

ChatBot

Mohammad Dehghan

Amin Samadi

Adel Mostafavi

Roadmap

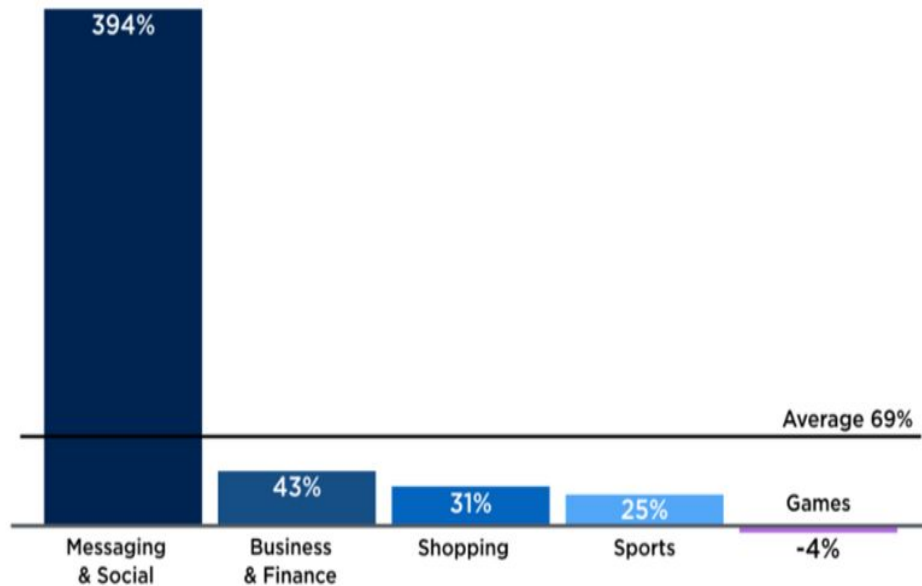
- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Why Bots?

People spend

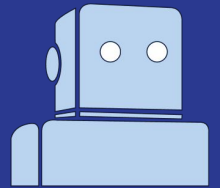
~90%

On messaging platforms



ChatBot environments

How large companies use these platforms shows the importance!



