Interacting with Artificial Intelligence Part 2

University of Oslo, 2019

Dr. Morten Goodwin

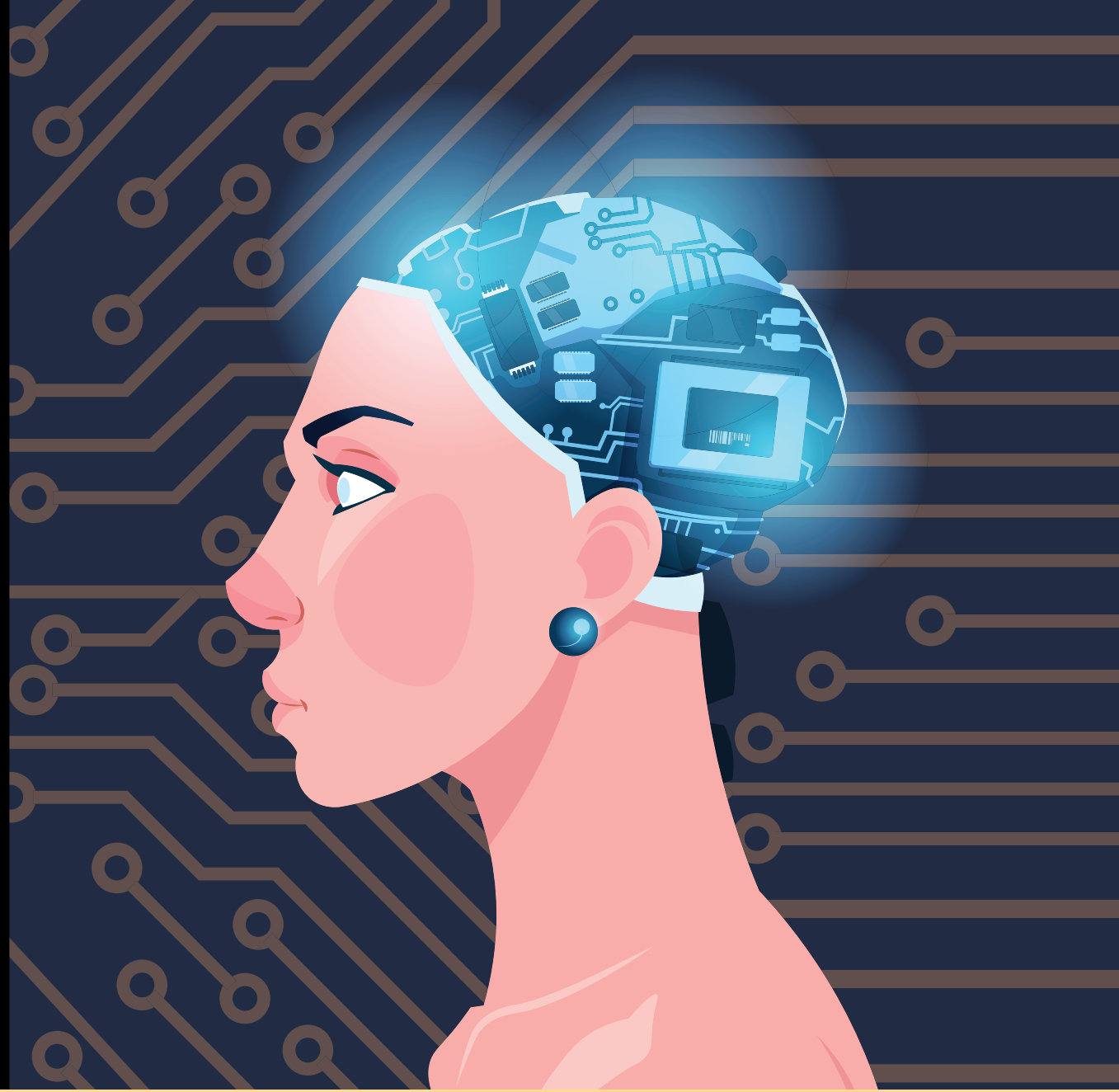
Agenda

