# Research

## Key words

Conversational agent, Question answering, answer selection, Knowledge discovery

## Context

<https://rajpurkar.github.io/SQuAD-explorer/> (2019) SQuaD

<https://rajpurkar.github.io/mlx/qa-and-squad/>

Historical methods

<https://www.sciencedirect.com/science/article/pii/S2212017313005409> – (2013) NLP-query > shallow learning > pattern matching (intents)

Linguistic dependencies

<https://towardsdatascience.com/building-a-question-answering-system-part-1-9388aadff507> - (2018) - dependency parsing

Hard-coded

AIML, Eliza, pandorabots, watson

## Modern Simple (answer selection)

Shallow learning

Q-A pairs

Intents and variables

simple modern chatbots - discover intents with RNN, pick up variables with regex Combine with directed graph?

<https://www.freecodecamp.org/news/how-i-made-a-smarter-chatbot-with-intents-5e6ad6e0fd71/> (2018) – mapping questions onto intentions, not answers. Then the chatbot can use a dialogue tree.

Two layer – embedding / RNN (GRU vs LSTM) (to include word embeddings?)

<https://www.aclweb.org/anthology/W18-3105> (2018) - building a chatbot for spec selection (answer selection)

<https://www.aclweb.org/anthology/C18-1181> (2018) - deep learning and answer selection

<https://arxiv.org/pdf/1508.01585v2.pdf> (2015) - CNNs in AS.

## Modern architectures (question answering)

## <https://towardsdatascience.com/automatic-question-answering-ac7593432842> (2018) Architectures for general question answering

Attention incorporated

Word embedding - phrase vectorisation - attention - output with corpus like R-Net

<https://towardsdatascience.com/nlp-building-a-question-answering-model-ed0529a68c54> (2018) four-stage ML for question answering inc. Attention

<https://towardsdatascience.com/how-the-current-best-question-answering-model-works-8bbacf375e2a> (2017) Maybe more advanced than this section? R-net

<https://www.microsoft.com/en-us/research/wp-content/uploads/2017/05/r-net.pdf> (2017) r-net

<https://yerevann.github.io/2017/08/25/challenges-of-reproducing-r-net-neural-network-using-keras/> (2017) – reproducing r-net

<https://arxiv.org/abs/1611.01603> (2016) Bi-directional Attention flow for machine comprehension

<https://www.groundai.com/project/a-compare-aggregate-model-for-matching-text-sequences/> (2016) – compare-aggregate model, which incorporates Attention

Transformer

Transformer with corpus like QANets or ‘Attention is all you need’

<https://arxiv.org/abs/1706.03762> (2017) Attention is all you need

<https://web.stanford.edu/class/cs224n/reports/default/15782330.pdf> (2019) Question answering with transformers

<https://towardsdatascience.com/implementing-question-answering-networks-with-cnns-5ae5f08e312b> (2018) QA Nets with CNNs and attentions

Sequence to sequence

more generative though

Fine tuning

Start with a pre-trained model and focus in on your dataset

## Model components

Models

<http://karpathy.github.io/2015/05/21/rnn-effectiveness/> (2015) - RNNs

<https://arxiv.org/pdf/1412.3555v1.pdf> (2014) - compares GRUs to LSTMs

<http://colah.github.io/posts/2015-08-Understanding-LSTMs/> (2015) – understanding LSTMs

<https://medium.com/mlrecipies/deep-learning-basics-gated-recurrent-unit-gru-1d8e9fae7280> (2019) - compare GRUs (less data required) and LSTMs (better utilises more data)

Embeddings

Word2vec, GloVe, sentencepiece

<https://medium.com/@japneet121/word-vectorization-using-glove-76919685ee0b> (2018) - Glove

Vectorisers

BERT, TFIDF, BoW   
<https://medium.com/@paritosh_30025/natural-language-processing-text-data-vectorization-af2520529cf7> (2018) - phrase encodings

<https://towardsdatascience.com/word2vec-for-phrases-learning-embeddings-for-more-than-one-word-727b6cf723cf> (2018) - embedding phrases

<https://ai.googleblog.com/2018/11/open-sourcing-bert-state-of-art-pre.html> (2018) - open sourcing BERT

<https://towardsdatascience.com/denoising-autoencoders-explained-dbb82467fc2> (2017) - de-noising auto-encoders

Attention mechanisms

Output

## Related fields

<https://www.researchgate.net/publication/221020490_Knowledge-Based_Question_Answering> – (2003) knowledge discovery for QA systems