Wit.AI

Generative

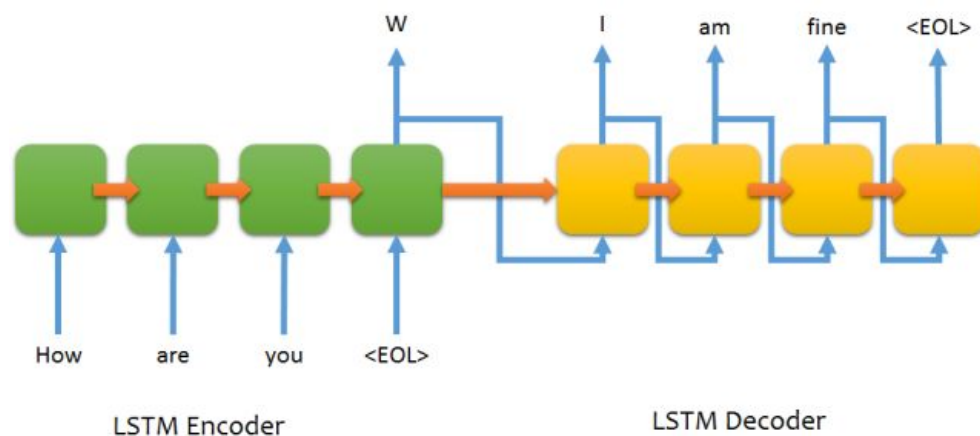
Selective

Roadmap

- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Generative Bots

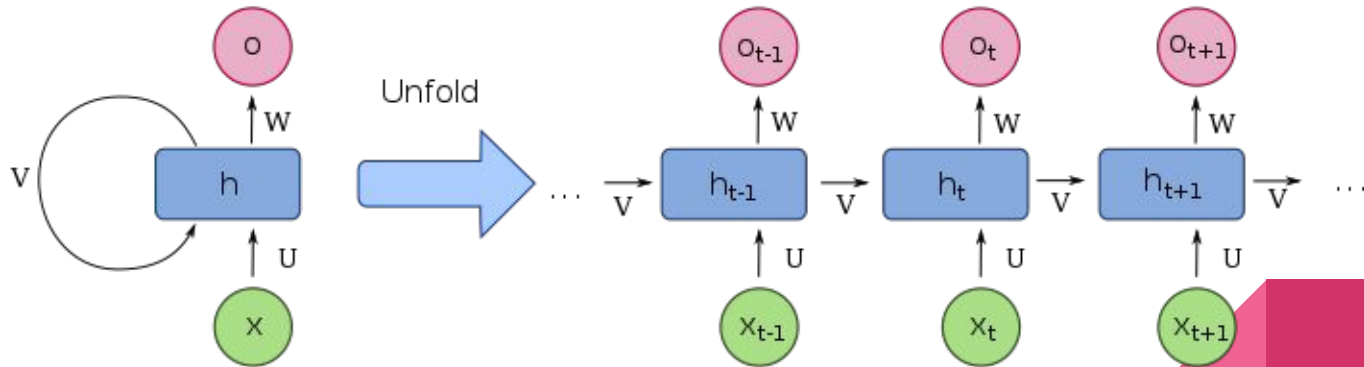
- Understand the context
- Generate the proper response



- Sequence to Sequence model
 - Also used for machine translation (google translate!)
 - Trained on conversational pairs of data (like reddit comments and replies)

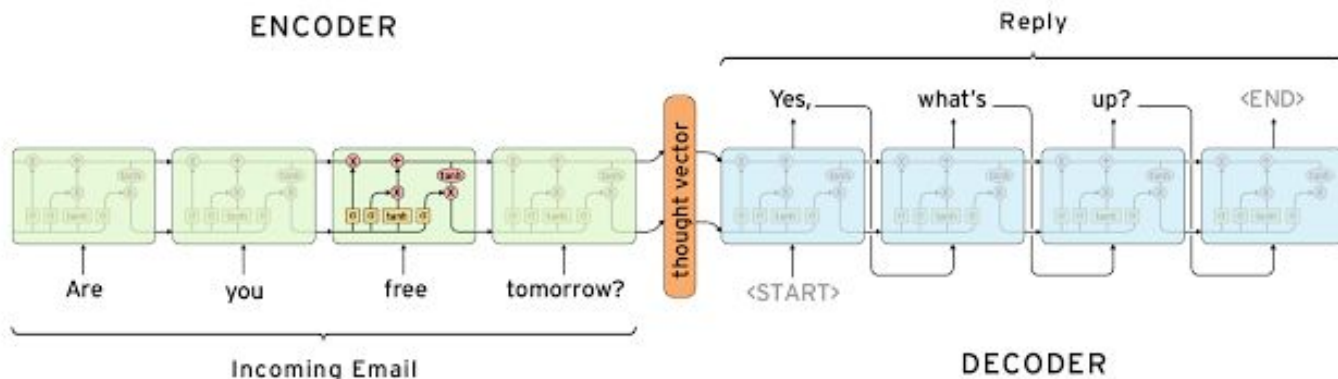
Encoder

- Output of the last layer of a RNN
 - What our network understands from a sentence!
- Trained with the gradient of the decoder



Decoder

- A language model
 - The Encoder output is the input here
- Outputs one word at a time
- Expected to create the proper answer



