



Learning Spoken Language Representations with Neural Lattice Language Modeling

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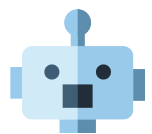
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Code available at <https://github.com/MiuLab/Lattice-ELMo>



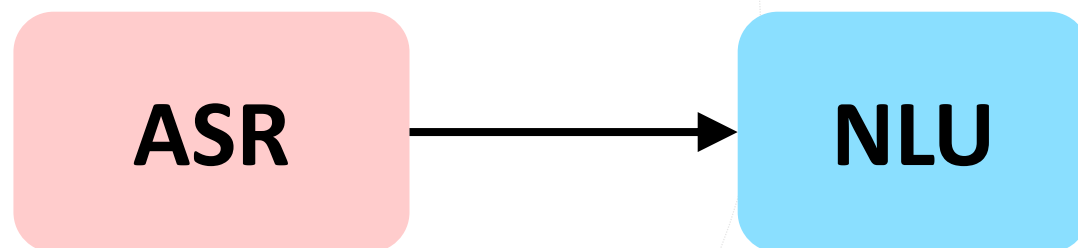
Highlights

- The idea of LM pretraining is adopted on lattices
- We introduce a lattice language modeling objective
- A 2-stage framework is proposed for learning contextualized representations of lattices efficiently



Task: Spoken Language Understanding

- Intuitive way for SLU: **pipelined approach**

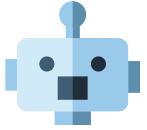
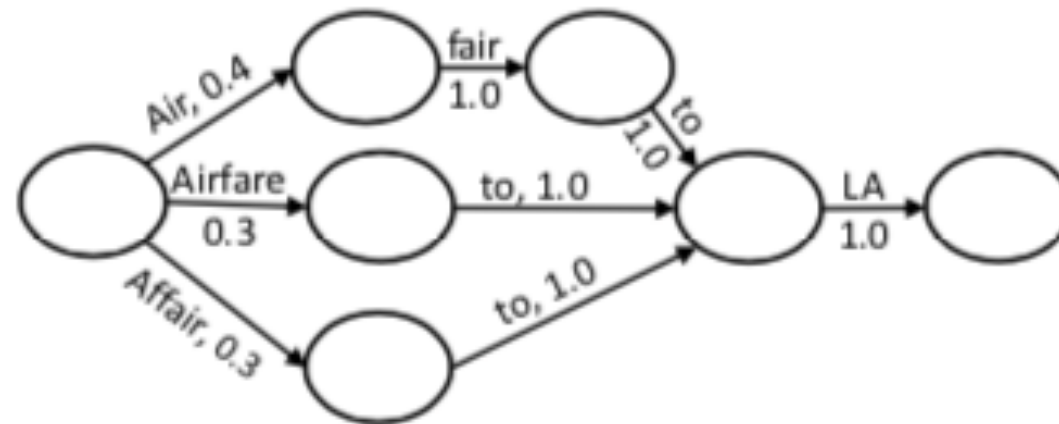


- ASR errors affects downstream tasks

We can preserve uncertainty using ASR lattices

Preserve uncertainty using ASR lattices

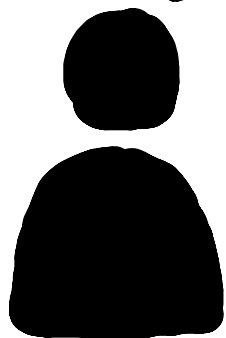
- Lattices:
directed acyclic graphs which encode several ASR hypotheses





