Natural Language Dialogues with Sequence-To-Sequence Learning

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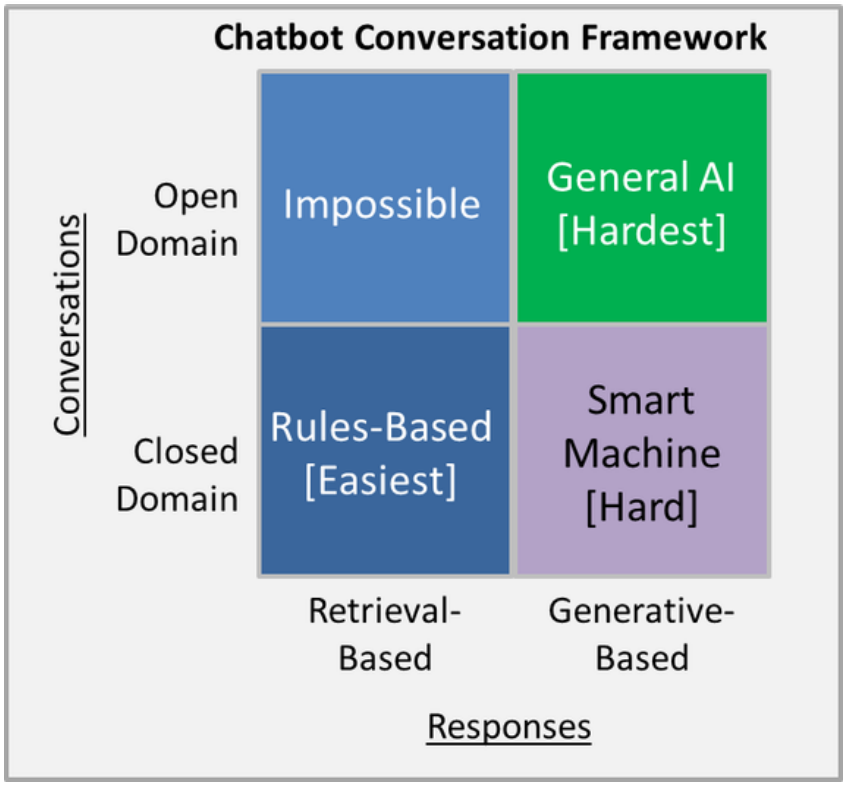
Deep Learning Day 2017, 22nd September 2017

What Kind Of Chatbots Are There?



Sources: https://chatbotslife.com/ultimate-guide-to-leveraging-nlp-machine-learning-for-you-chatbot-531ff2dd870c

Rule-Based: TheMovieMan

Hello Dirk, pleased to meet you.

I would like to recommend you some movies.

Who is your favourite director?

You can also send me an image of them if you don't know their name.

ridley scott

Ridley Scott directed "Gladiator (2000)".

Have you seen it?

yes

How did you like it?

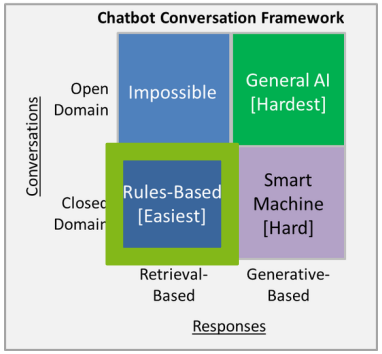
It was just bad :(

I didn't feel it

It was okay

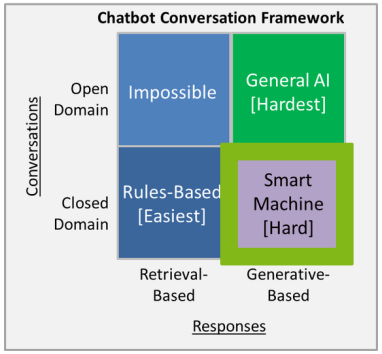
I liked it

It was Awesome!