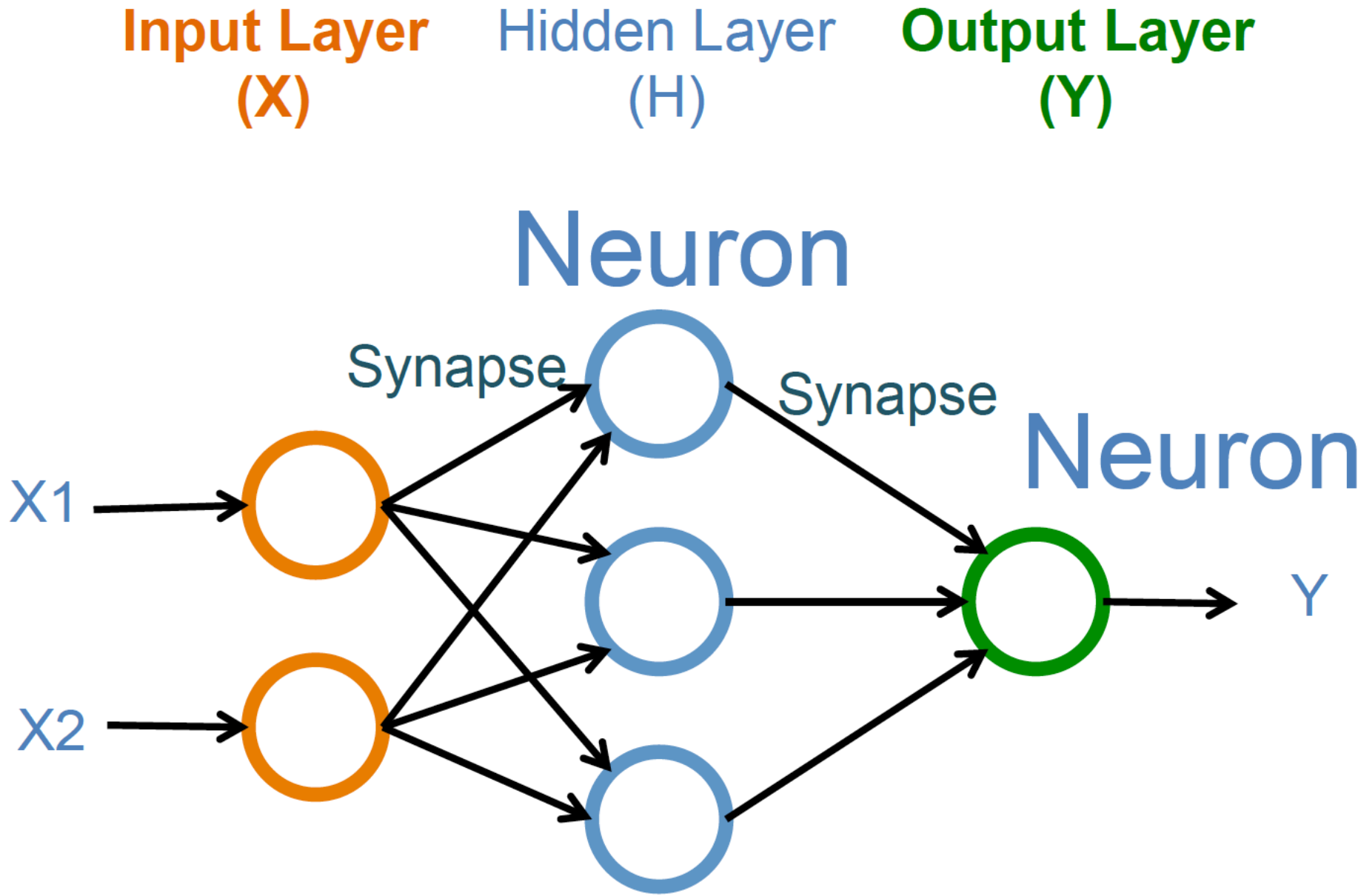
Day 1:

1. Introduction to Artificial Intelligence and Deep Learning
2. Create a classifier
3. Create a AI-based chatbot

Day 2:

1. Create a generative chatbot
2. Present your chatbot



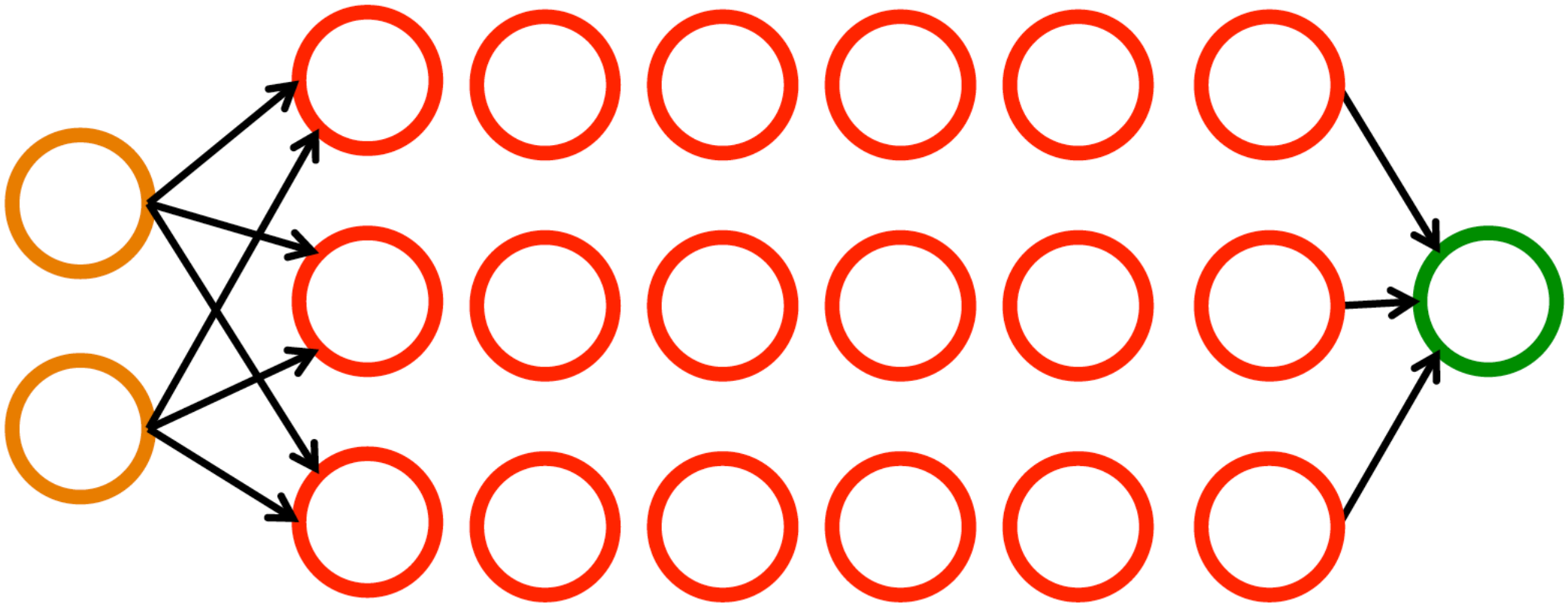

Input Layer
(X)
Hidden Layer
(H)
Output Layer
(Y)
Neuron
Synapse
Synapse
Neuron
X1
X2
Y

