

DIVE INTO
DEEP LEARNING
<https://d2l.ai>

Introduction to Natural Language Processing

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GTC 2020 Instructor-Led Tutorial

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Applied Scientist

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This is the preview version (v0.7) of Dive into Deep Learning, whose content and style will be improved in the future official publication. Please visit the book website <https://d2l.ai> for an updated version.

DIVE INTO DEEP LEARNING

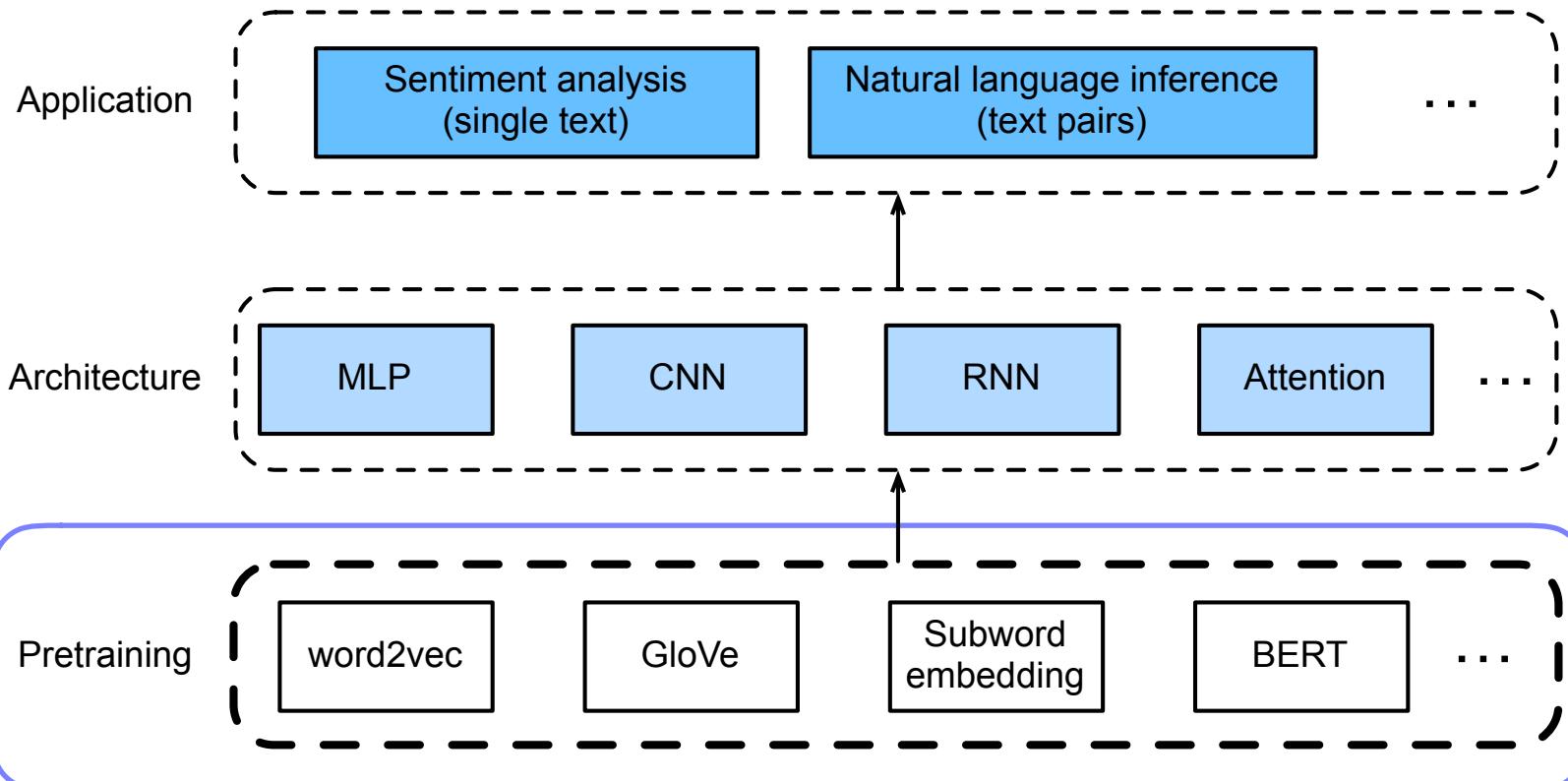
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Aston Zhang, Zachary C. Lipton,
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Preview Version