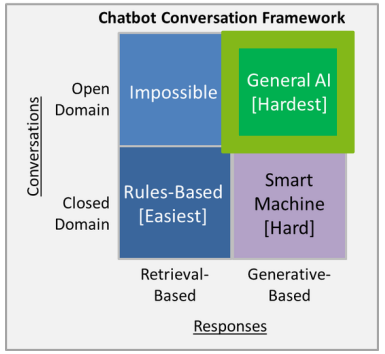


Smart-Machine: Reddit Movie Chatbot

Input:	Can you tell me something about game of thrones?
0.5M:	i m not sure if you re a fan of the movie , but i m not sure if you re going to be a fan of the
1.0M:	i m not sure what you re saying .
1.5M:	i m not sure if i m going to be watching this .
2.0M:	i m not sure if you re joking , but i m pretty sure that s the case .
2.5M:	i m not sure if you re talking about the game or the game , but i think the game is a little different .
3.0M:	hodor hodor
Cleverbot:	Dani is life.



General-AI: Neural Conversational Model

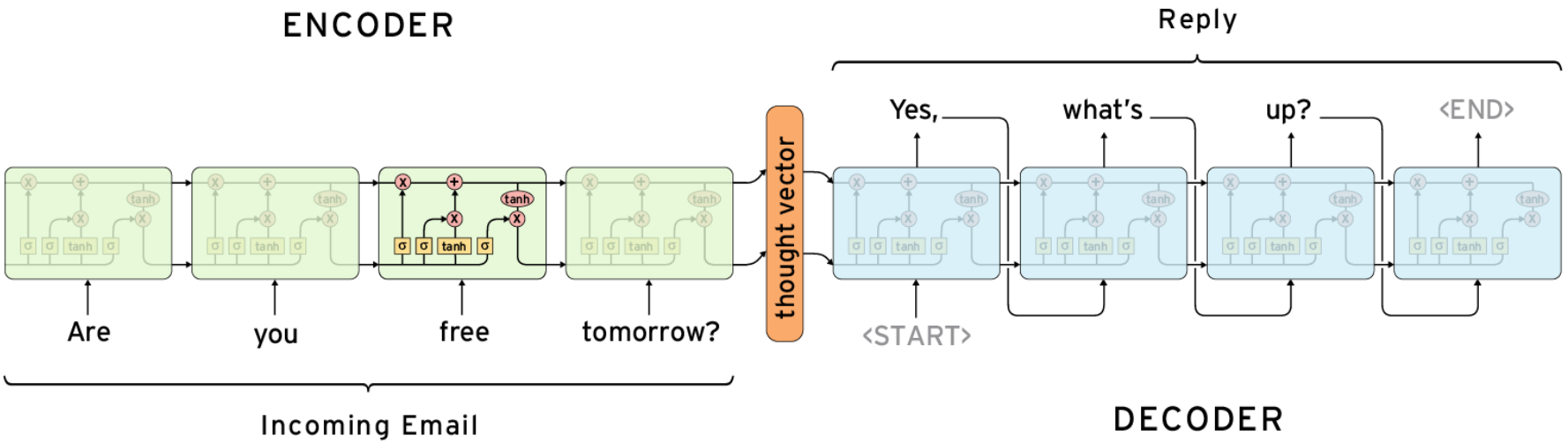


Human: *who is skywalker ?*
Machine: *he is a hero .*
Human: *who is bill clinton ?*
Machine: *he 's a billionaire .*
Human: *is sky blue or black ?*
Machine: *blue .*
Human: *does a cat have a tail ?*
Machine: *yes .*
Human: *does a cat have a wing ?*
Machine: *no*

Human: *what is the purpose of life ?*
Machine: *to serve the greater good .*
Human: *what is the purpose of living ?*
Machine: *to live forever .*
Human: *what is the purpose of existence ?*
Machine: *to find out what happens when we get to the planet earth .*
Human: *where are you now ?*
Machine: *i 'm in the middle of nowhere .*

