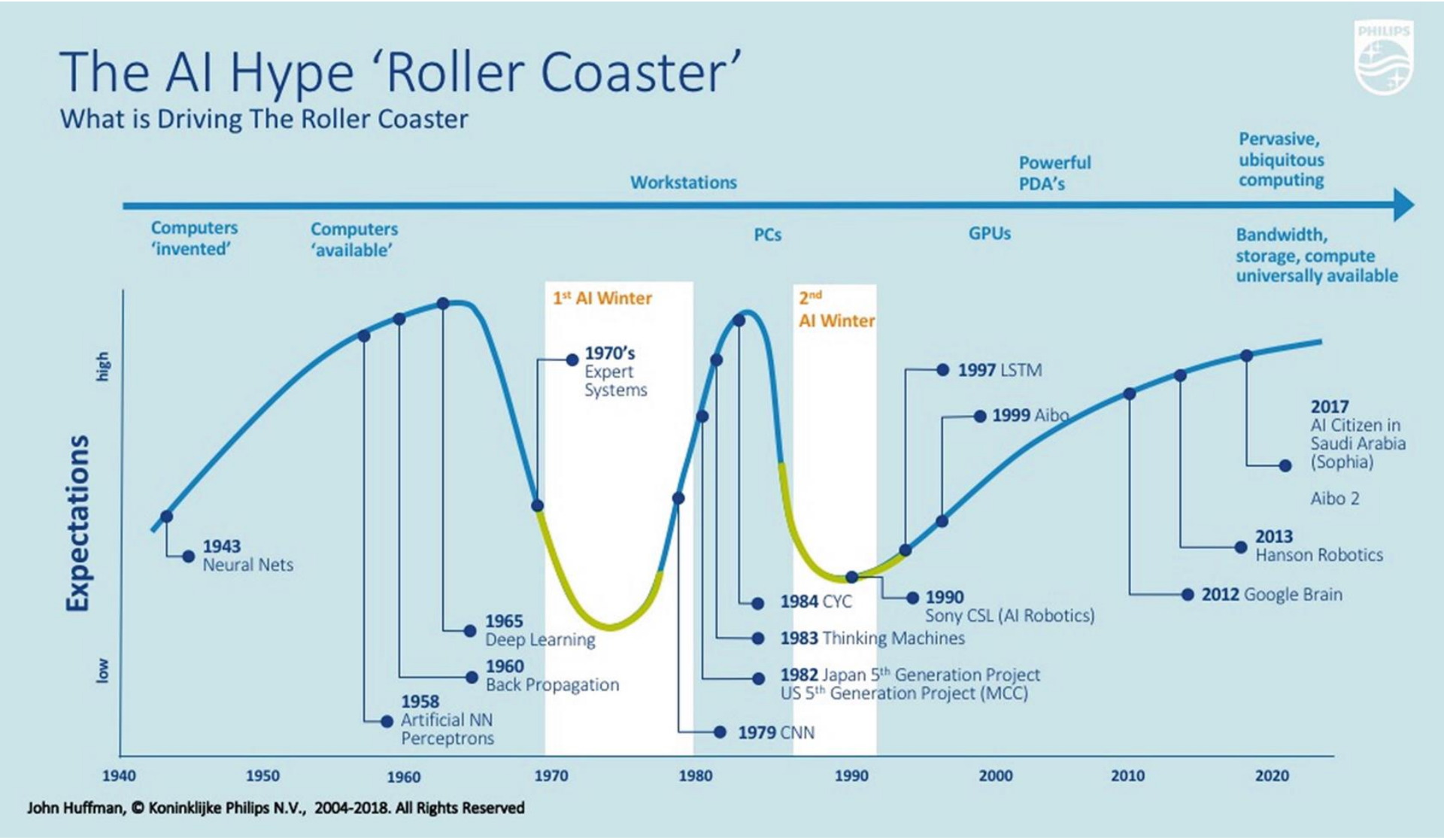
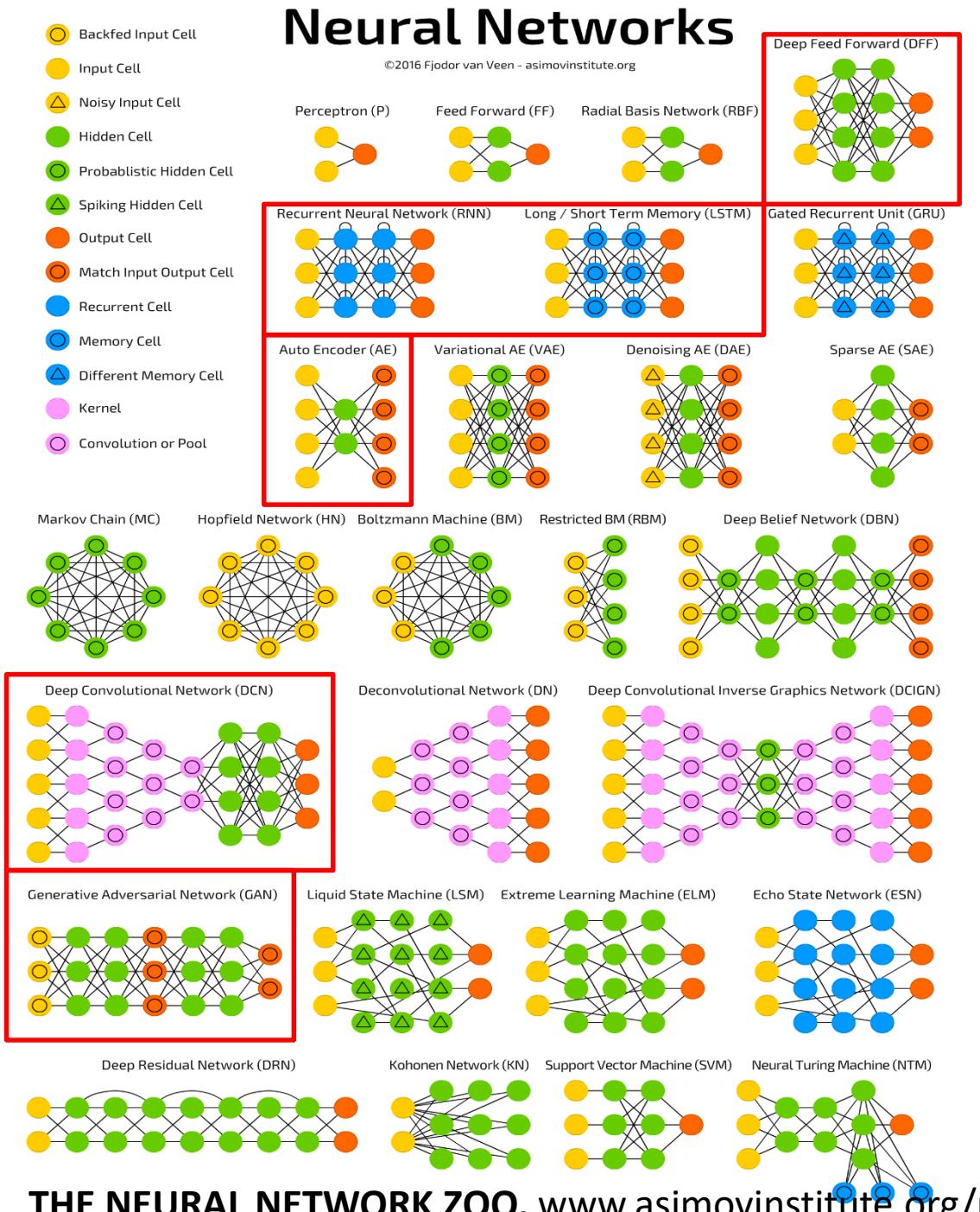
Vitalik Buterin: Change whole Industries?