NLP Roadmap

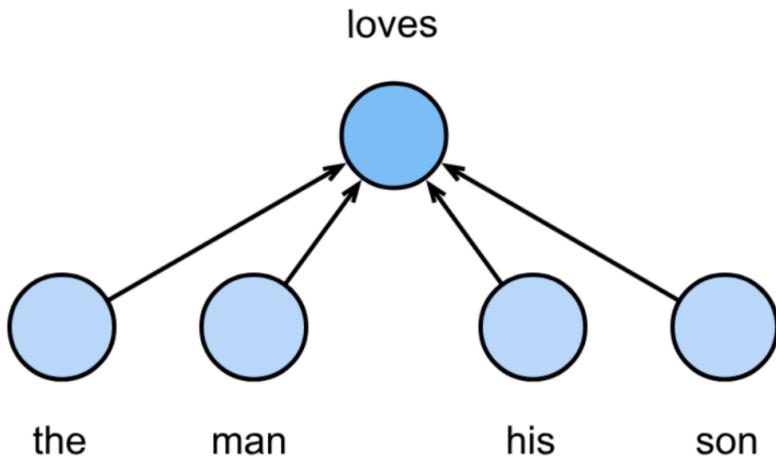


Shallow Word Representation

- **CBOW**

Center word is based
on the context

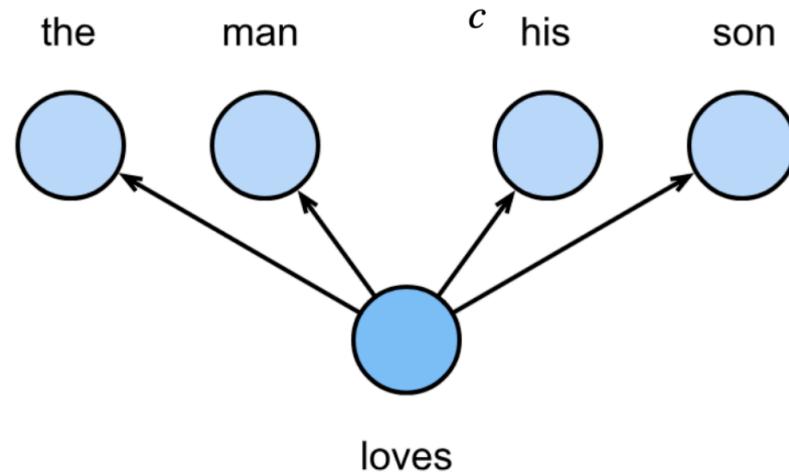
$$p(w \mid \text{context}) = p(w \mid \{w_c\})$$



- **Skip-gram**

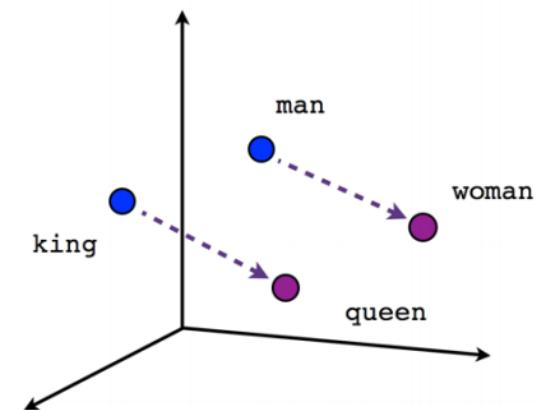
Context is based on
Center word

$$p(\text{context} \mid w) = \prod p(w_c \mid w)$$

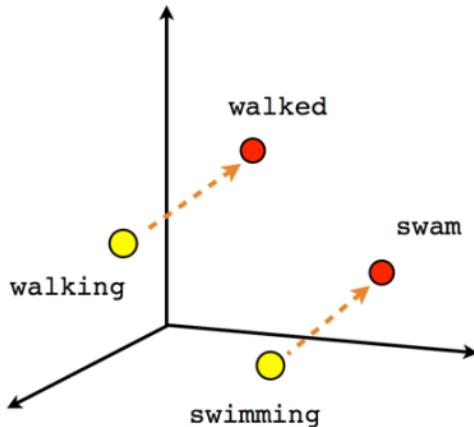


Shallow Word Representation

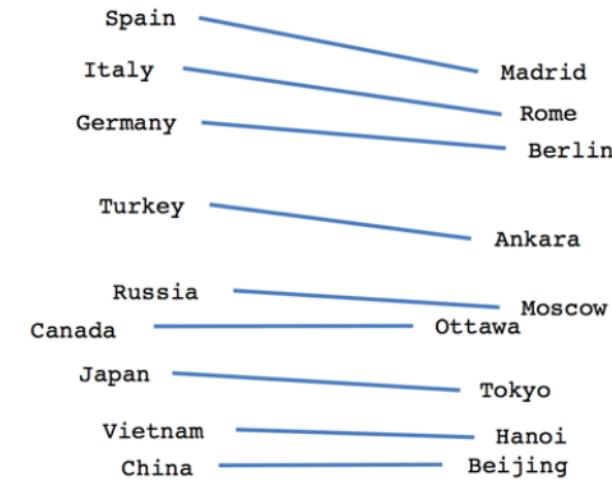
- Represent words by vectors



Male-Female



Verb tense



Country-Capital

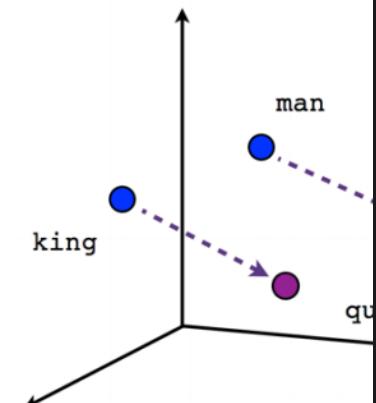
<https://nlp.stanford.edu/projects/glove/>