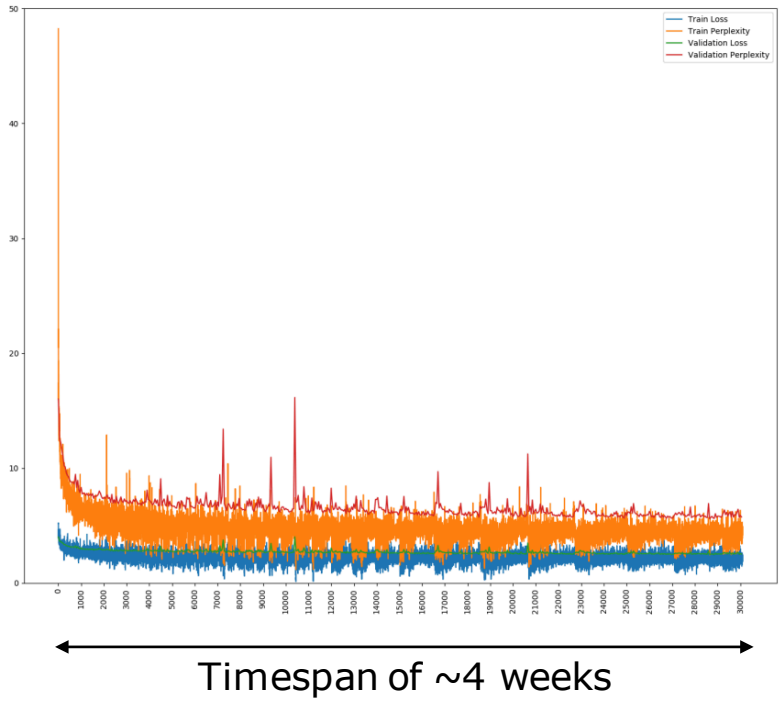
Source: Oriol Vinyals & Quoc Le (2015), Neural Conversational Model

Seq2Seq: Architecture



Source: http://suriyadeepan.github.io/2016-12-31-practical-seq2seq/

Seq2Seq: Training



Sources: http://colah.github.io/posts/2015-09-Visual-Information/

q = [0.1, 0.08, … , 0.001, 0.01]

p = [0, 0, 0, 0, 0, 1, 0 … , 0, 0]

$$H(p,q) = -\sum_{x \in X} p(x) \log_2 q(x)$$

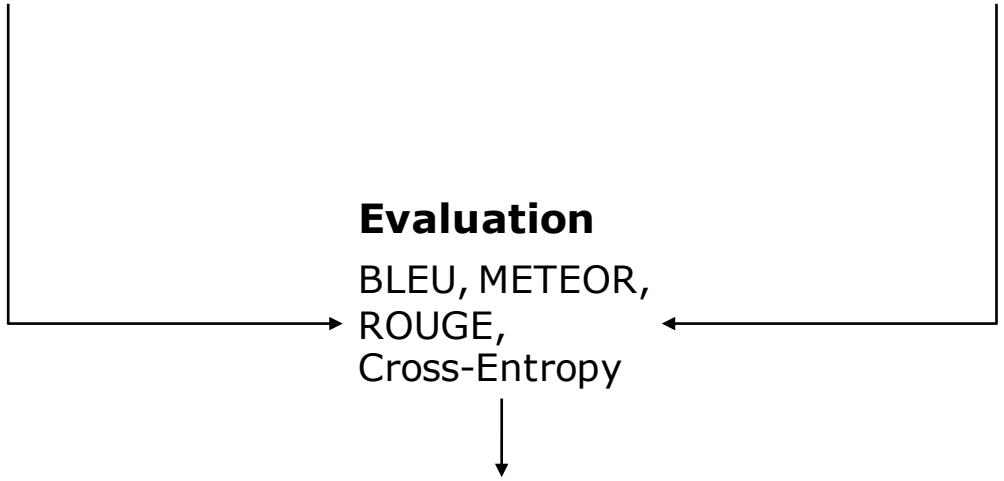
Seq2Seq: Evaluation

Sentence #1:

The president meets the press in Illinois

Sentence #2:

Donald Trump welcomes the media in Chicago



Result?