Roadmap

- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Selective Bots

Context

Use Nlp methods to figure out what user is saying

Answer

Choose between possible answers

Actions

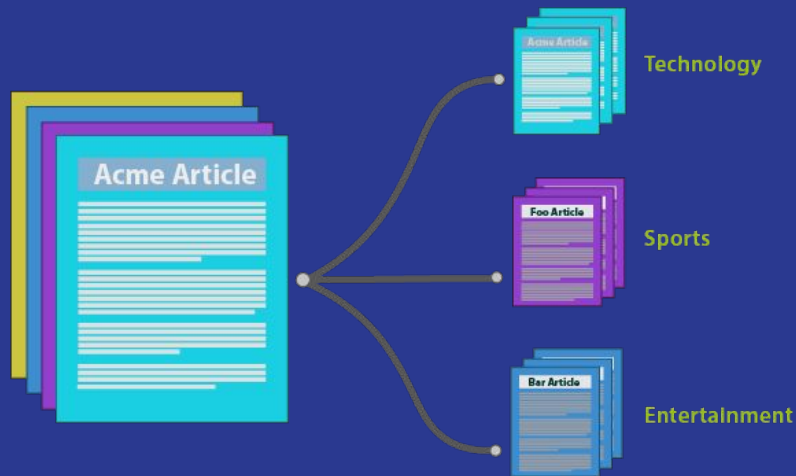
Take actions for some contexts

- An API call for weather
- Name entity recognition

Understanding context

Text classification
VS
Intent classification

Classifying the context with NLP



Word representation

How to express words to a computer?

One-hot vector

- All words should have the same dimension
- Fixed size vocabulary
- Only one entry is one which is the index of that word in our vocabulary

The diagram illustrates one-hot vectors for a vocabulary. It shows four words and their corresponding vectors:

- Rome** = $[1, 0, 0, 0, 0, 0, \dots, 0]$ (The first element is 1, others are 0. An arrow points from the label 'Rome' to the first element of the vector.)
- Paris** = $[0, 1, 0, 0, 0, 0, \dots, 0]$ (The second element is 1, others are 0. An arrow points from the label 'Paris' to the second element of the vector.)
- Italy** = $[0, 0, 1, 0, 0, 0, \dots, 0]$ (The third element is 1, others are 0.)
- France** = $[0, 0, 0, 1, 0, 0, \dots, 0]$ (The fourth element is 1, others are 0.)

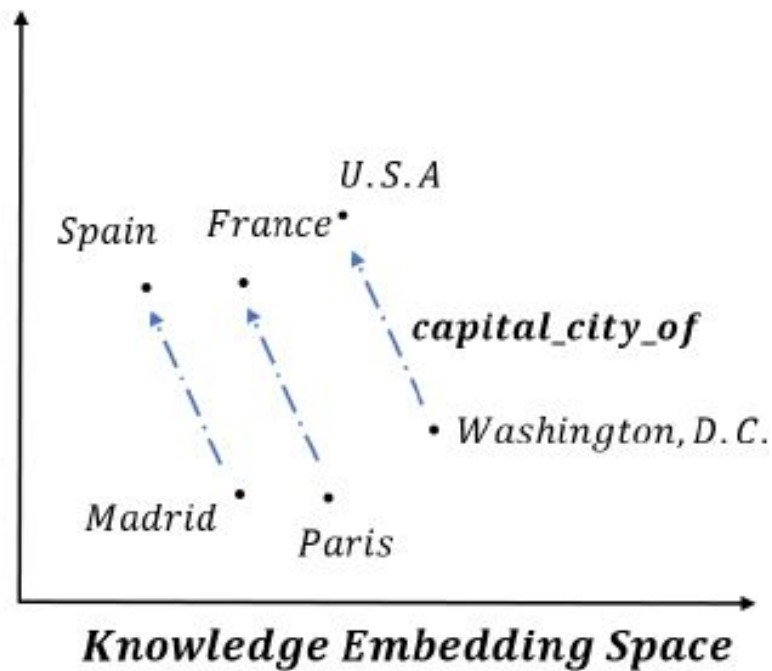
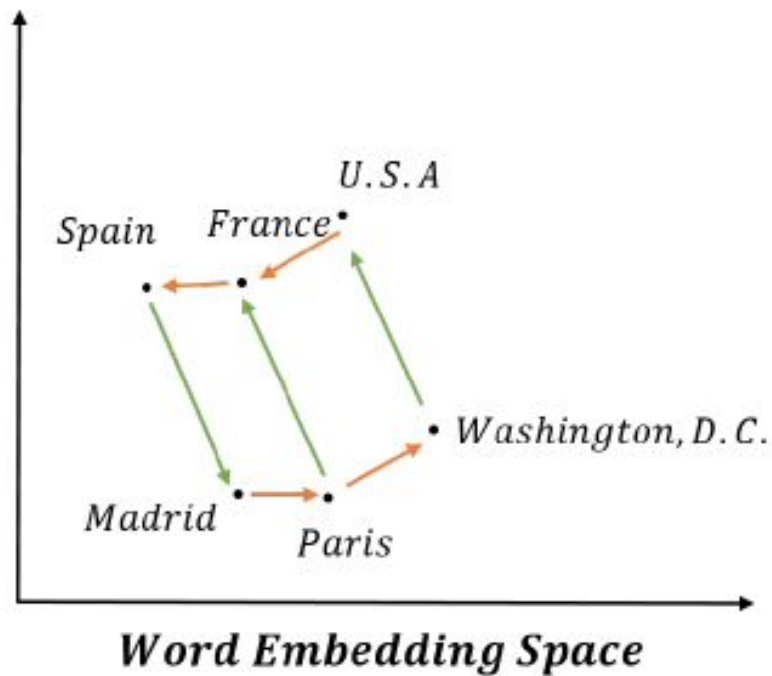
An arrow labeled "word V" points to the last element (0) of the France vector, indicating the position of a specific word in the vocabulary.