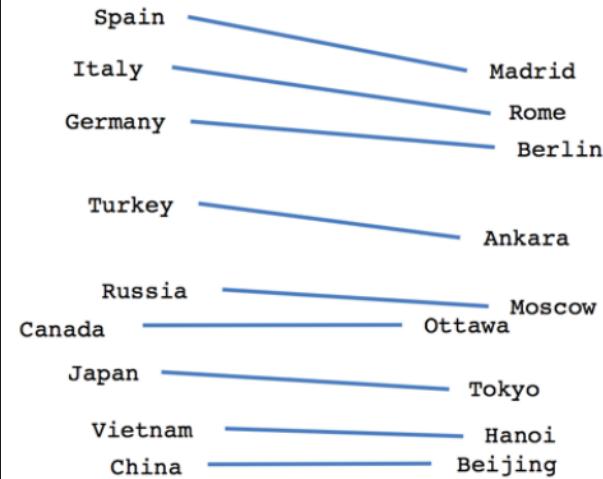
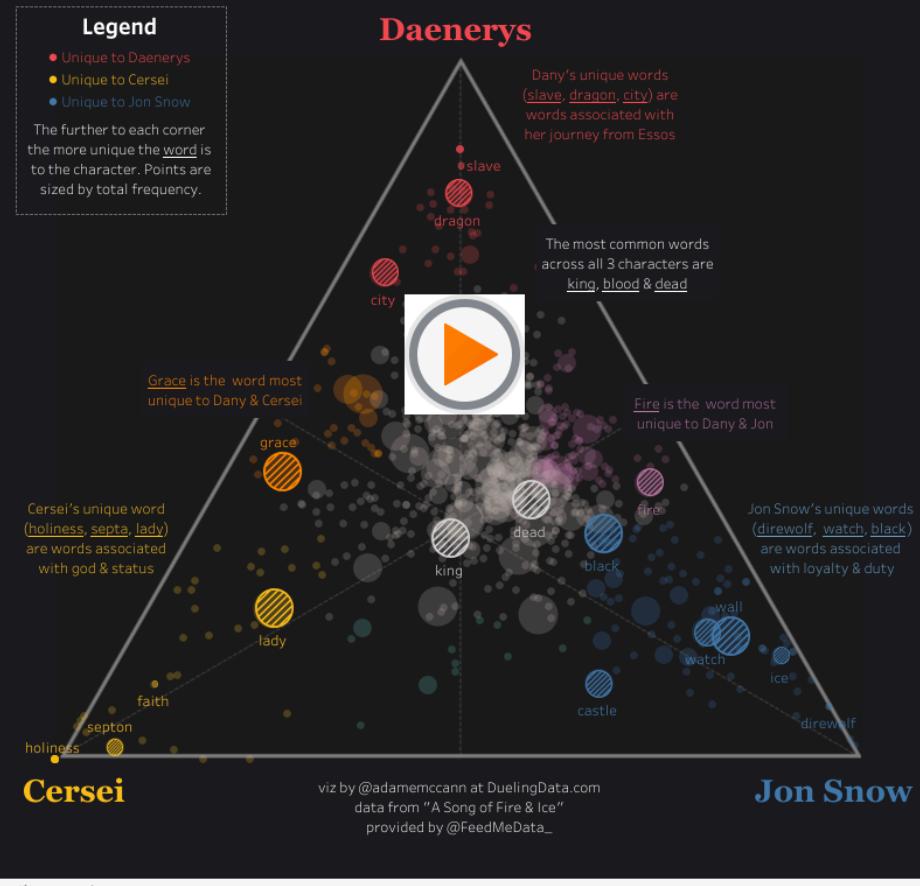
GAME OF THRONES™ IN WORDS

This viz shows the most unique words by character for each chapter in the 5 Game of Thrones books

- Represent



Male-Female



Country-Capital



Problem of Shallow Word Representation

M Mongabay.com

Upset about Amazon fires last year? Focus on deforestation this year (commentary)

That is, the recent deforestation surge fueled the 2019 Brazilian Amazon fires. The fires were in fact a lagging indicator of recent deforestation. Such information ...

1 week ago



BI Business Insider

How to restart your Amazon Fire Stick in 3 different ways -
Business Insider

The Amazon Fire Stick is one of the most popular media streaming devices available right now. Not only can you shop on Amazon using a Fire Stick, but you can ...