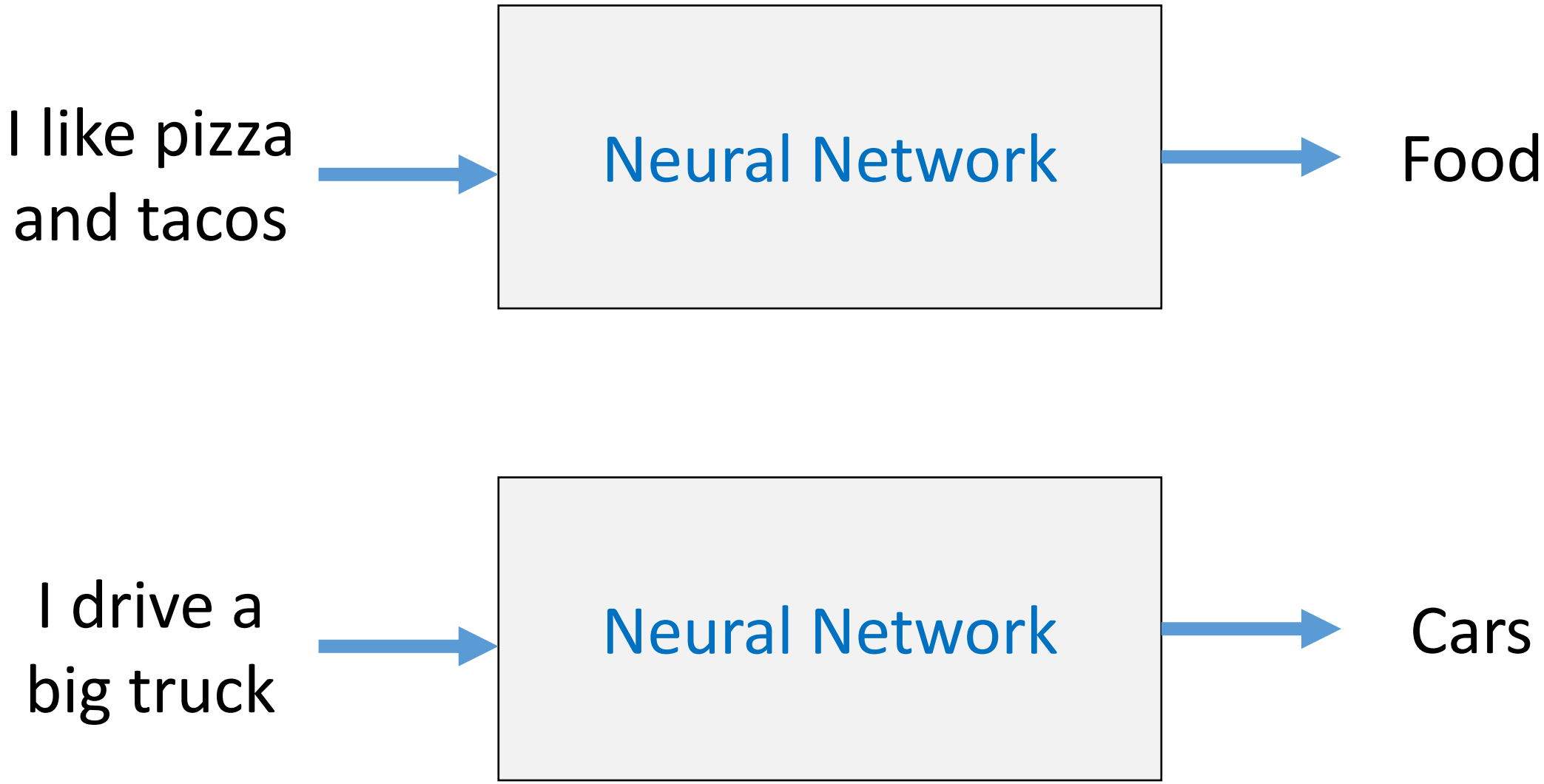
Input Layer
(X)