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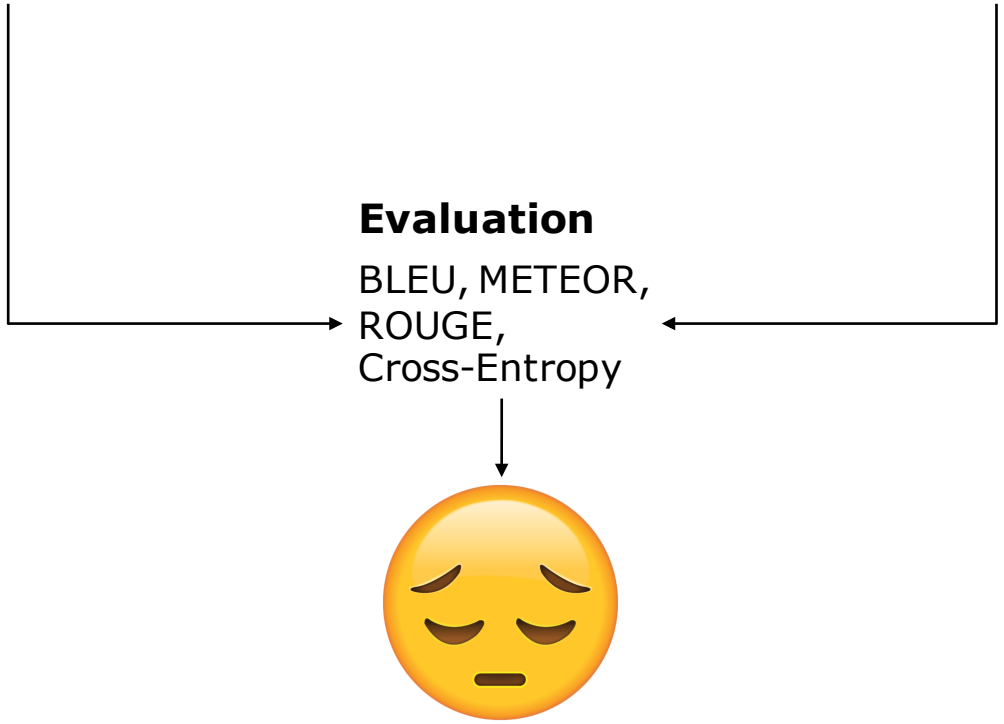

