Talk to me, I won't byte

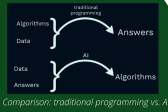## Programming a Conversational Chatbot

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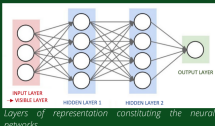Coaches: Siri Kohl, Astrid Romer Bär

theory

The main difference between Artificial Intelligence and traditional programming is the input method: traditional computing requires the programmer to supply the computer with algorithms and data, upon which answers are calculated, whereas AI necessitates some form of input data along with corresponding example answers to independently develops its own algorithms.

Comparison: traditional programming vs. AI

Representation Learning presents the targeted aspects of the program in a favourable manner for the computer; this guides the machine towards relevant information. During this *training phase*, the processor repeatedly creates a model from the acquired knowledge, leading to a purification of the information by means of *Neural Networks*.

Regular Deep Learning models operate in three stages:
1. **Representation**: creates model with neural networks
2. **Evaluation:** analyses the outcome with an indicator of the failure to success rate
3. **Optimization:** targets shortcomings to improve the model as a whole

Layers of representation constituting the neural networks.
(https://www.digitaltrends.com/cool-tech/what-is-an-artificial-neural-network/)

project

data

A readily available dataset of *Reddit* (interactive online platform) comments was used for the following reasons:
- The comments were already structured into parent-child comment-replies
- The dataset contained 1.7 billion comments
- Reddit comments provide casual everyday exchanges, suitable for a conversational chatbot

software

Dealing with a multitude of data demands a Relational Database Management System (here: PostgreSQL) as well as a Database Management Tool (here: DBeaver). These aid in storing and organizing data in tables.
A program was created to build a database, extract and pair up the contents of the comments and separate the data into input and output vectors.
Open Python libraries with TensorFlow were used for the training code.

hardware

In addition to a personal computer, a Google Cloud Virtual Machine with 8 CPUs was rented for the duration of the training phase.

results

A chatbot was successfully created. Even though every input evokes multiple replies, only the answer with the highest score is displayed.

Positive scores (shown in green) are deemed suitable, while negative scores (portrayed in red) are considered unfitting by the chatbot.

```
> are you real?
  Yes, I am real. [13.75]

> are you a robot?
  No, I"m not a robot. [14.5]

> are you human?
  Yes. [12.1]

> how old are you?
  19 [6.8]

> are you a girl or a boy
  I am a girl [8.15]

> what is the meaning of life?
  I think it"s a joke. [14.5]

> is life funny?
  No, it"s not. [13.45]

> so it's a bad joke?
  I think it"s a bad joke. [15.1]
```
An example of an interaction with the chatbot.

Additional features:
- Case-sensitivity as well as different responses to varying punctuation
- Replies to same statements remain consistent within the same session; replies in new sessions (when program is restarted) may differ across sessions
- No access to computational capabilities, merely linguistic analysis and output
- Forming opinions/passing judgement remains a weakness
- Extensive knowledge on Reddit's running jokes and trending witticisms

Scan the QR code for more transcriptions of conversations.

analysis

positives
- A functioning chatbot was created

negatives
- Incoherent replies still occur far too frequently
- Despite large dataset available, only a fragment was successfully implemented
- Working with big files caused massive delays in all processes; costly time investment with recurring crashes
- Ensuring compatibility and correct configurations proved difficult
- Hardware used wasn't optimal; neural network training would benefit from GPU over CPU use

future possibilities
- Augmenting used dataset
- Comparing different types of datasets; may result in chatbots with different personalities
- Improving hardware

... to reach the ultimate goal of AI: becoming indistinguishable from humans