Word embedding

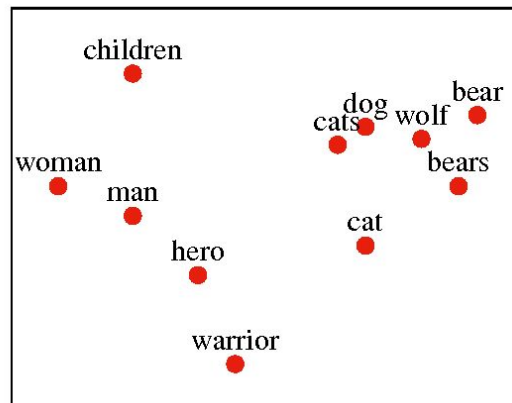
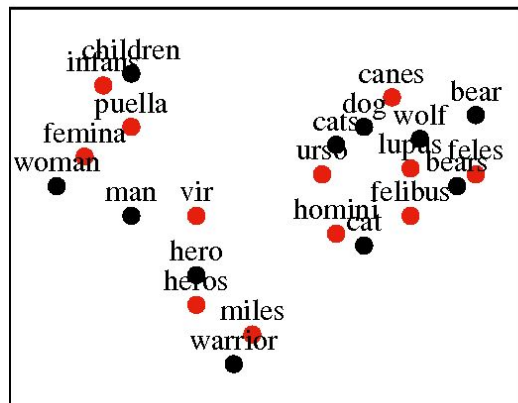
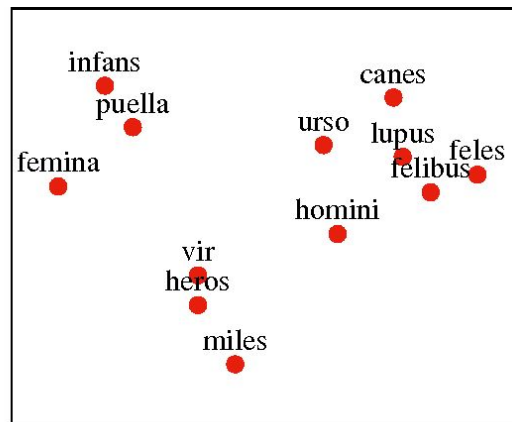
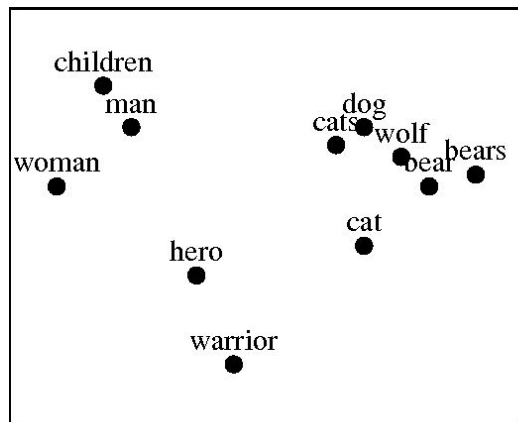
- Featurized representation of words
- Each words is embed to a vector in a 100 or 200 or ... dimension space
- Learned from large text corpus (1-100B words)
 - We can train it
 - Download pre-trained
- Helps us learn a context with fewer examples



