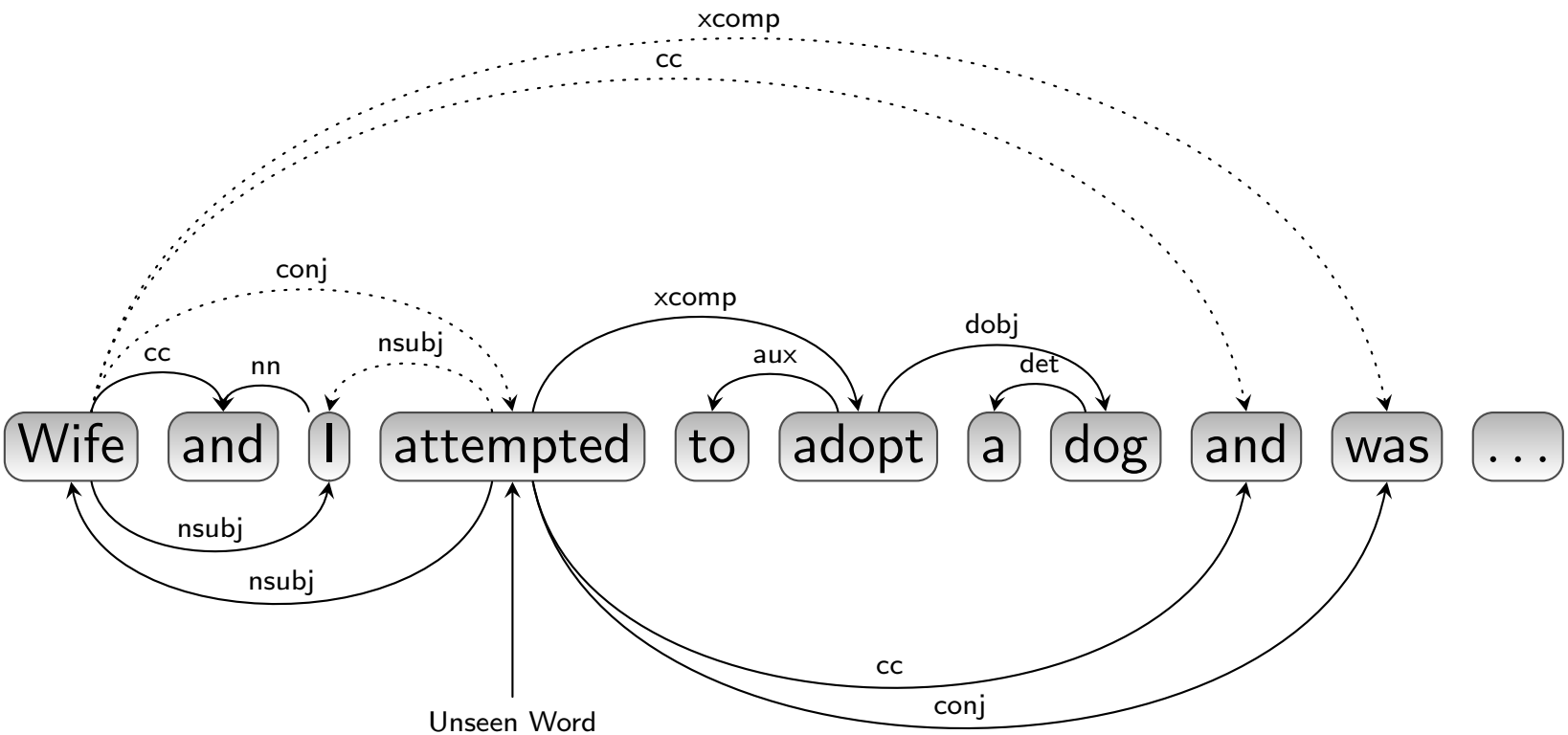
Depenednecy Parsing experiments with WSJ and Web Treebank



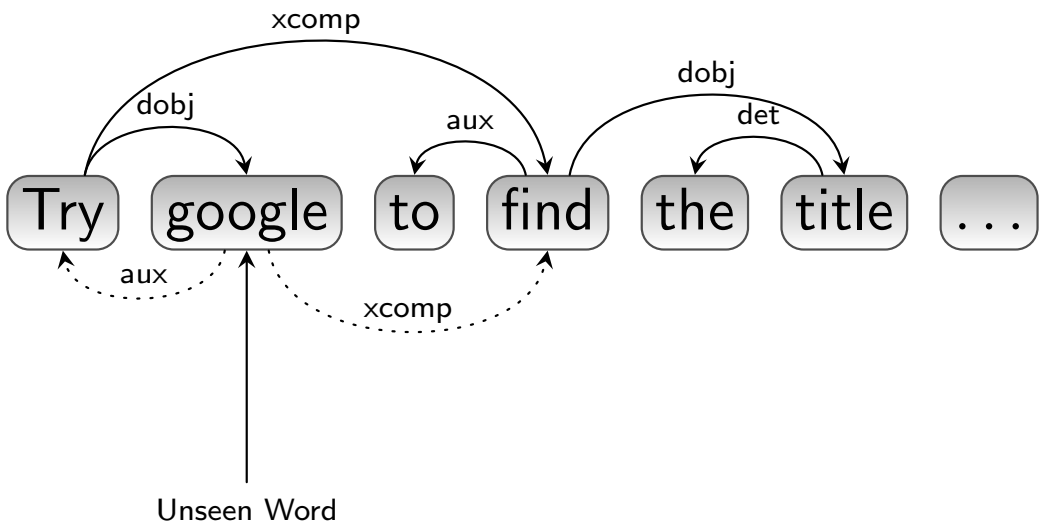
# Results on Downstream Task



# What Works


xcomp
cc
conj
cc
nn
nsubj
xcomp
aux
dobj
det
Wife
and
I
attempted
to
adopt
a
dog
and
was
. . .
nsubj
nsubj
cc
conj
Unseen Word

# What Doesn't


xcomp
dobj
aux
dobj
det
Try
google
to
find
the
title
. . .
aux
xcomp
Unseen Word

# Observations

- We achieve significant improvements in dependency parsing accuracy across several domains.
- We also observe improvements over a downstream task that uses dependency output.
- Our approach is simple, effective, and applicable to various other settings.

Thanks