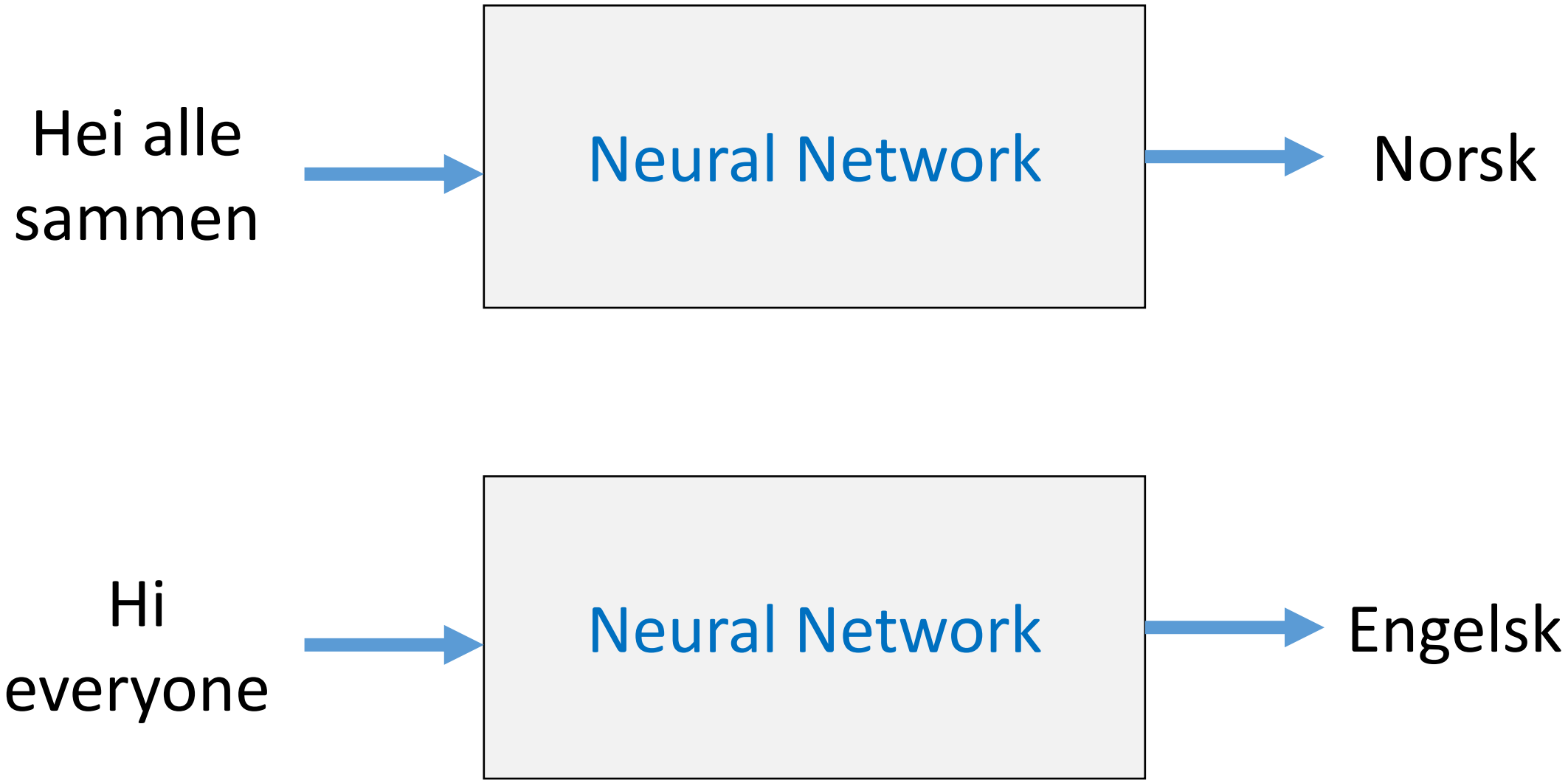
Hidden Layers
(H)

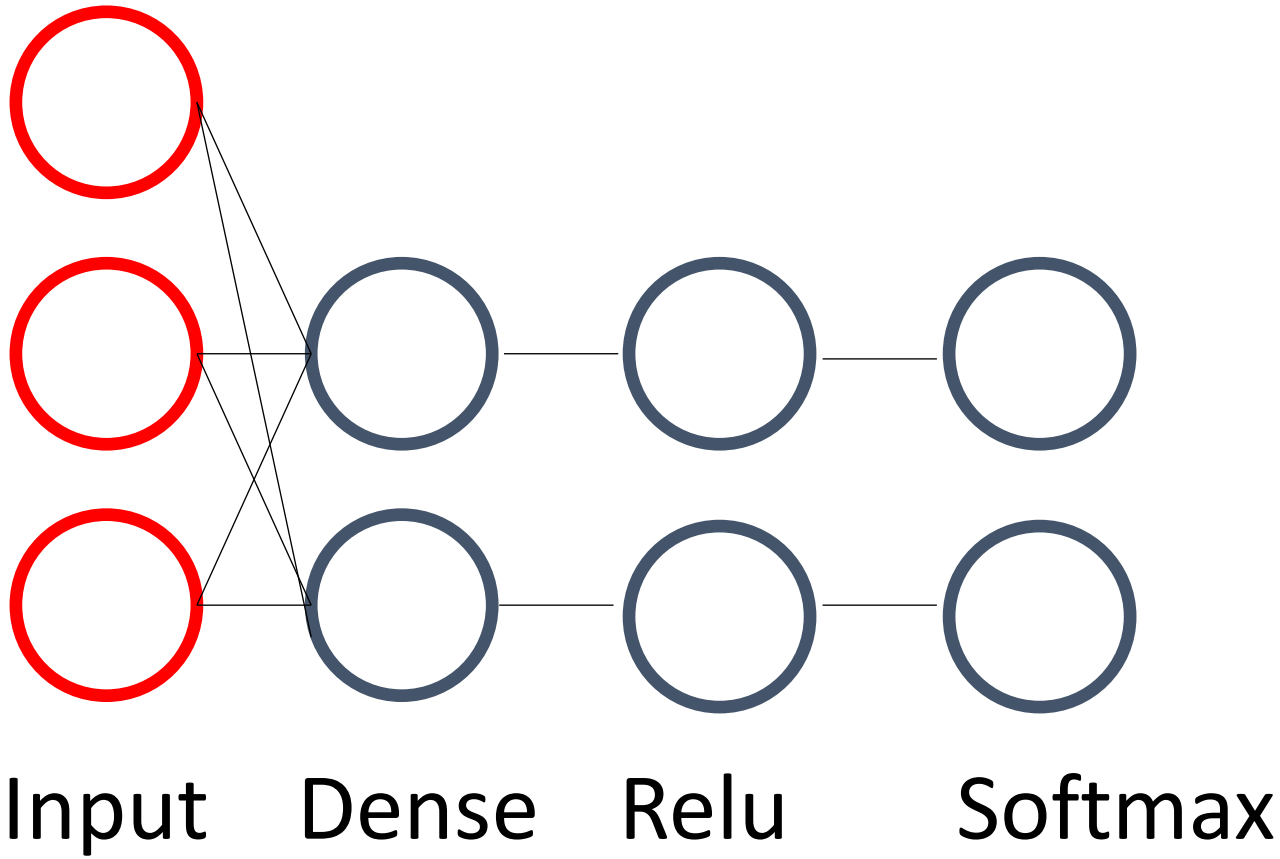
Output Layer
(Y)