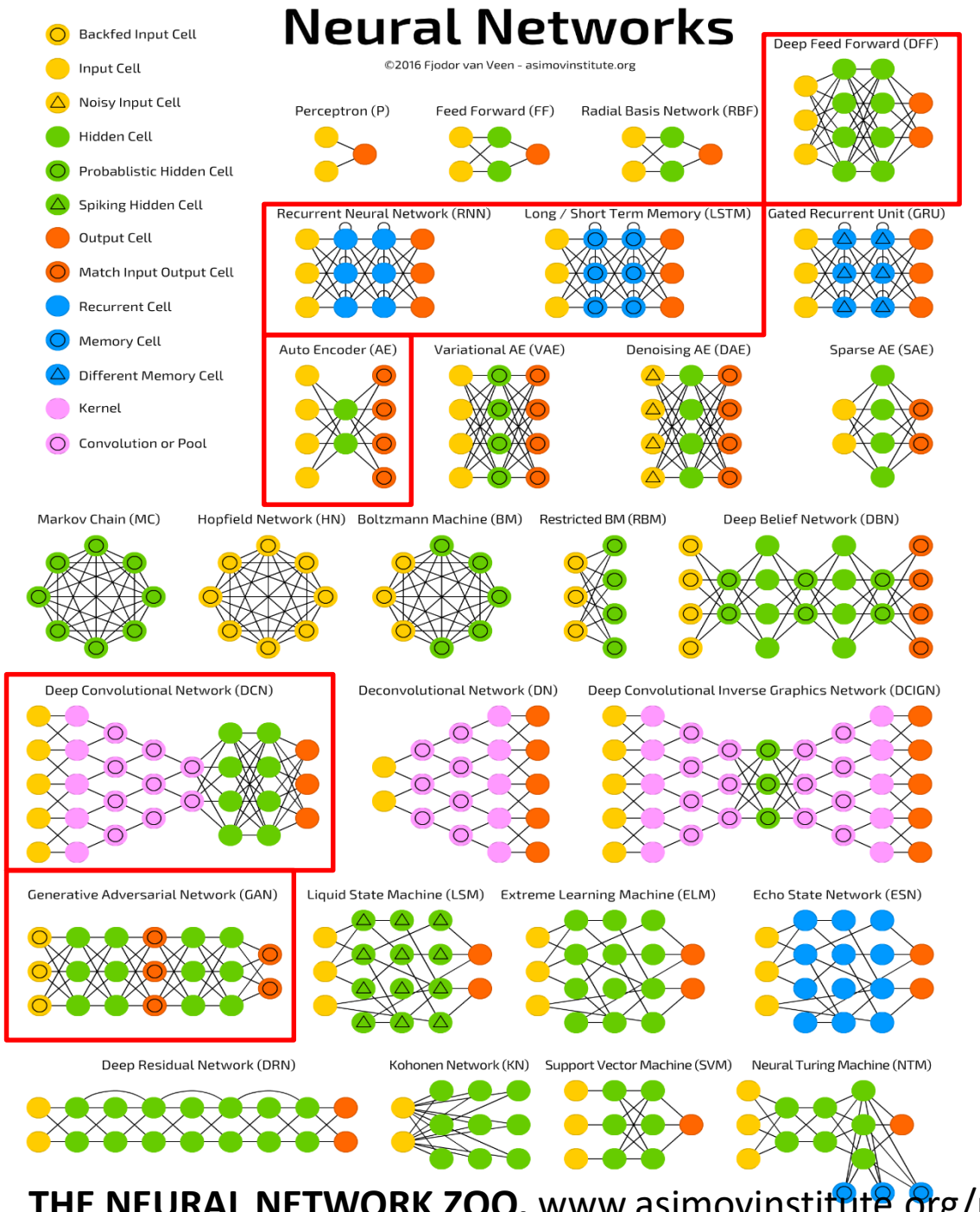
Neuronale Netze stellen einen zentralen **Baustein** für **Deep Learning** dar.