10 hours ago



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10 hours ago



- **Cons** for shallow word representation:
 - Word ambiguity: Polysemy
 - Language model only looks in a single direction
 - Often don't update the pre-trained models



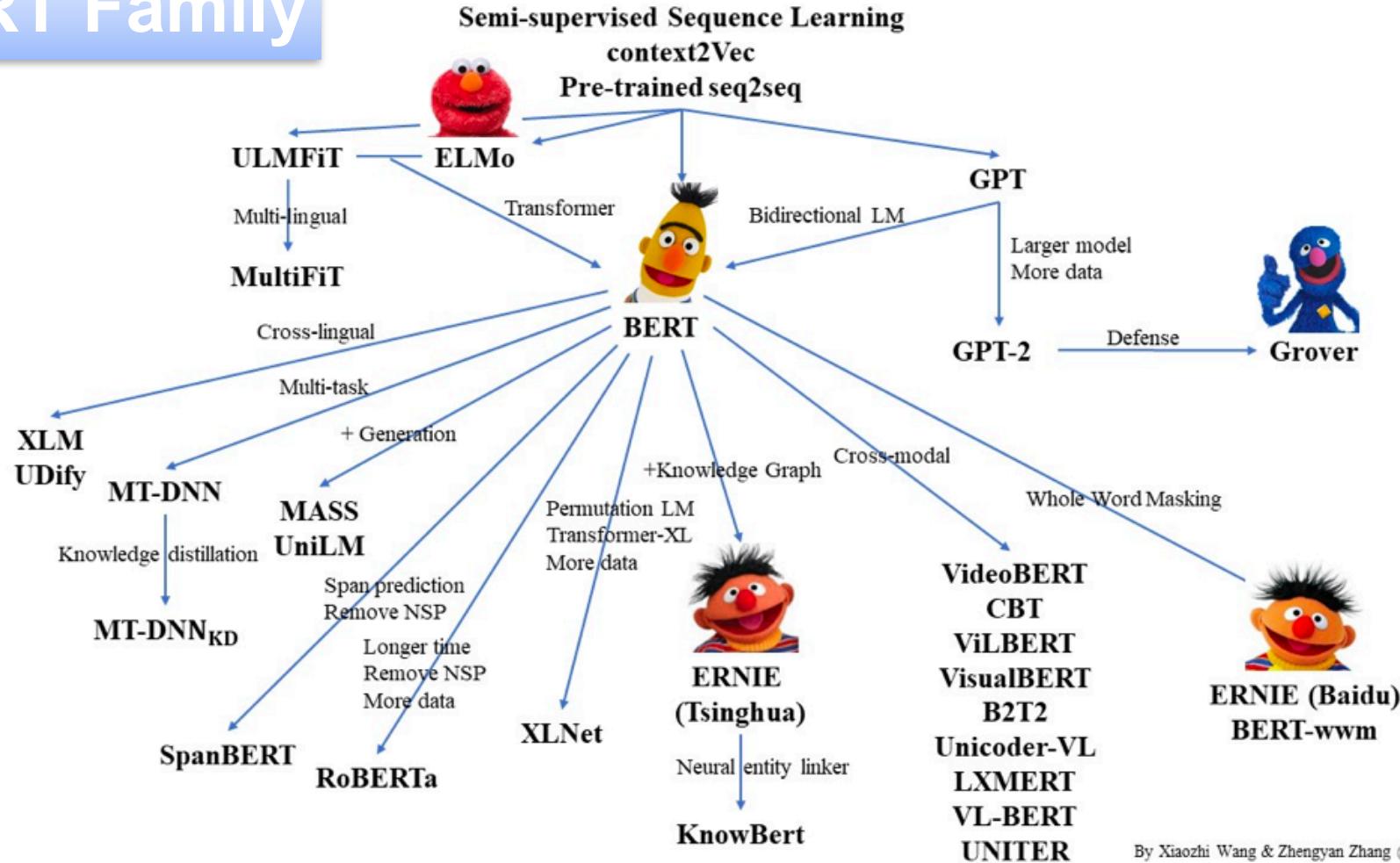
Deep Word Representation

BERT

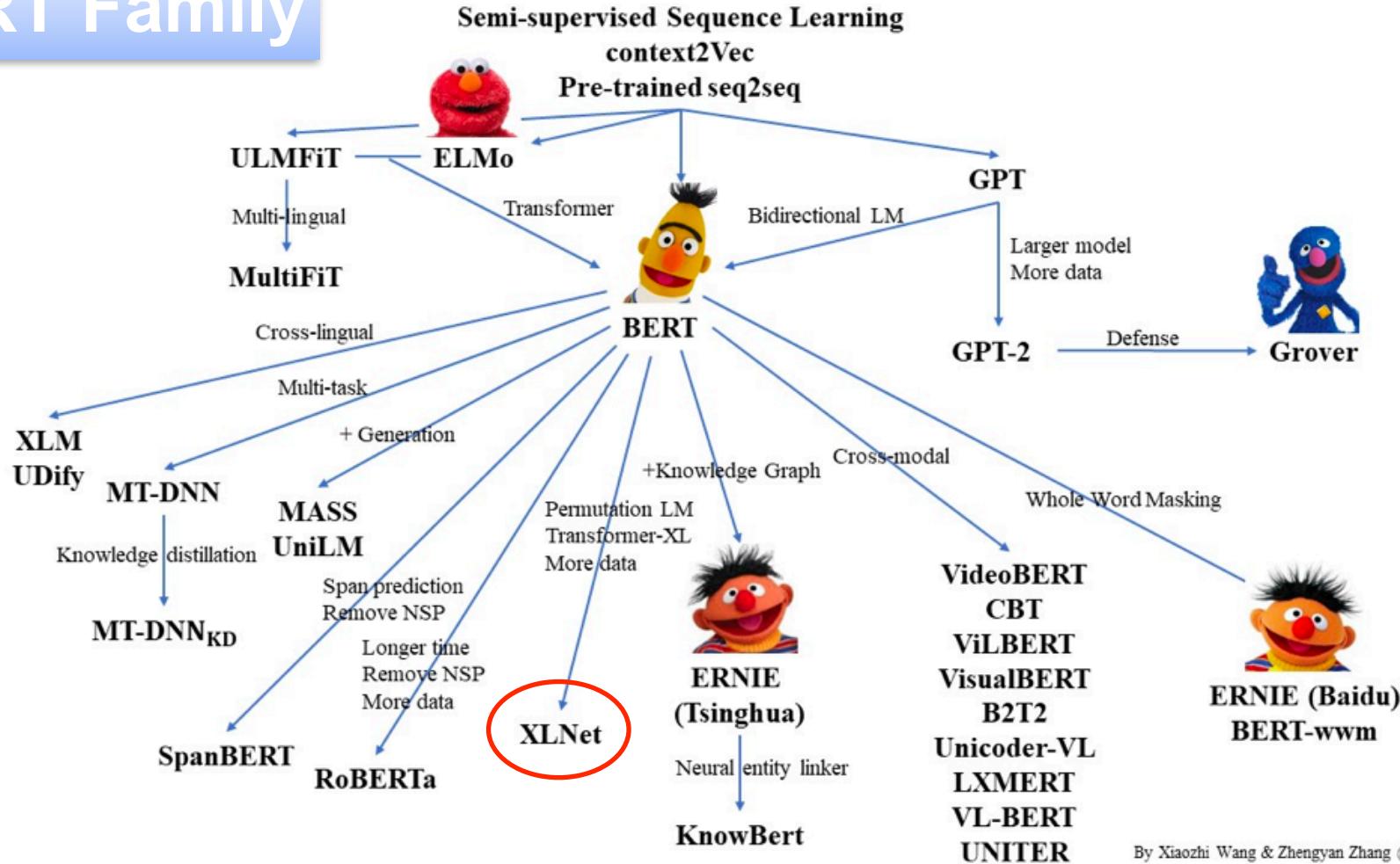
Bidirectional Encoding
Representation
from Transformer



