Word Embeddings

Machine Learning

Word Embeddings

- Word Embeddings: An NLP technique of representing words as vectors
- Several methods exist to do this kind of translation. Popular methods include
  - Dimension reduction techniques, like SVD
  - word2Vec (Neural networks)
  - GloVe

Context ≈ Meaning

- The purpose of word embeddings is to use closer vectors to represent similar words.
- That is, it detects similarities mathematically.
- More specifically it aims to capture similarities between words based on their distributional properties in large samples of language data.
- "a word is characterized by the company it keeps"
- Given enough data, usage and contexts, word embeddings can make highly accurate guesses about a word’s meaning.

Similar words and similar vectors

- Two words with similar contexts mean similar things
  - Eg: Red & Blue, Cat & Dog
- Cosine Similarity - measuring distance between word vectors
- Embedding can (surprisingly) build even more meaning into the vectors
  - Eg: ‘King’-‘Man’+‘8Woman’ ≈ ‘Queen’

Applications

- Analyzing any form of text for insights: reviews, survey responses, tweets, comments
- NLP
  - Text classification
  - Sentiment analysis
  - Translation
- Recommendation systems

Singular Value Decomposition

- Begins with a text corpus (Eg. All the tweets in say a yr)
- Assemble a word co-occurrence matrix: M
- Find a lower dimensional word embedding matrix W such that, $M = W * W^T$.
    - This step be done using Singular Value Decomposition (SVD)
- The W matrix now contains the vector representation for each word.

word2Vec

- Uses a simple neural network with an input layer, a hidden layer and an output layer
- Train the neural network to either
  - Predict context given a word (skip gram model) or
  - Predict word given a context (continuous bag of words model)

- I went to the cinema on Sunday
- I went to the beach on Monday

- My favorite pet is a cat
- I like walking my pet dog

- I bought a red Honda
- I bought a red car
- I bought a blue Toyota

I will have oats and eggs for breakfast