Im Laufe der Jahre wurden zahlreiche **Architekturen** für Neuronale Netze entwickelt.

Die Wahl der **Architektur** hängt von der **Datenstruktur**, den **Dateninhalten** und der **Aufgabenstellung** ab.

Aktuell wichtige Klassen sind u.a. **Convolutional Neural Networks (CNN)**, **Recurrent Neural Networks (RNN)**, **Autoencoder**, **Generative Adverserial Networks (GAN)**.

THE NEURAL NETWORK ZOO, www.asimovinstitute.org/neural-network-zoo/



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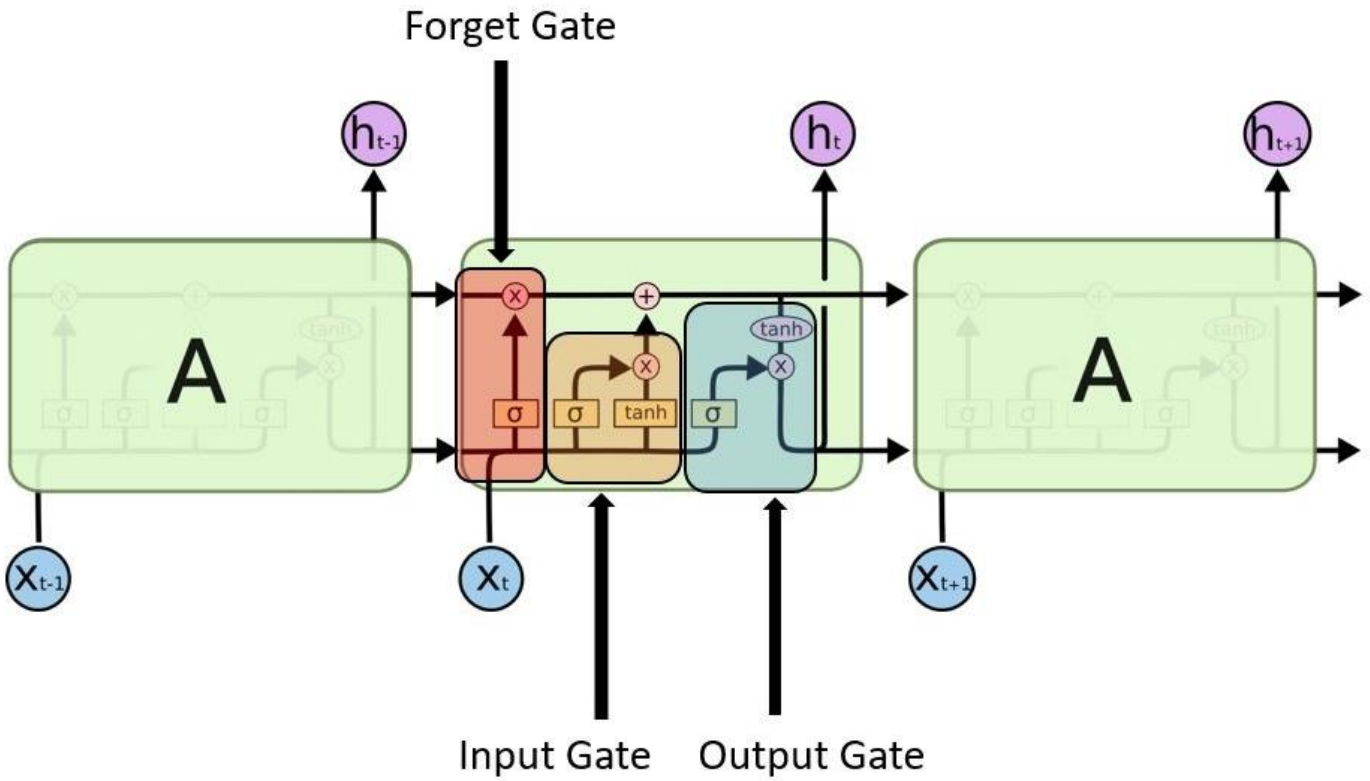
Kernidee Long-Short Term Memory (LSTM)

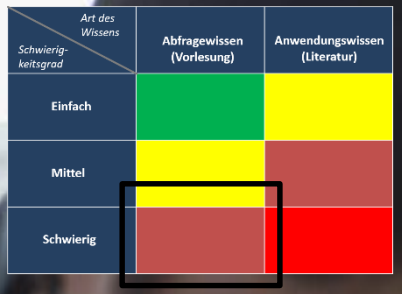


LSTMs haben im Gegensatz zu **RNN** ein **Kurzzeit-** und ein **Langzeitgedächtnis**.

Ein **LSTM** enthält drei sogenannte **Gates**.
Das **Forget Gate** steuert, was **vergessen** werden soll.
Das **Input Gate** bearbeitet, was **gemerkt** werden soll.
Das **Output Gate** steuert, was **weitergegeben** werden soll.

