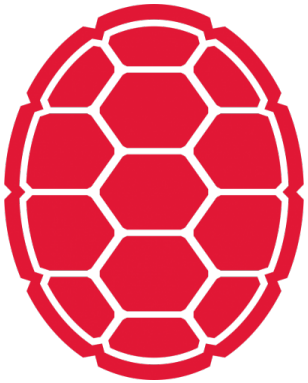

Distributional Semantics

Machine Learning: Jordan Boyd-Graber
University of Maryland
SLIDES ADAPTED FROM YOAV GOLDBERG AND OMER LEVY

Beyond word2vec

- word2vec is factorizing a word-context matrix.
- The content of this matrix affects the resulting similarities.
- word2vec allows you to specify a *window size*.
- But what about other types of contexts?

- Example: **dependency contexts** (Levy and Dagan, ACL 2014)

Bag of Words (BoW) Context

Australian scientist discovers star with telescope

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Syntactic Dependency Context

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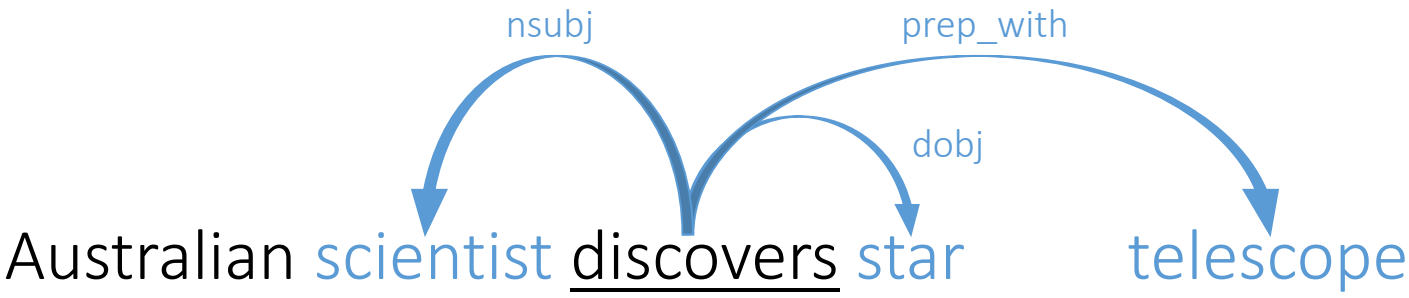
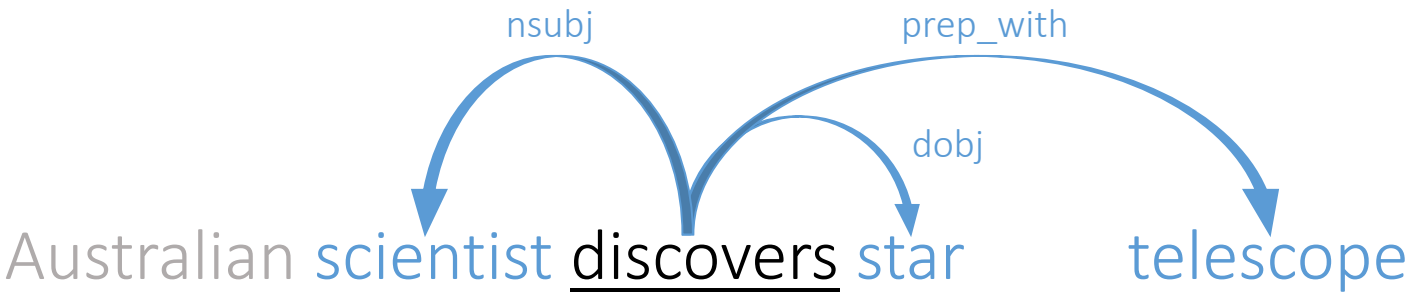


Syntactic Dependency Context



Embedding Similarity with Different Contexts

Target Word	Bag of Words (k=5)	Dependencies
Hogwarts (Harry Potter's school)	Dumbledore hallows half-blood Malfoy Snape	Sunnydale Collinwood Calarts Greendale Millfield
	Related to Harry Potter	**Schools**

Embedding Similarity with Different Contexts

Target Word	Bag of Words (k=5)	Dependencies
Turing (computer scientist)	nondeterministic non-deterministic computability deterministic finite-state	Pauling Hotelling Heting Lessing Hamming
	Related to computability	**Scientists**

Embedding Similarity with Different Contexts

Target Word	Bag of Words (k=5)	Dependencies
dancing (dance gerund)	singing dance dances dancers tap-dancing	singing rapping breakdancing miming busking
	Related to dance	**Gerunds**

Online Demo!

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Choose the correct contexts for your application

- larger window sizes – more topical
- dependency relations – more functional

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- . . .
- the sky is the limit

Summary

Distributional Semantics

- Words in similar contexts have similar meanings.
- Represent a word by the contexts it appears in.
- But what is a context?

Neural Models (word2vec)

- Represent each word as dense, low-dimensional vector.
- Same intuitions as in distributional vector-space models.
- Efficient to run, scales well, modest memory requirement.
- Dense vectors are convenient to work with.
- Still helpful to think of the context types.