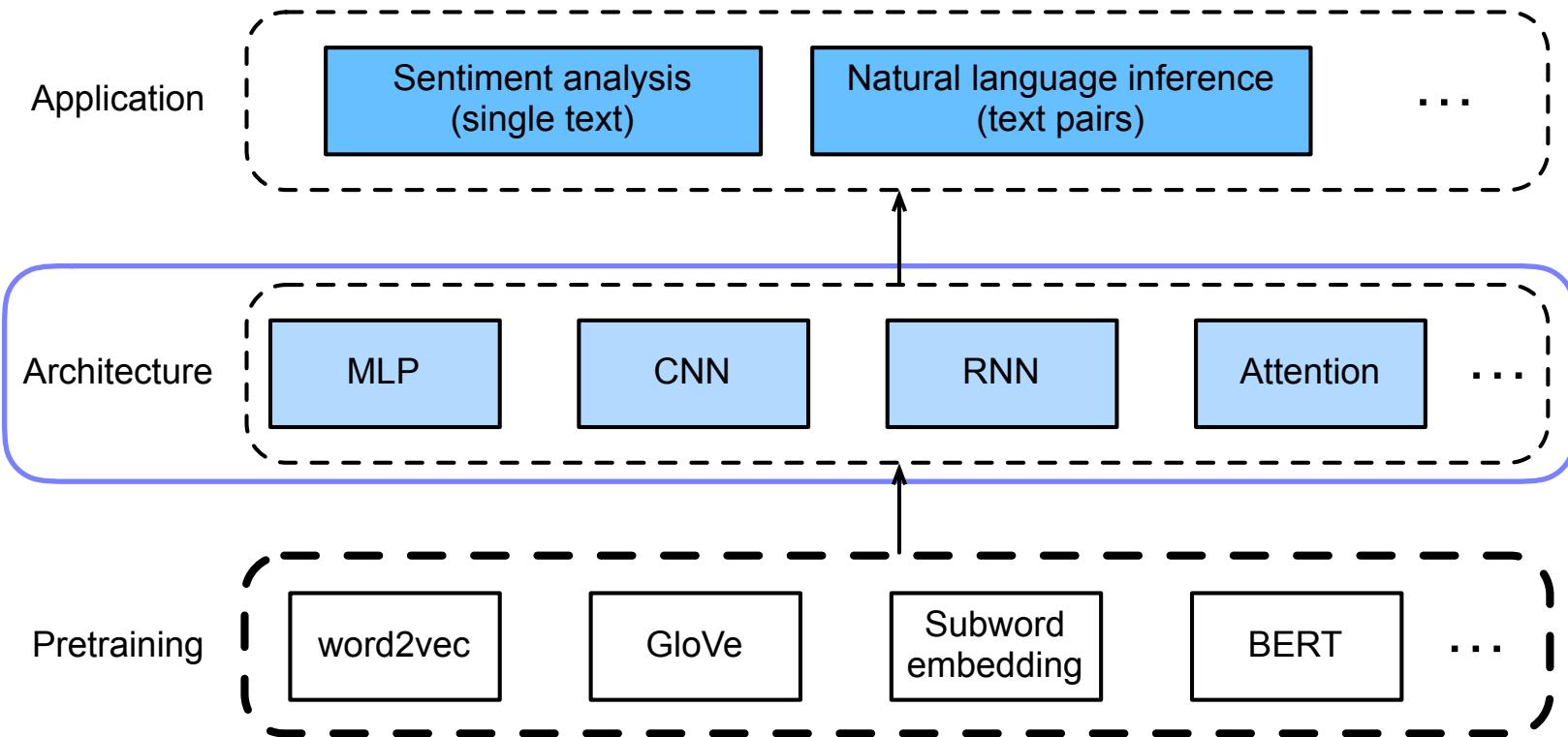
BERT Family



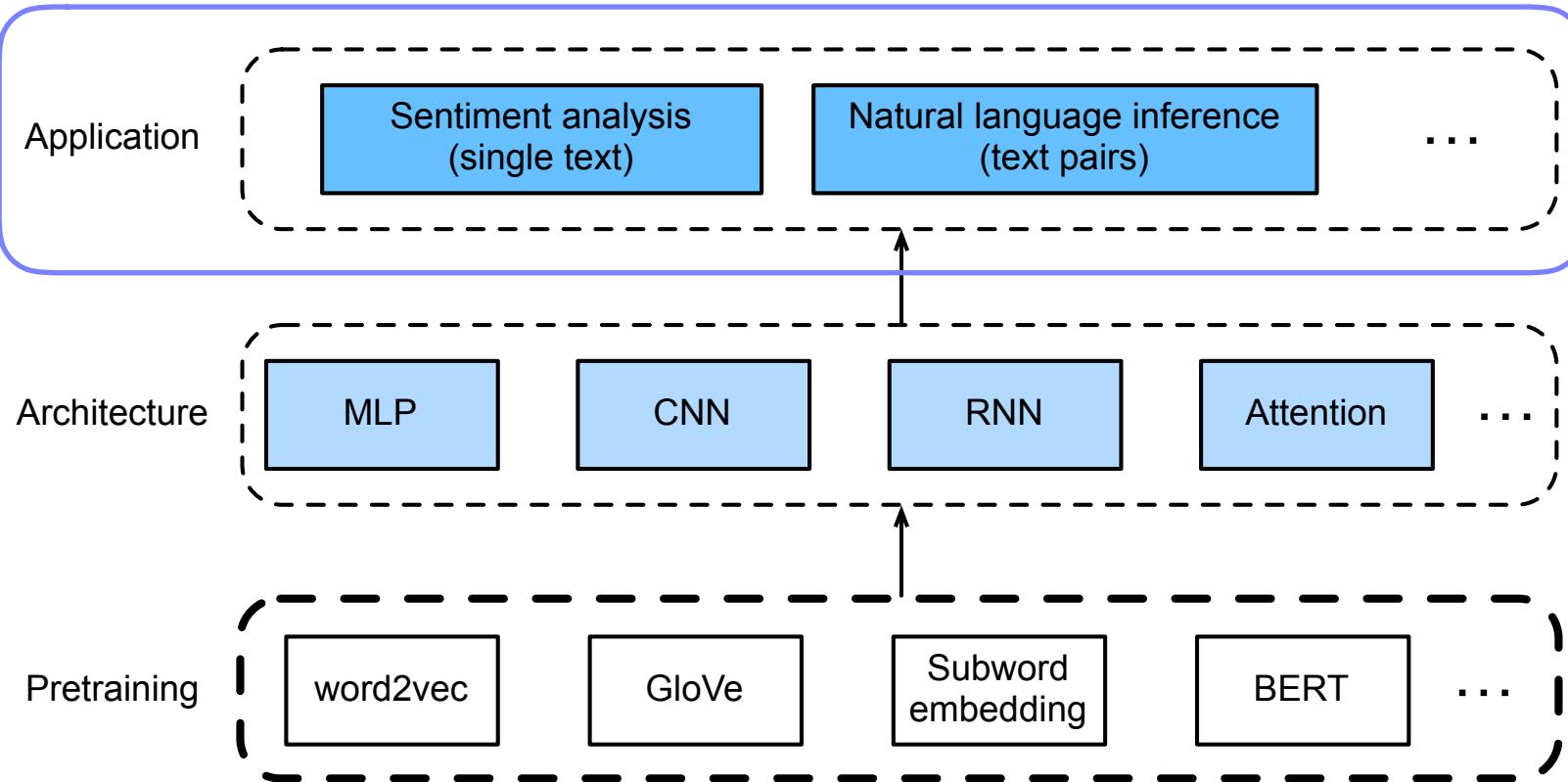