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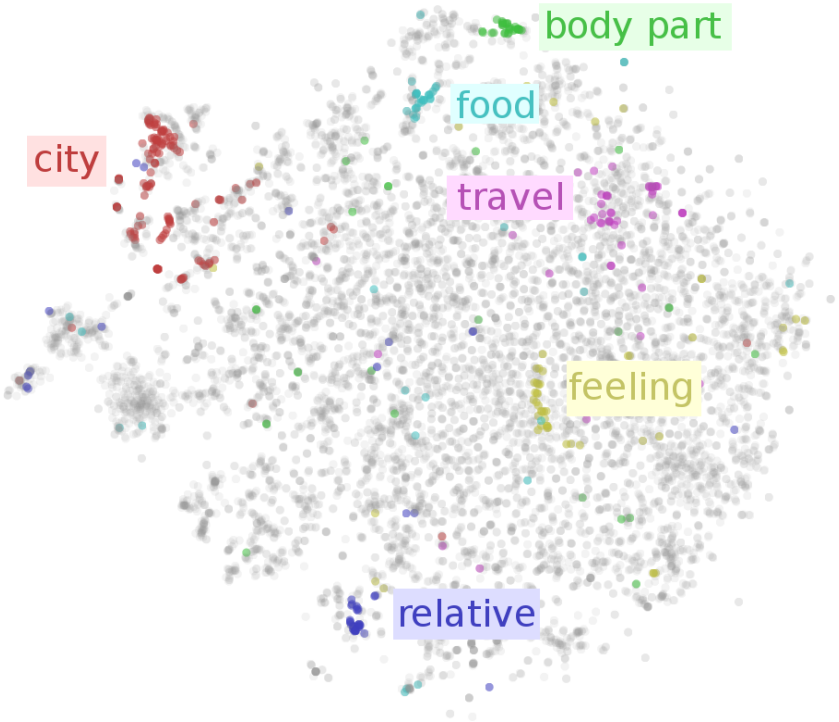