Vector offset



Dimension Reduction



How to classify

- bag of words
 - Classical machine learning methods
 - Naive bayes & ...
 - DNNs
- CNNs (long texts)
- RNNs

Roadmap

- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Optimizations

Some methods to enhance the context understanding process

- Transfer Learning
- Using LSTMs, bidirectional models, ... as RNN cells
- Attention models
- Using feedback to enhance performance

Roadmap

- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Actions

- what happens after understanding an intention
- Further considerations for some tasks
 - Finding adverbs
 - Name entity recognition

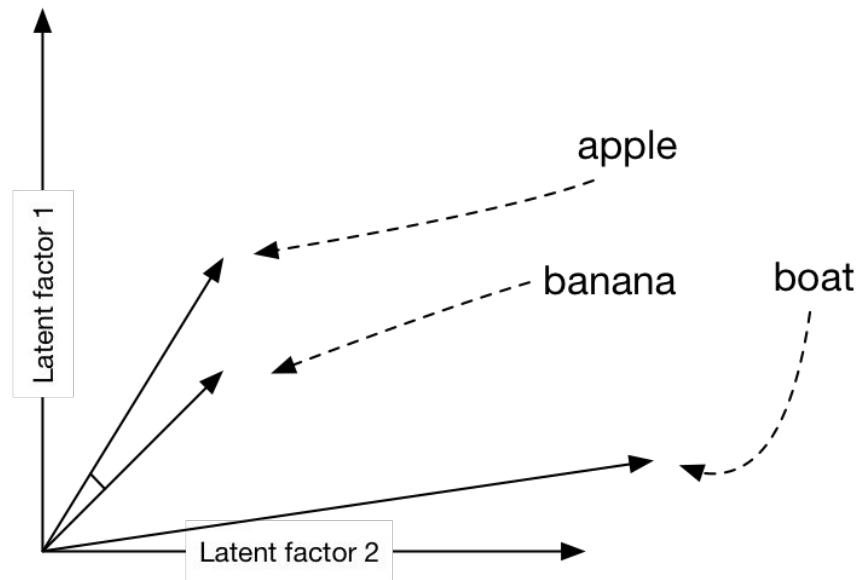
What's the weather tomorrow in Palo Alto?

```
intent = weather forecast  
when   = July 21, 2018  
place  = Palo Alto, CA
```

- Other actions based on customer requirements

Name Entity Recognition

- Detect special set of words
 - Company names, city names, adverbs, ...
- Approaches
 - Training a RNN to detect
 - Using word embedding and cosine similarity

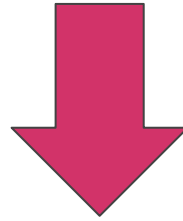


Roadmap

- Why bots
- Generative bots
- Selective bots
 - Understanding context
 - Word representation
 - How to classify
- Optimization
- Actions
 - Name entity recognition
- Test & Analyze

Test & analyze

- Keep monitoring bot conversations
- Bot should report uncertainties
- Possible feedbacks from customers



Locate the weak points