BERT Family



NLP Roadmap



NLP Roadmap



NLP Applications

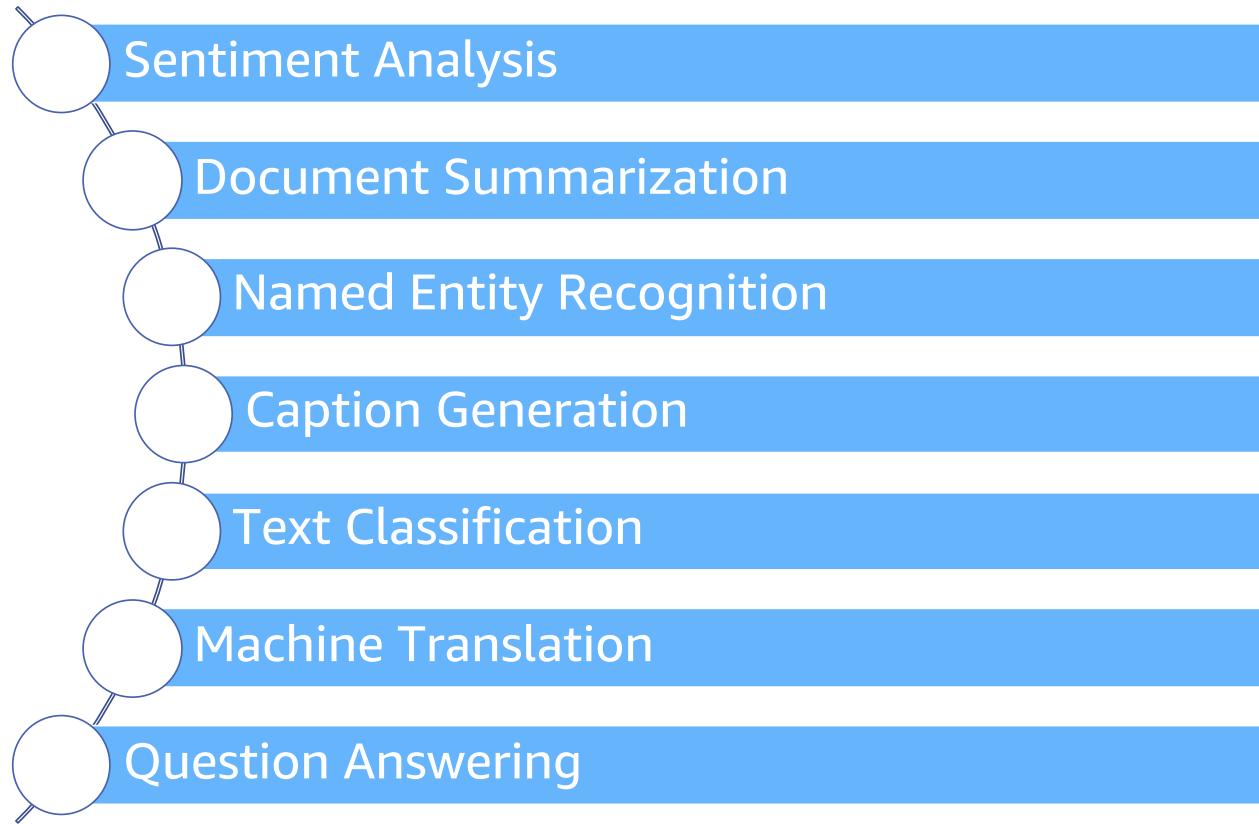
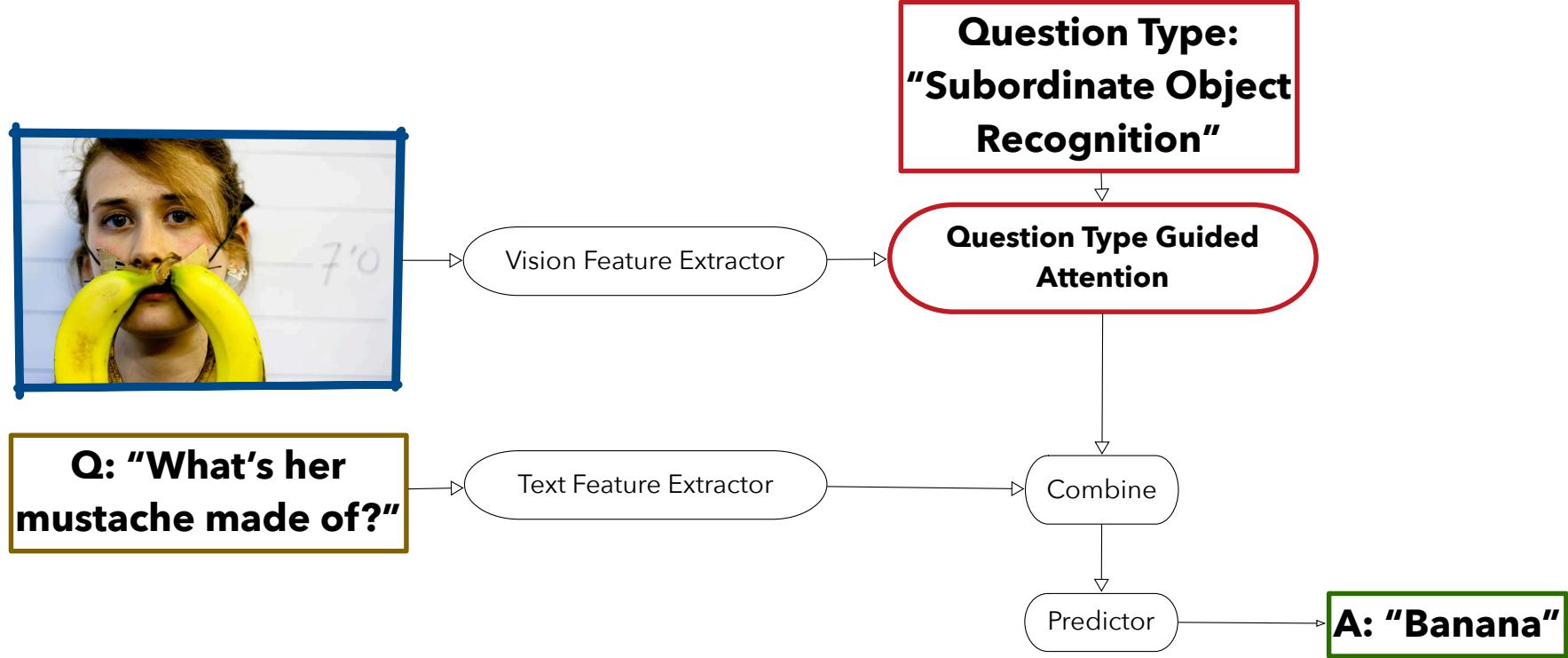