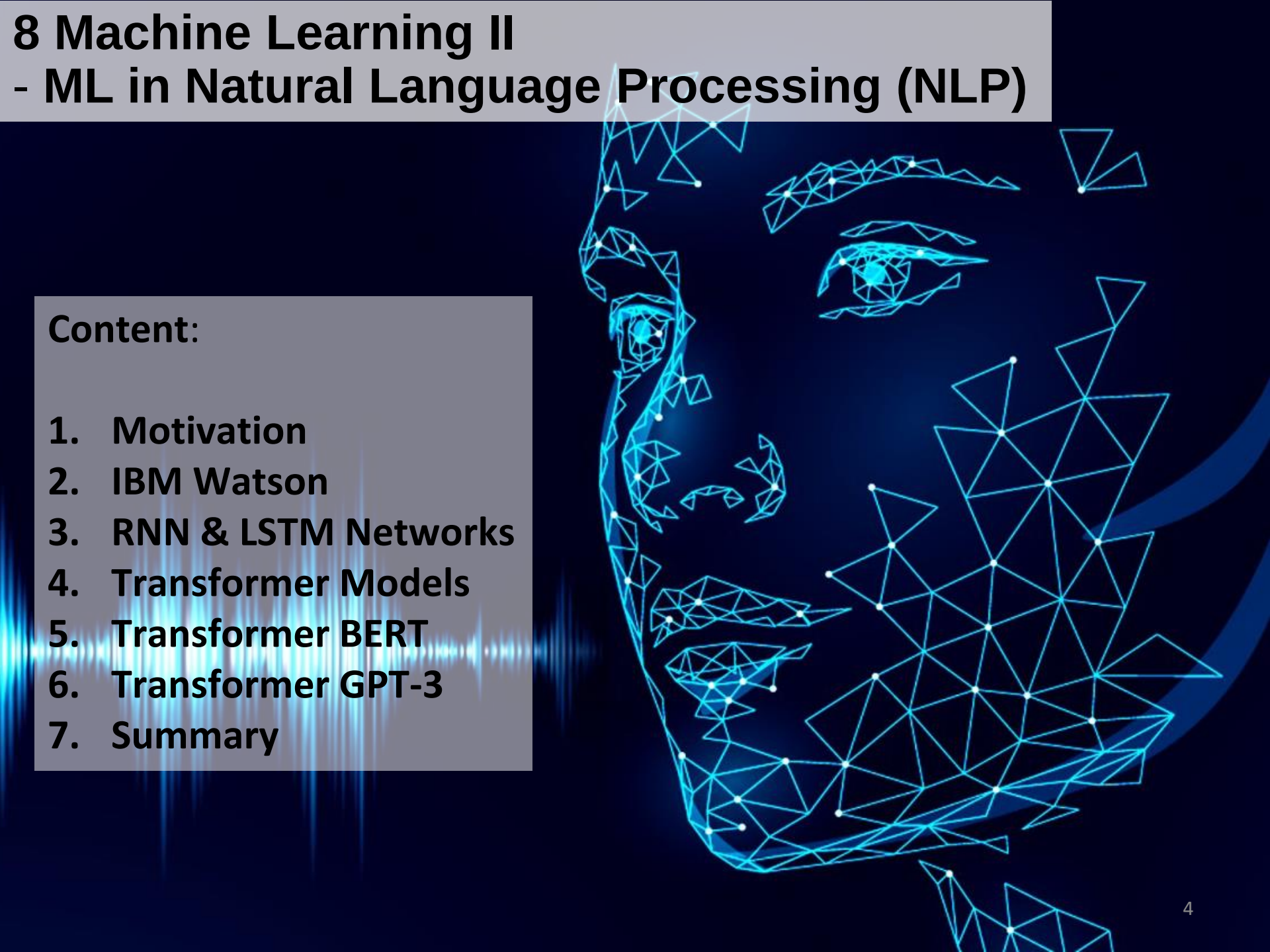
Es gibt auch **Gated Recurrent Units** (GRUs).

For Text Generation with LSTM, the Neural Network takes a ___ as Input. The Output will be a _____ for each Word from Dictionary.



a) Image| Sequence of Word
b) Number of Words | Matrix of Probability
c) Meaning of Words | Sequence of Word
d) Sequence of Words | Matrix of Probability
e) Matrix of Probability| Sequence of Words

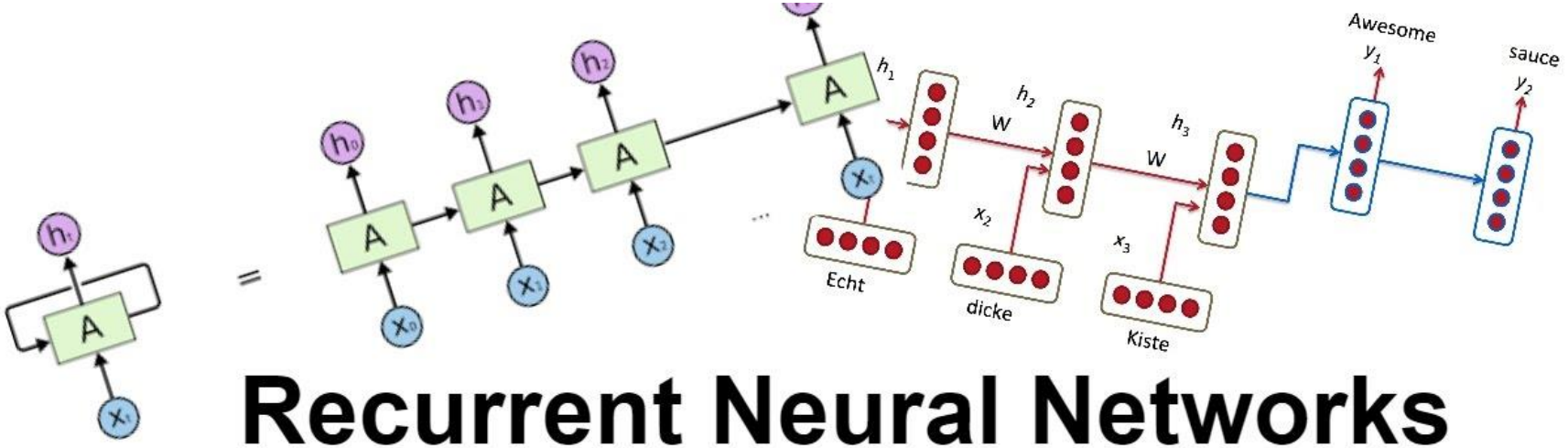
8 Machine Learning II
- ML in Natural Language Processing (NLP)