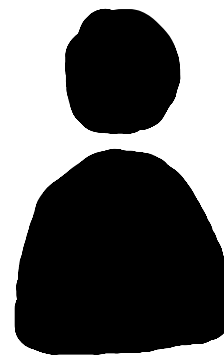
Preserve uncertainty using ASR lattices

Using lattices helps



LatticeRNN

LM pre-training helps



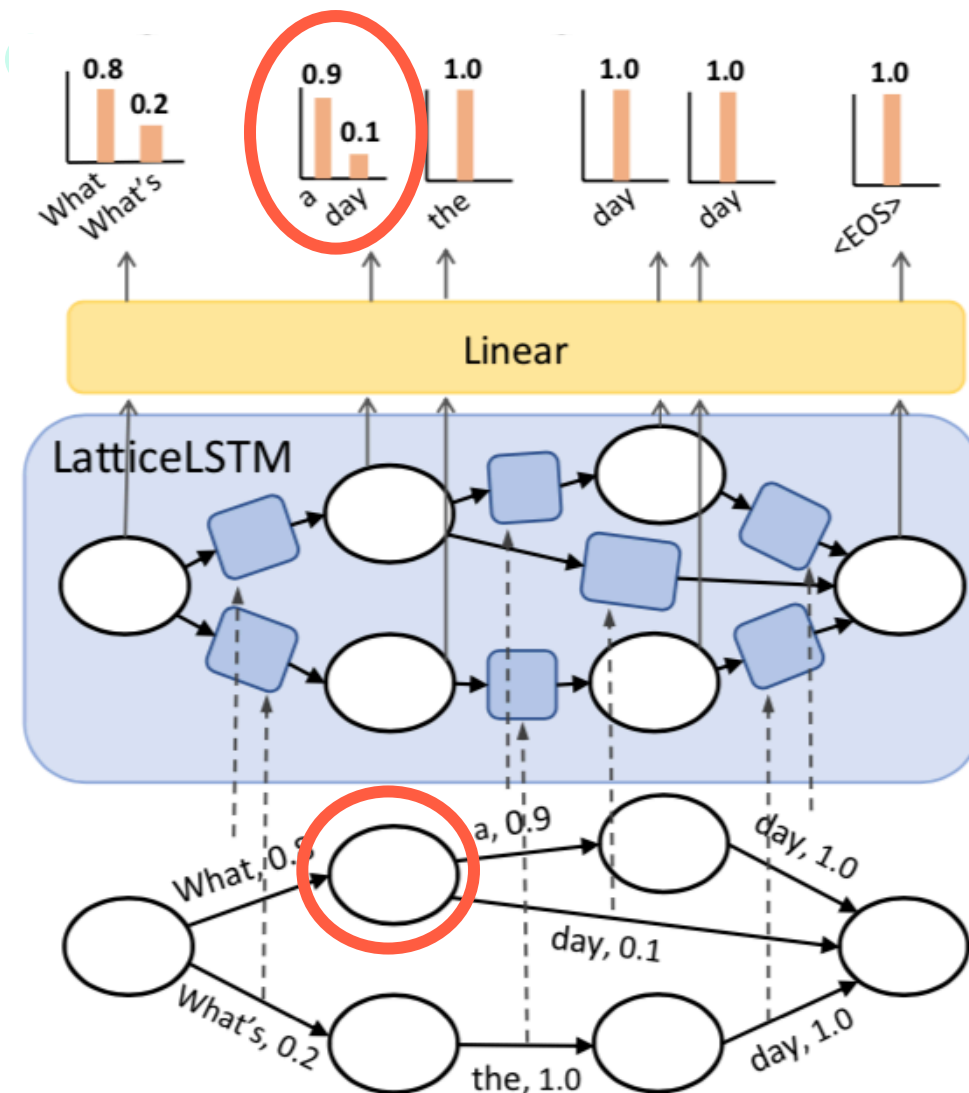
ELMo

Can we combine them together?



Lattice language modeling

- Use LatticeLSTM to encode nodes of a lattice
- Ask the model to predict the outgoing transitions(words) given a node's representation
- When the lattice has only one hypothesis, this reduces to normal language modeling





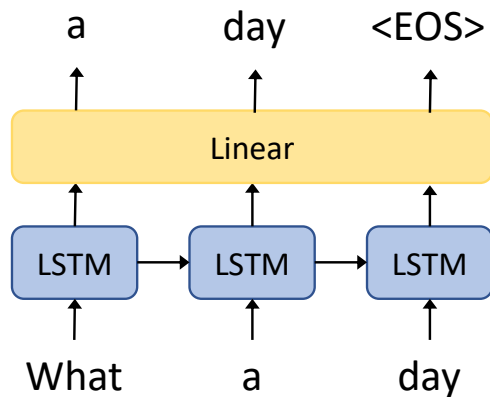
Lattice language modeling

- So now we can pre-train a LatticeELMo!
- However, LatticeLSTM runs prohibitively slow
- Observation: sequential text is actually a lattice with only one hypothesis
=> normal LM pretraining is also lattice LM pretraining