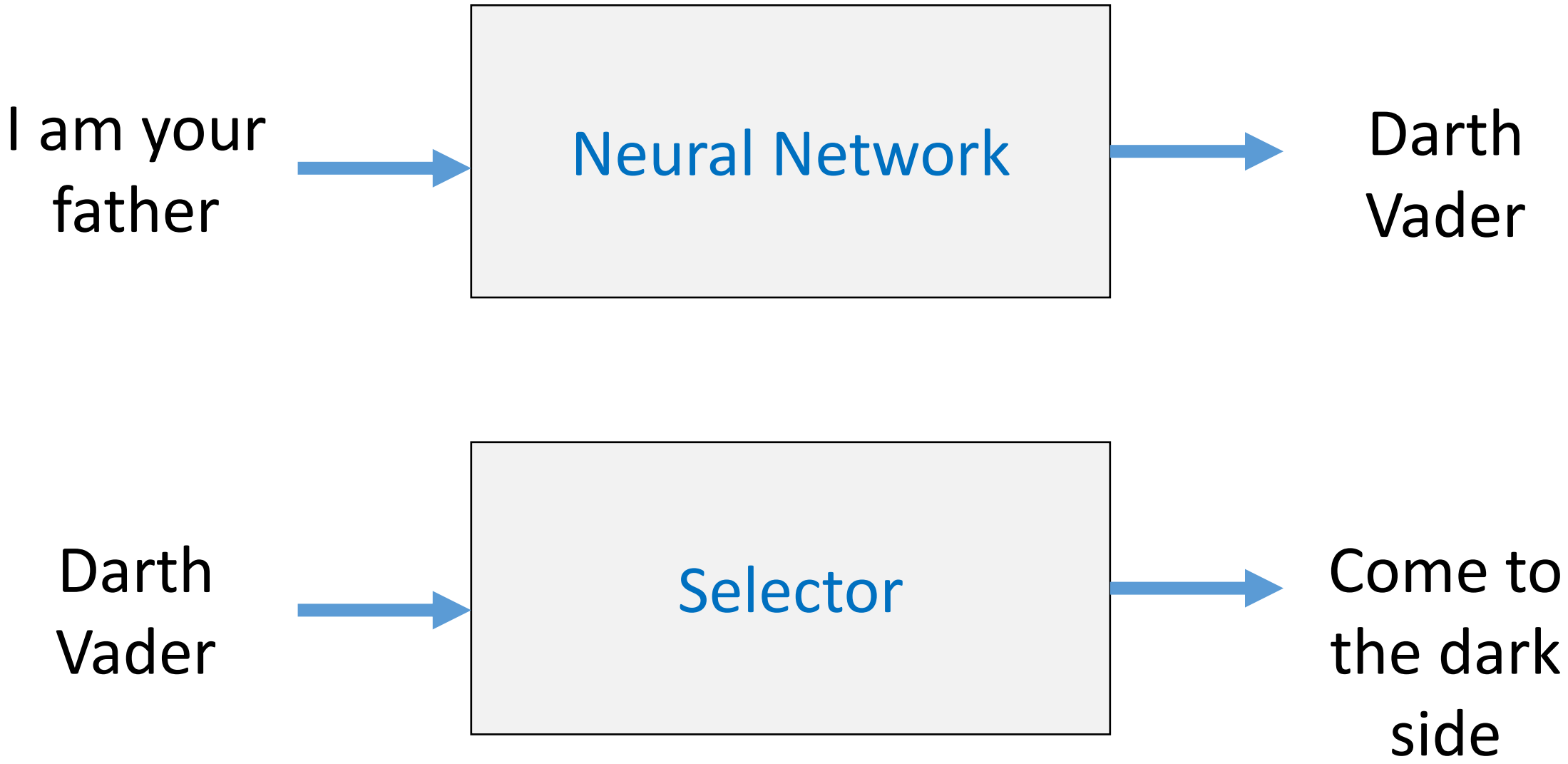
Deep Neural Networks
Deep Learning




I like pizza and tacos
Neural Network
Food
I drive a big truck
Neural Network
Cars


Hei alle sammen
Neural Network
Norsk
Hi everyone