Image Question Answering



Shi et al, 2018, Arxiv



Text Synthesis

Content: Two dogs play by a tree.

Style: *happily, love*



Two dogs *in love* play *happily* by a tree.

Human captions from the training set

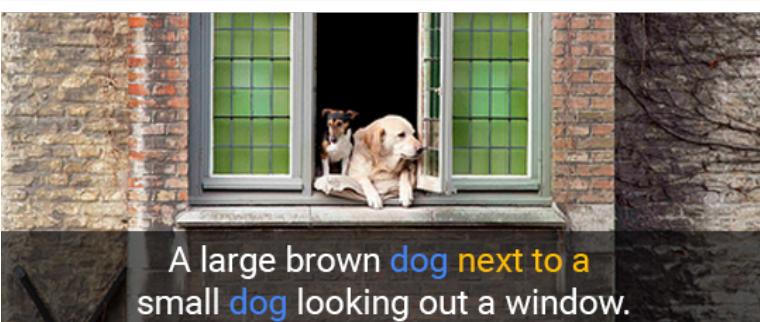
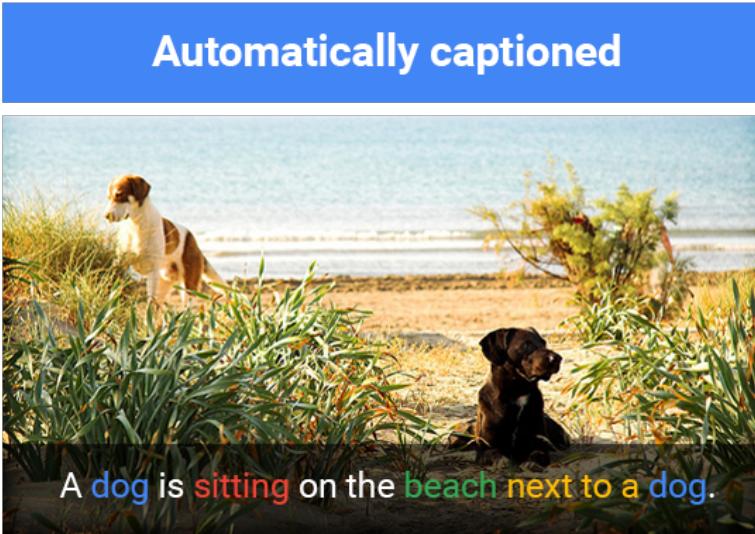


Image captioning



Shallue et al, 2016

<https://ai.googleblog.com/2016/09/show-and-tell-image-captioning-open.html>



More NLP Tutorials in D2L

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14. Natural Language Processing: Pretraining	^
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14.2. Approximate Training	
14.3. The Dataset for Pretraining Word Embedding	
14.4. Pretraining word2vec	
14.5. Word Embedding with Global Vectors (GloVe)	
14.6. Subword Embedding	
14.7. Finding Synonyms and Analogies	
14.8. BERT	
14.9. The Dataset for Pretraining BERT	
14.10. Pretraining BERT	
15. Natural Language Processing: Applications	^
15.1. Sentiment Analysis and the Dataset	
15.2. Sentiment Analysis: Using Recurrent Neural Networks	
15.3. Sentiment Analysis: Using Convolutional Neural Networks	
15.4. Natural Language Inference and the Dataset	
15.5. Natural Language Inference: Using Attention	
15.6. Natural Language Inference: Fine Tuning BERT	

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