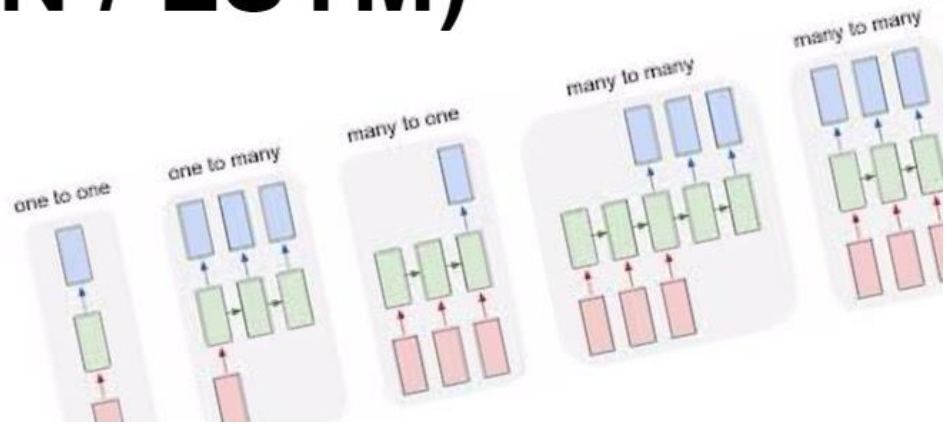
Content:

1. Motivation
2. IBM Watson
3. RNN & LSTM Networks
4. Transformer Models
5. Transformer BERT
6. Transformer GPT-3
7. Summary

3. RNN & LSTM Networks



Recurrent Neural Networks (RNN / LSTM)



Michael Amberg

Todays Content:

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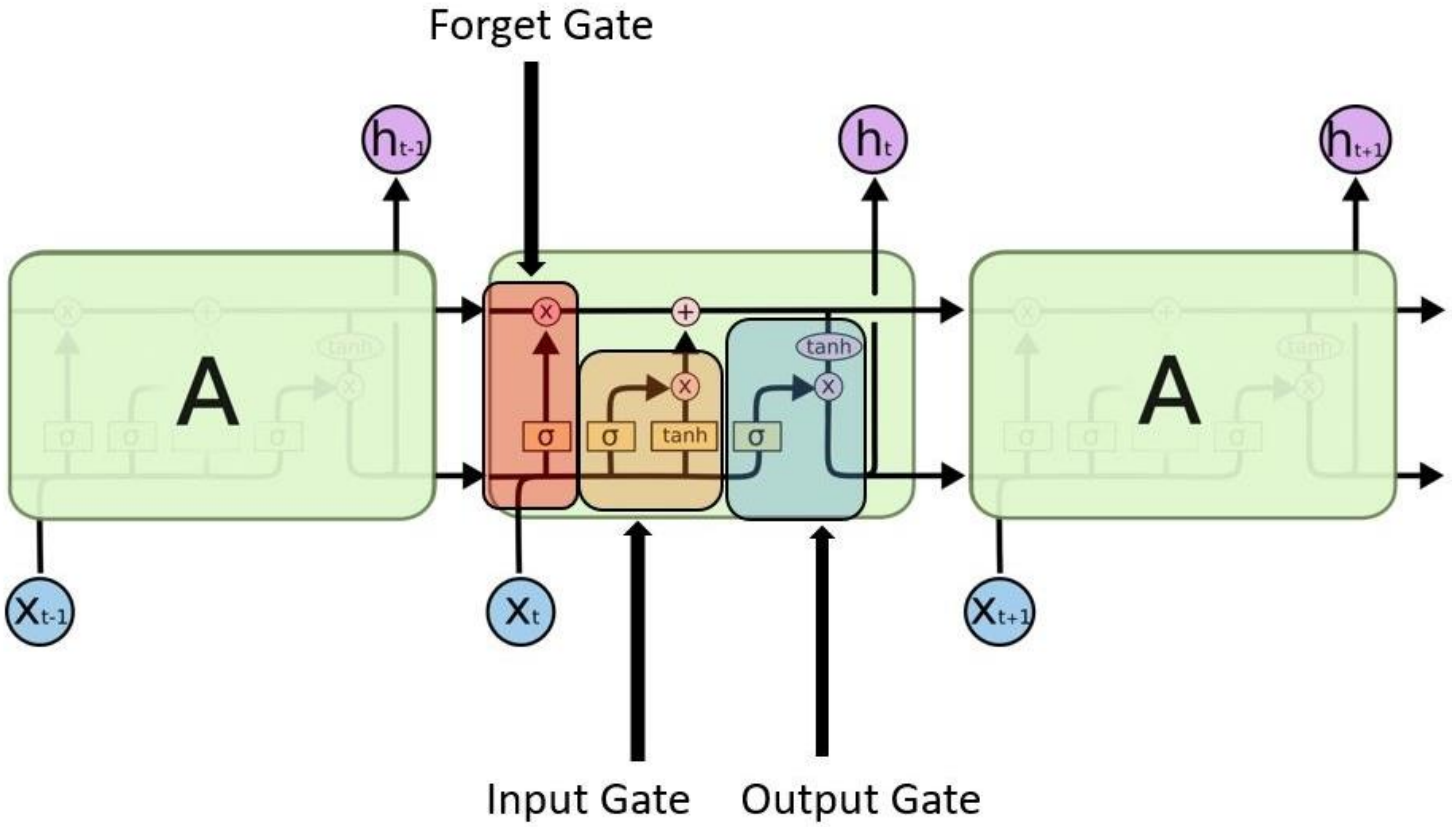
Kernidee Long-Short Term Memory (LSTM)