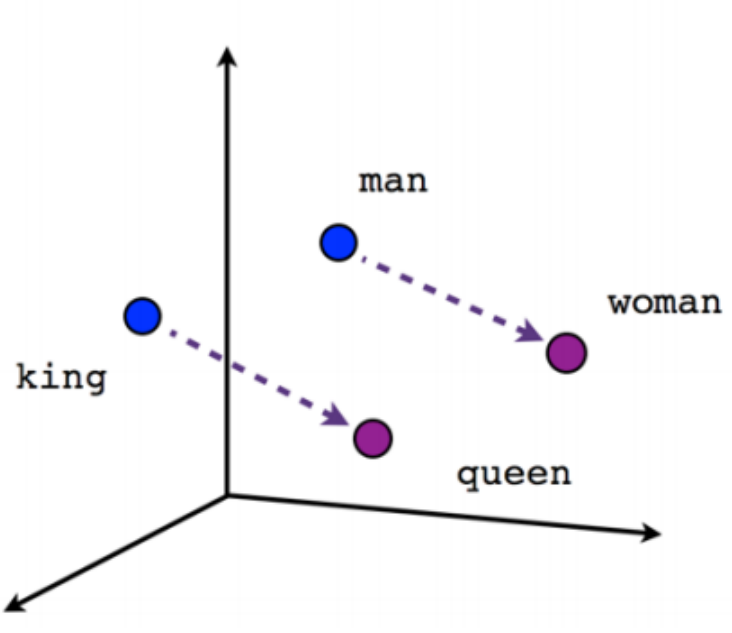
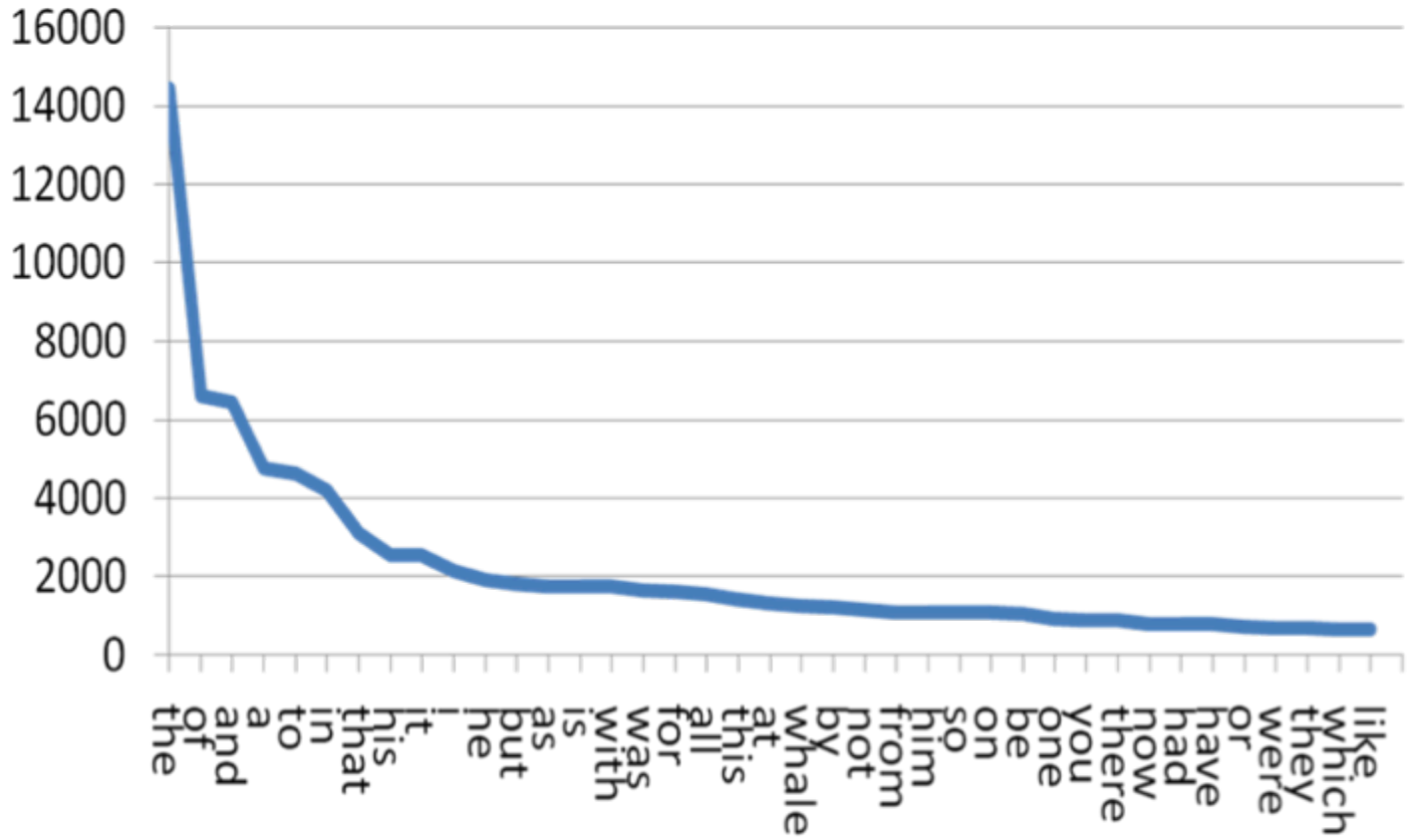