Neural Network
Engelsk


Input
Dense
Relu
Softmax


I am your father
Neural Network
Darth Vader
Darth Vader
Selector
Come to the dark side

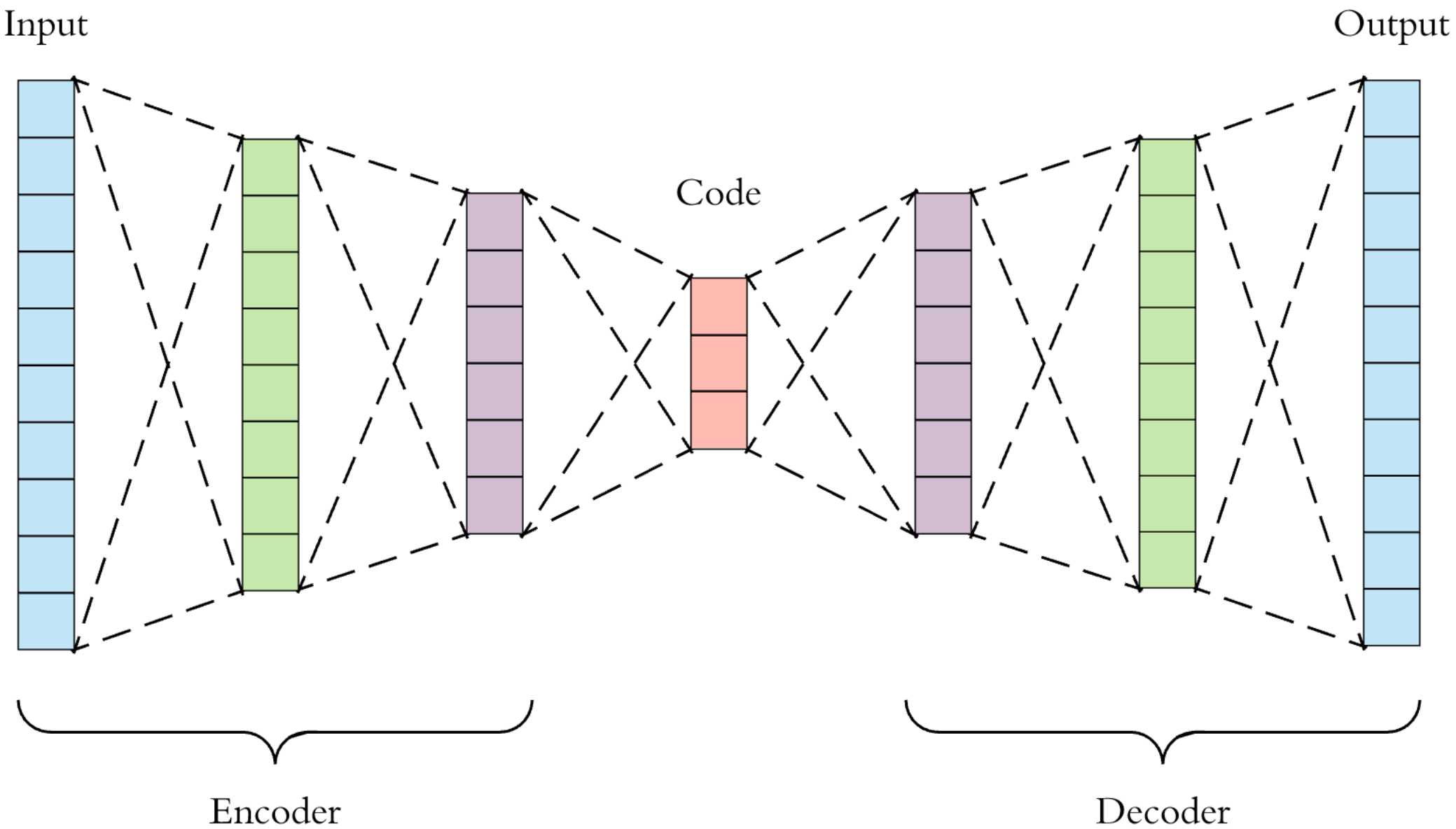
Curse of dimensionality. Any suggestions?