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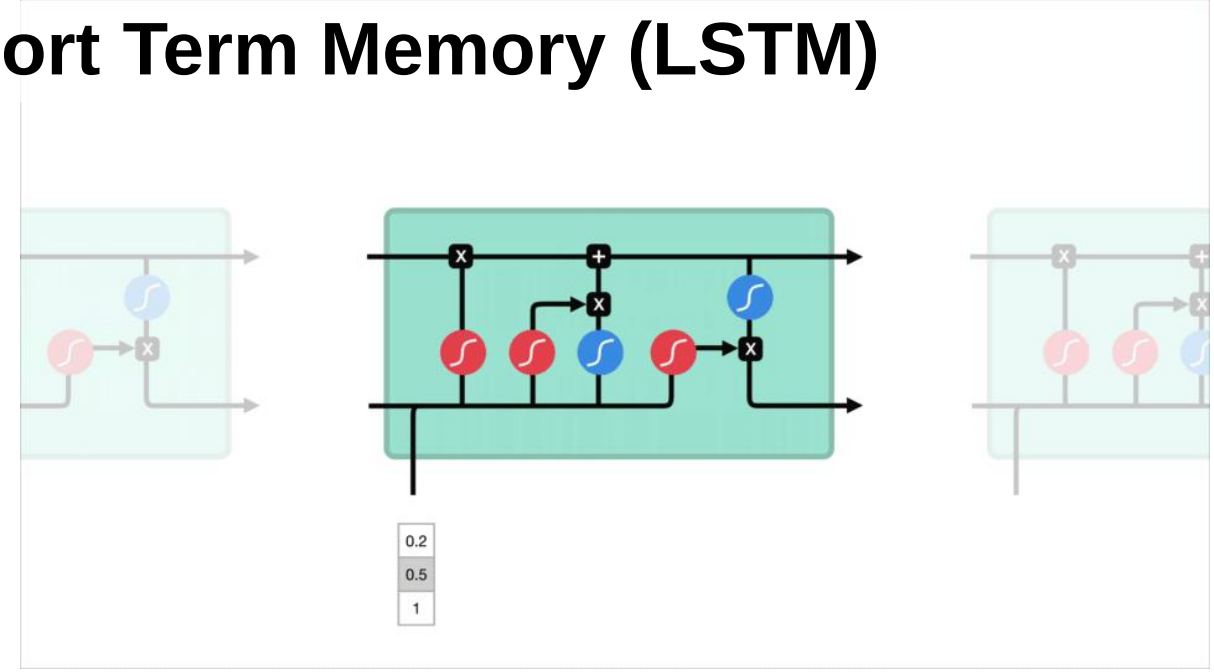
Es gibt verschiedene Arten von **LSTM-Architekturen**.

Long-Short Term Memory (LSTM)



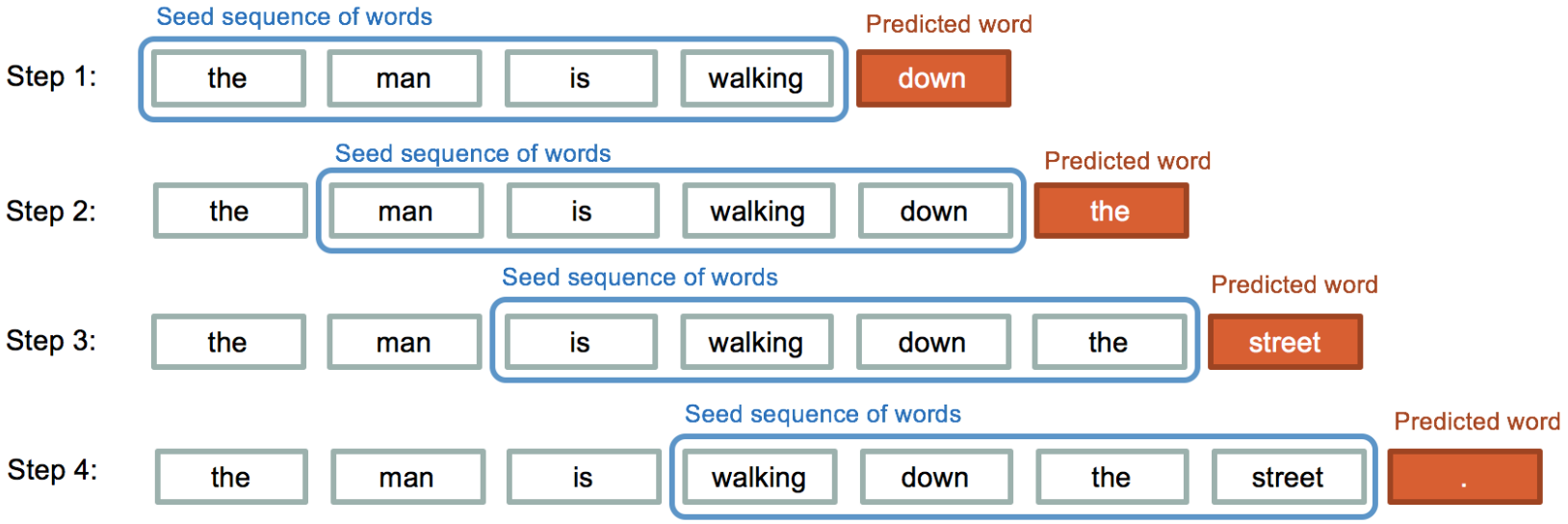
Laut **Wikipedia**: Seit etwa 2016 setzen **große Technologieunternehmen** wie **Google**, **Apple** und **Microsoft LSTM** als **grundlegende Komponente** ein.

