Neural Networks: II. Recurrent NN (Part 8)

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Motivation

- Before: "simple" Input $\rightarrow$ "simple" Output
- Now:
  - Stock Market Analysis (Time Series)
  - Google Translate
  - describing a photo with words

Motivation

S&P 500

Recurrent Neuron

$$h_t = f(h_{t-1}, x_t; W), \quad t = 1, \ldots, T$$

- h_t: New hidden state
- f: Activation function (same for all t)
- h_{t-1}: Old hidden state
- x_t: Input at some time t
- W: Weights (same for all t)

$\rightsquigarrow$ Output: $y_t = y_t(h_{t_y})$

"many to one"

$x_1, \ldots, x_T \rightarrow y_T$ (e.g. Stock Market Analysis)

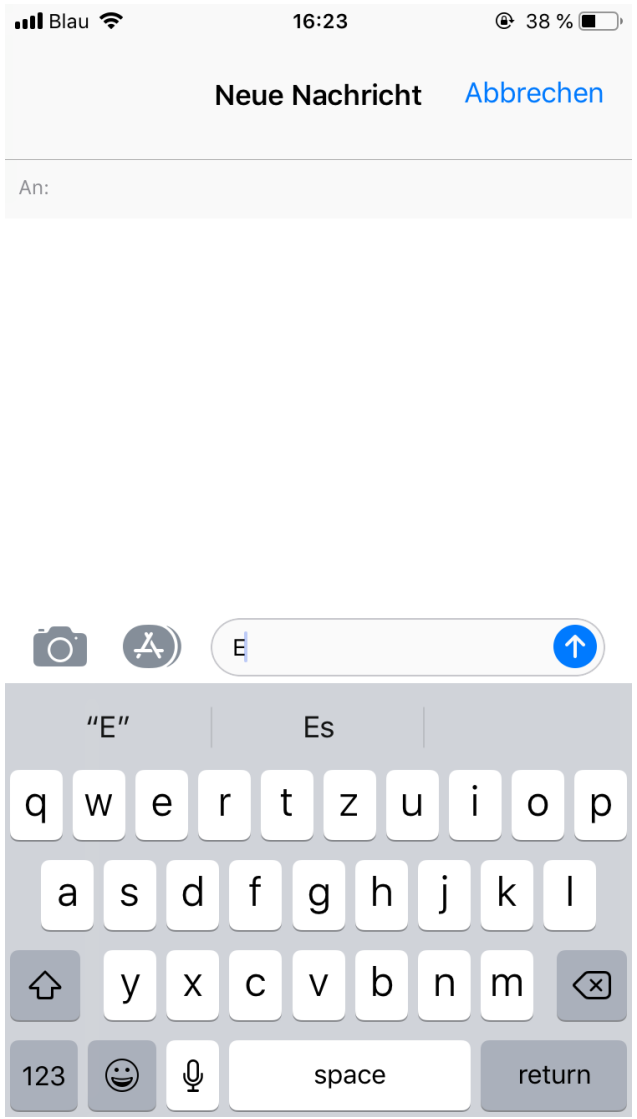
”many to many”

$x_1, \ldots, x_T \rightarrow y_1, \ldots, y_T$ (e.g. Google Translate, texting a SMS)

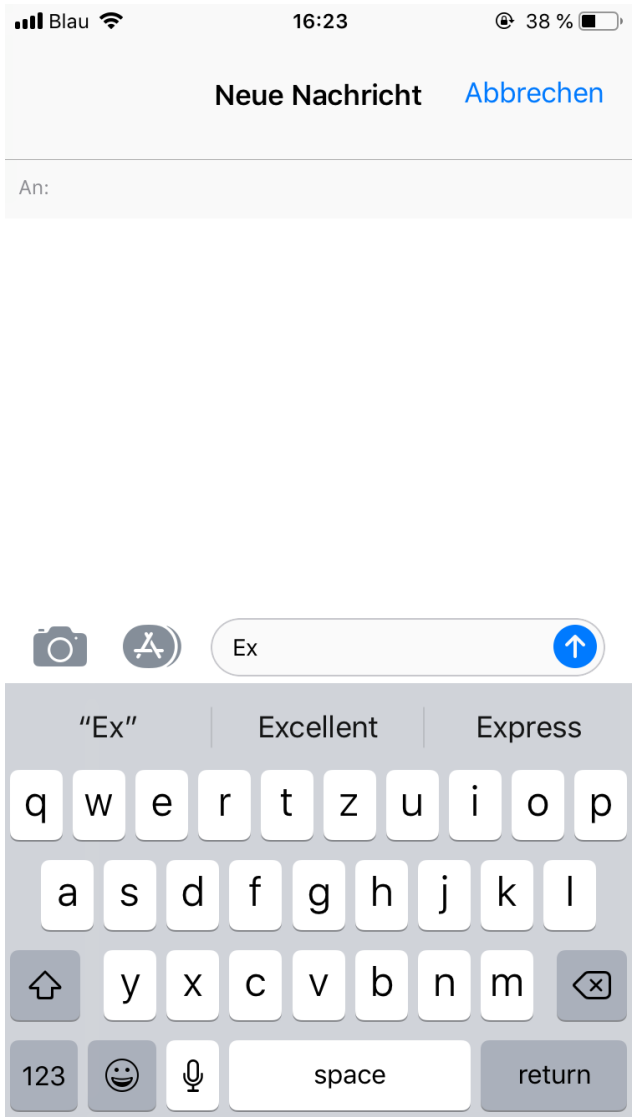
Example: Google Translate

"Gestern habe ich mit meinem Nachbarn im Garten Fußball ~~gespielt~~ geschaut"