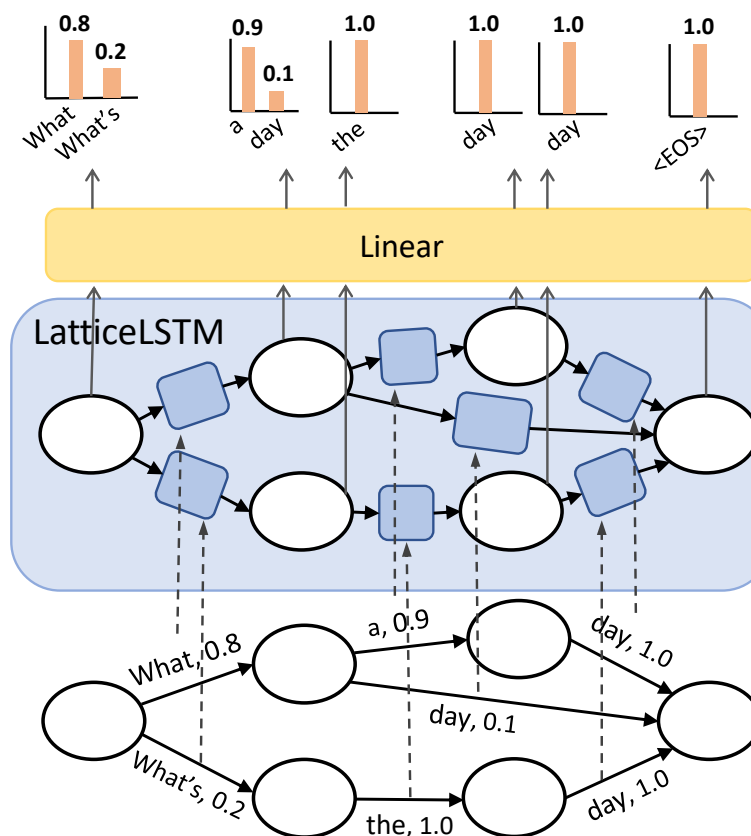
We can do pre-training in two stages!

Two-stage pre-training

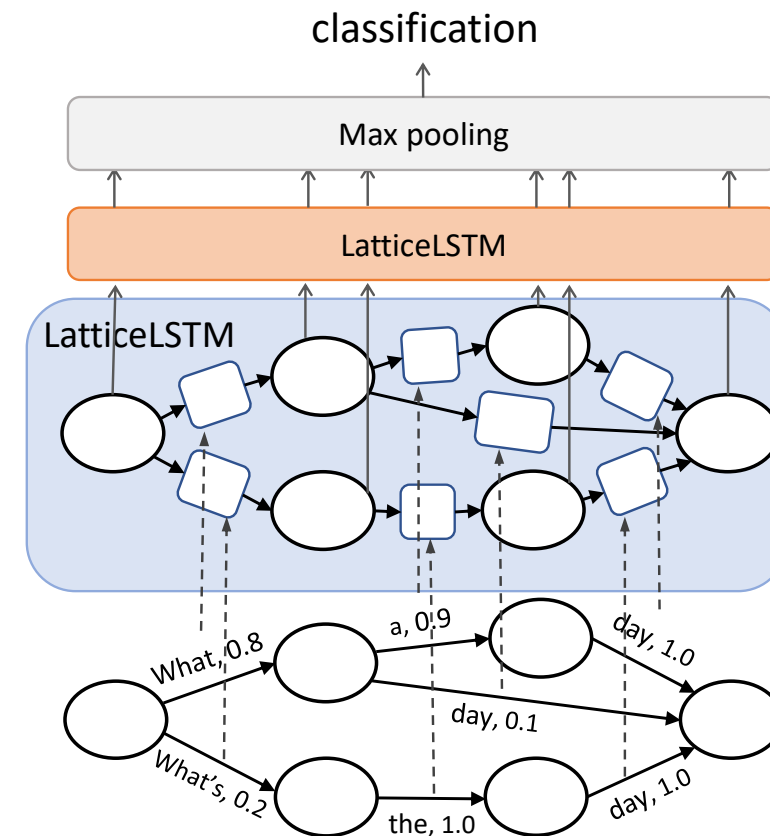
Stage 1: Pre-Training on Sequential Texts