So verwendete **Google** beispielsweise **LSTM** für die **Spracherkennung** auf dem **Smartphone**, für den **Smart Assistant Allo** und für **Google Translate**.

Apple verwendet **LSTM** für die **„Quicktype“-Funktion** auf dem **iPhone** und für **Siri**.

Amazon verwendet **LSTM** für **Amazon Alexa**.

Textgenerierung mit RNN und LSTM



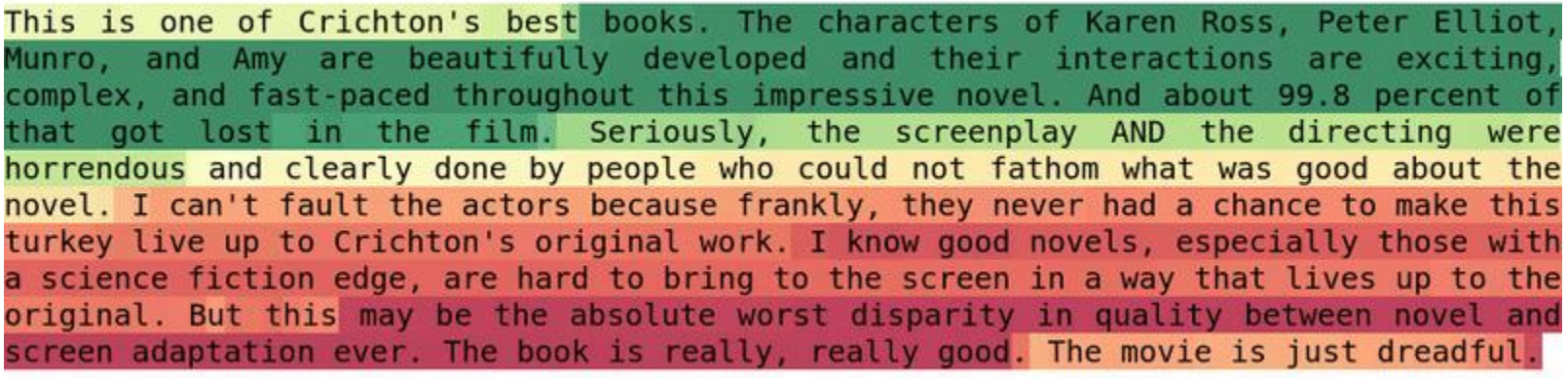
The **phrases** in **text** are nothing but **sequence** of **words**. So, LSTM can be used to **predict the next word**. The neural network take **sequence of words** as **input** and **output** will be a **matrix of probability** for **each word** from **dictionary** to be next of given sequence. The model will also learn how much **similarity** is between each words or characters and will calculate the probability of each.
Using that we will **predict** or **generate next word** or character of sequence.

Text Generation Using LSTM, 2020
bansalh944.medium.com/text-generation-using-lstm-b6ced8629b03

OpenAI: Sentimentanalyse mit LSTM

We first **trained** a **multiplicative LSTM** with **4,096 units** on a corpus of **82 million Amazon reviews** to **predict the next character** in a chunk of text. **Training** took **one month** across **four NVIDIA Pascal GPUs**, with our model **processing 12,500 characters per second**.

The **diagram** below represents the **character-by-character value** of the **sentiment neuron**, displaying **negative values** as **red** and **positive values** as **green**.
Note that **strongly indicative words** like "***best***" or "***horrendous***" cause particularly **big shifts in the color**.



Unsupervised Sentiment Neuron, 2017
openai.com/blog/unsupervised-sentiment-neuron/