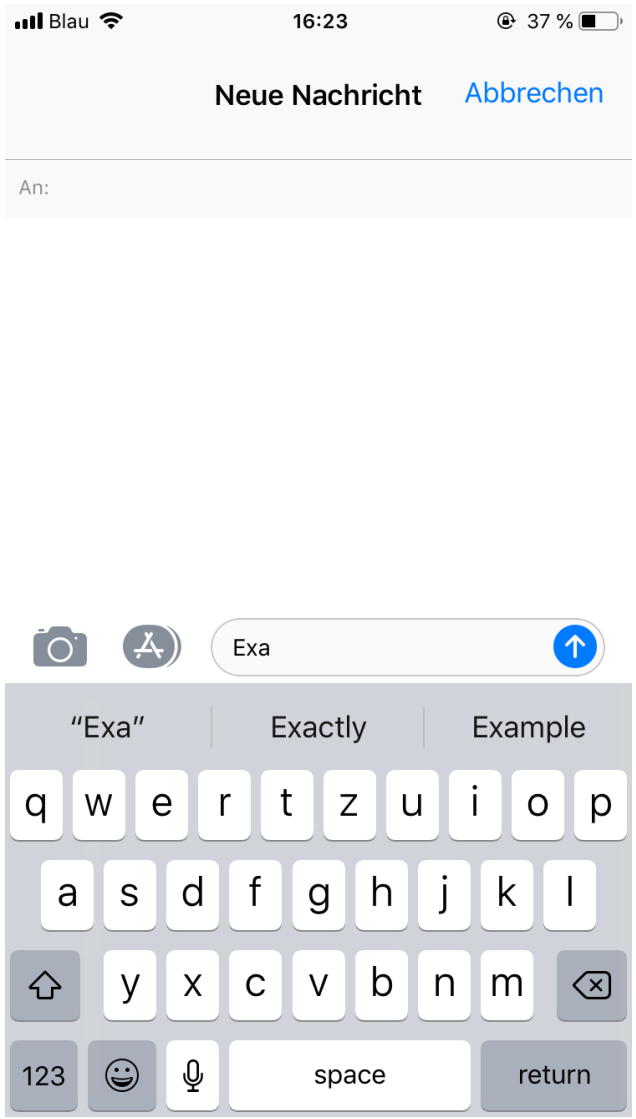
Example: Texting "Example"



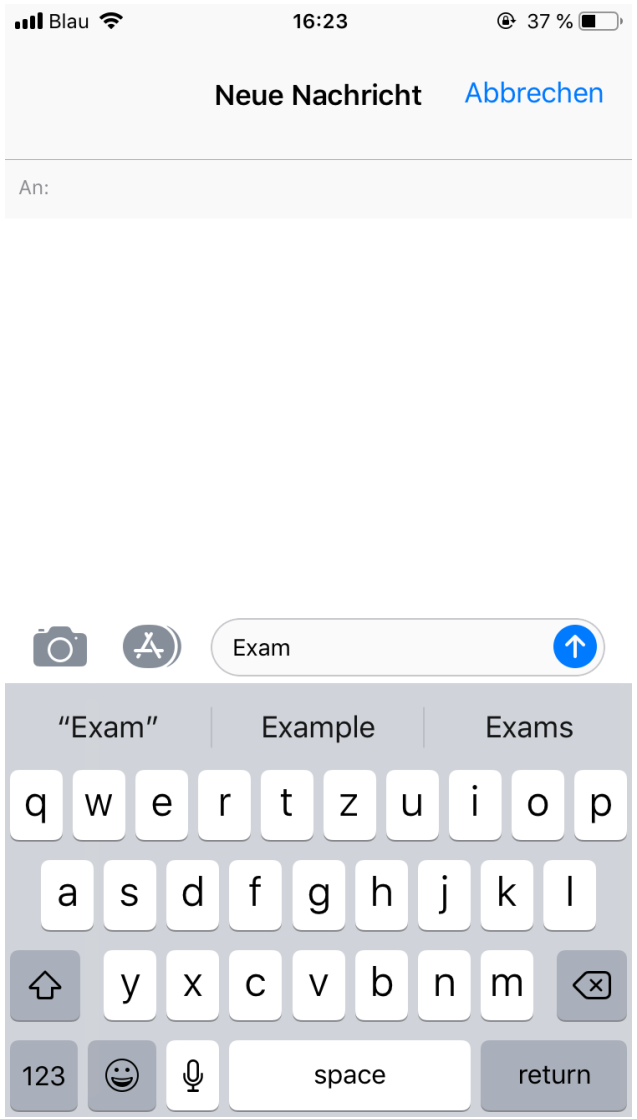
Example: Texting "Example"



Example: Texting "Example"



Example: Texting "Example"



"one to many"

$x_1 \rightarrow y_1, \ldots, y_T$ (e.g. Describing a photo)

Example: Describing a photo

Backpropagation

What about Backpropagation? $\rightsquigarrow$ truncated Backpropagation in time

- feed forward in time "forever"
- backprop for only some small step t_p
- t_p is a hyperparamater chosen to be computational efficient

Clowning

- Neural Joke Generation (He Ren, Quan Yang)
- Generating Sequences With Recurrent Neural Networks (Graves)
- "Sunspring" film