Stage 2: Pre-Training on Lattices

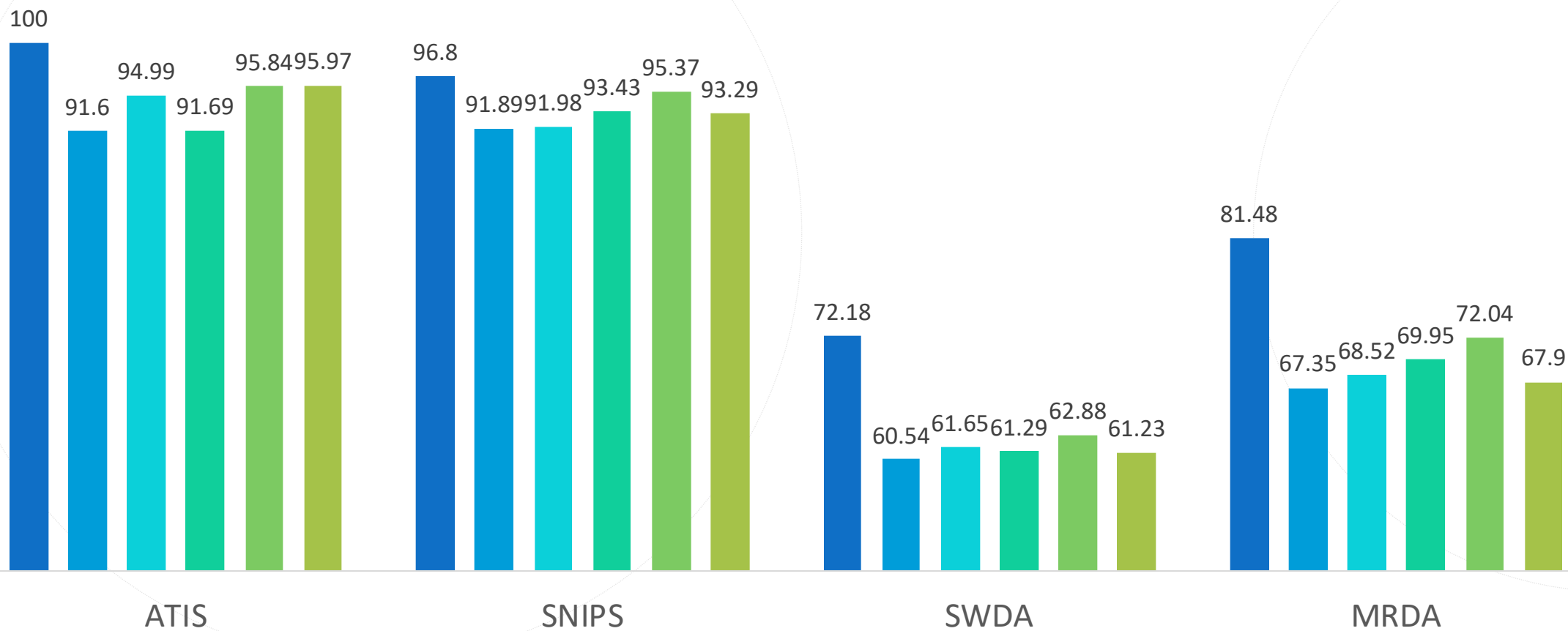


Training Target Task Classifier



Results

Manual + ELMo 1-best 1-best + ELMo LatticeLSTM Proposed BERT-base





Conclusion

- We extend the sequential LM objective to a lattice language modeling objective
- We propose a 2-stage framework for learning contextualized representations of lattices efficiently
- Experiments on various SLU tasks show that our proposed framework provides consistent improvements



Thanks for listening!

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