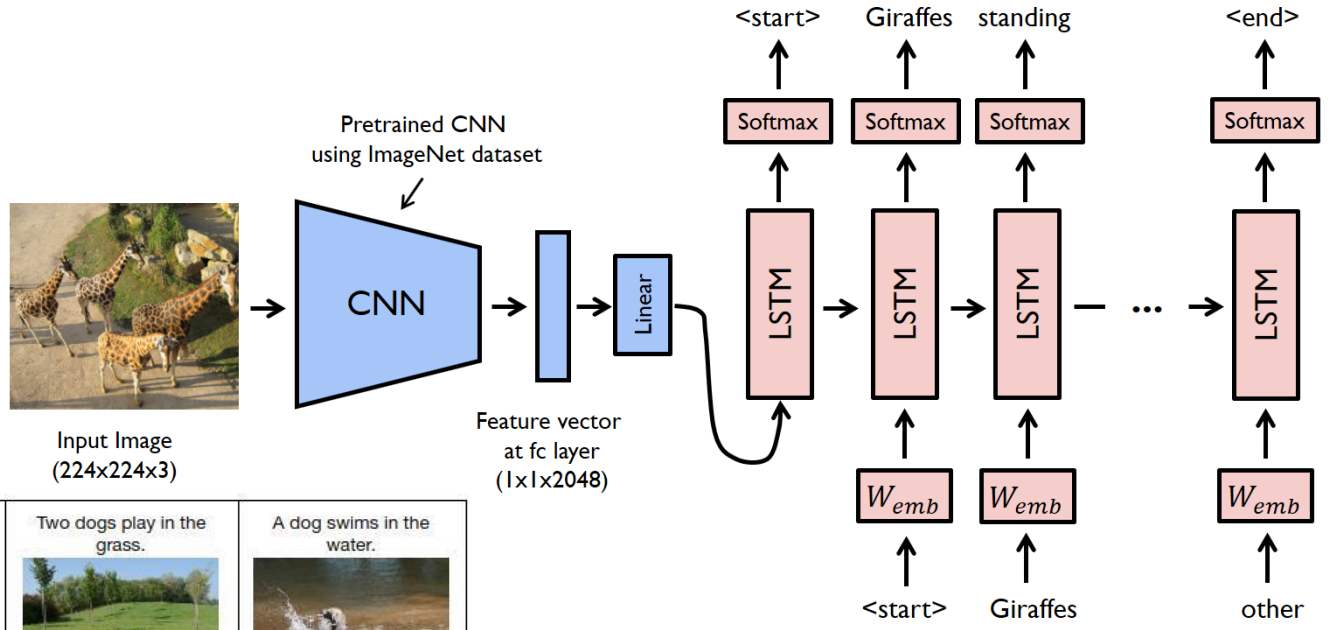
OpenAI: Sentimentanalyse mit LSTM

Examples of **synthetic text generated** by the trained model.
Below, **selected random samples** from the model after fixing the sentiment unit's value to determine the **sentiment of the review**.

SENTIMENT FIXED TO POSITIVE	SENTIMENT FIXED TO NEGATIVE
Just what I was looking for. Nice fitted pants, exactly matched seam to color contrast with other pants I own. Highly recommended and also very happy!	The package received was blank and has no barcode. A waste of time and money.
This product does what it is supposed to. I always keep three of these in my kitchen just in case ever I need a replacement cord.	Great little item. Hard to put on the crib without some kind of embellishment. My guess is just like the screw kind of attachment I had.
Best hammock ever! Stays in place and holds it's shape. Comfy (I love the deep neon pictures on it), and looks so cute.	They didn't fit either. Straight high sticks at the end. On par with other buds I have. Lesson learned to avoid.
Dixie is getting her Doolittle newsletter we'll see another new one coming out next year. Great stuff. And, here's the contents - information that we hardly know about or forget.	great product but no seller. couldn't ascertain a cause. Broken product. I am a prolific consumer of this company all the time.
I love this weapons look . Like I said beautiful !!! I recommend it to all. Would suggest this to many roleplayers, And I stronge to get them for every one I know. A must watch for any man who love Chess!	Like the cover, Fits good. . However, an annoying rear piece like garbage should be out of this one. I bought this hoping it would help with a huge pull down my back & the black just doesn't stay. Scrap off everytime I use it.... Very disappointed.

Unsupervised Sentiment Neuron, 2017
openai.com/blog/unsupervised-sentiment-neuron/

Kombinierter Einsatz von RNN und LSTM



RNN und **LSTM** können auch mit **Feed-Forward-Netze** (z.B. **Convolutional Neural Networks)** kombiniert werden. Sie bringen damit „**Memory**“ hinein.

Anwendungen sind z.B.:
Textuelle Beschreibung von Bildern (**Image Captioning**) oder Automatische Generierung von Untertiteln (**Video Captioning**).

Generierung von Musik mit RNN und LSTM

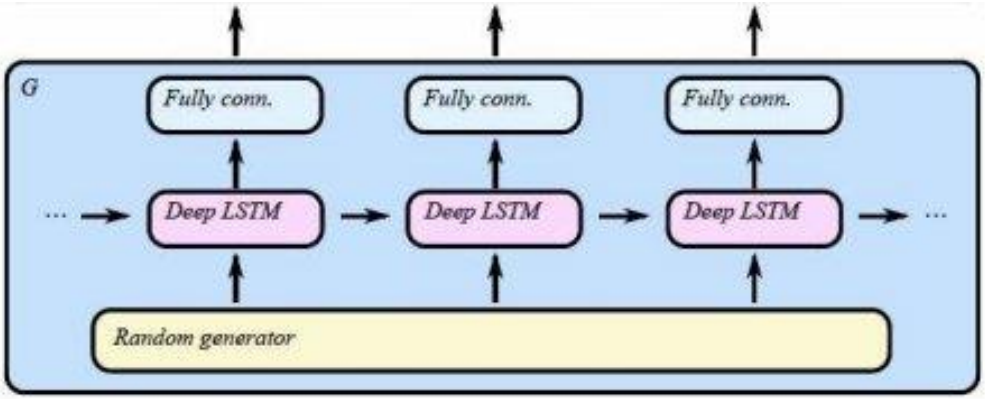


Fig. 7.27 C-RNN-GAN architecture.

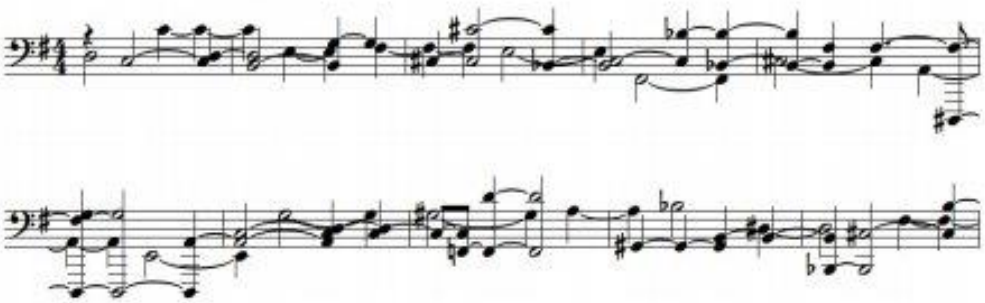


Fig. 7.28 C-RNN-GAN generated examples.

Musik ist auch eine Sequenz (Sequence). Mit RNN und LSTMs kann man Musik generieren.

Music Composition using Recurrent Neural Networks
web.stanford.edu/class/archive/cs/cs224n/cs224n.1174/reports/2762076.pdf

RNN & LSTM Summary: Sequence to Sequence