Sources: http://sebastianruder.com/word-embeddings-1/, https://www.tensorflow.org/tutorials/word2vec

Seq2Seq: Language Diversity



Source: https://blogemis.com/2015/09/26/zipfs-law-and-the-math-of-reason/

Seq2Seq: Language Diversity

Input: What are you doing?			
−0.86	I don't know.	−1.09	Get out of here.
−1.03	I don't know!	−1.09	I'm going home.
−1.06	Nothing.	−1.09	Oh my god!
−1.09	Get out of the way.	−1.10	I'm talking to you.
Input: what is your name?			
−0.91	I don't know.	...	
−0.92	I don't know!	−1.55	My name is Robert.
−0.92	I don't know, sir.	−1.58	My name is John.
−0.97	Oh, my god!	−1.59	My name's John.

Source: Li et. al (2016), A Diversity-Promoting Objective Function for Neural Conversation Models

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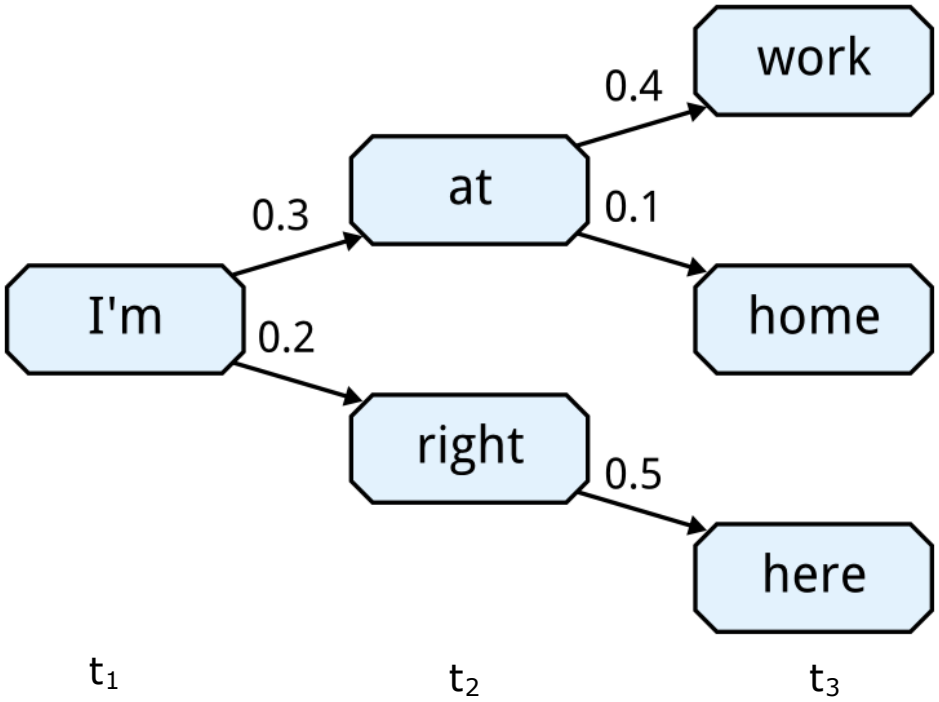
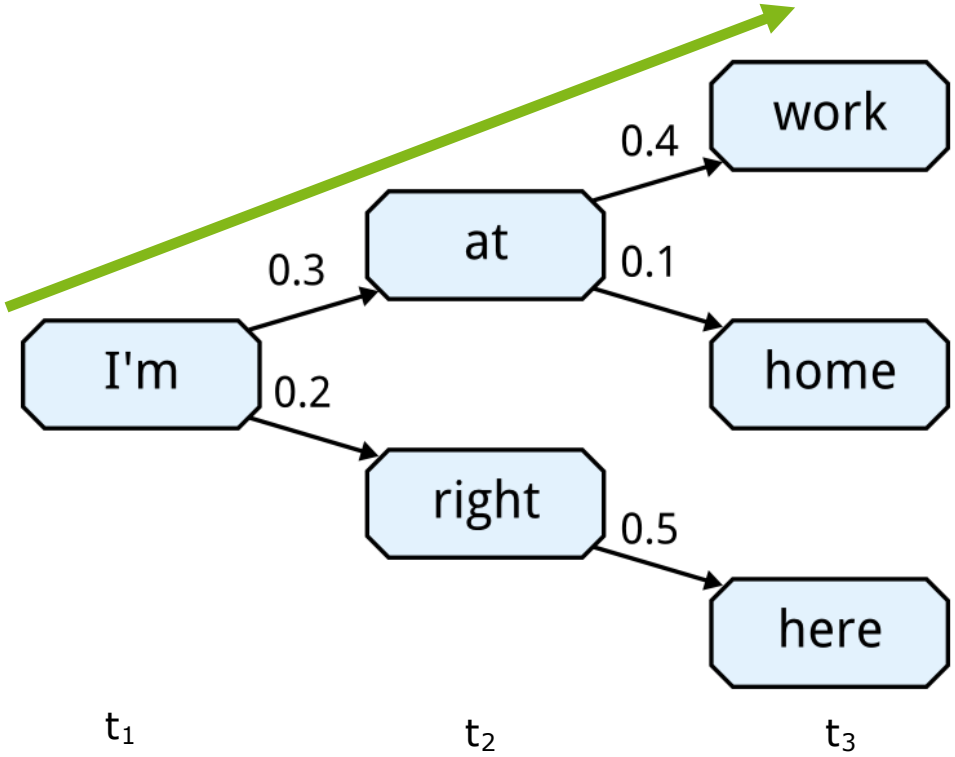


Sources: https://research.googleblog.com/2016/05/chat-smarter-with-allo.html

Seq2Seq: Language Diversity



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Conclusion

- Chatbots are already working for specific tasks in closed domains
  - Mostly rule-based, generative will become more popular in the next years
- Seq2Seq works, but results are still not „production-ready“
- Still a lot of challenges to overcome:
  - Evaluation, Language Models, Context, Personality, ...
- Very active research area with a lot of open questions!

Thanks for the attention! ☺