Stemming

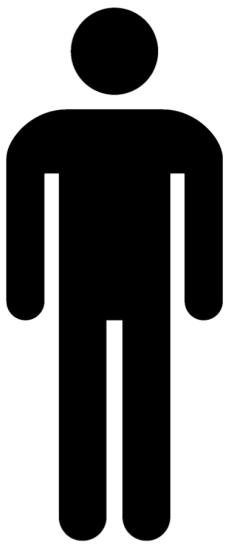
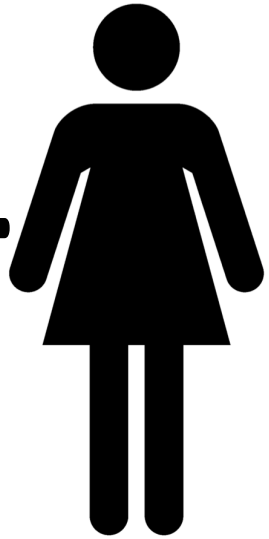
Cars	Car
Running	Run
Runs	Run
Agder	Agder
Elections	Elect

Stemming

- >>> from nltk.stem import *
- >>> words = ["elections","cars","car","sheep","fish"]
- >>> stemmer = PorterStemmer()
- >>> stemmer.stem("elections")
- 'elect'
- >>> singles = [stemmer.stem(i) for i in words]
- >>> singles
- ['elect', 'car', 'car', 'sheep', 'fish']


Input
Output
Code
Encoder
Decoder

Konge

\-  +  =

Mann

Kvinne

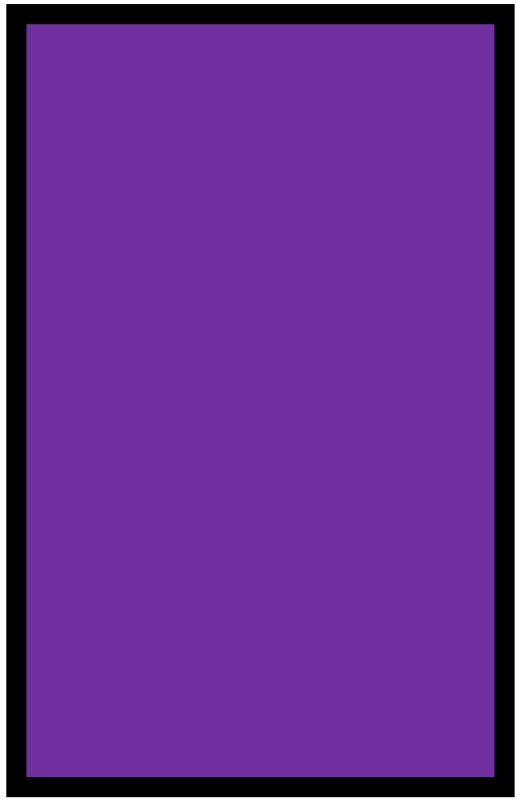
Paris

Frankrike

Japan

Eple

+



Lilla

=

Kylling

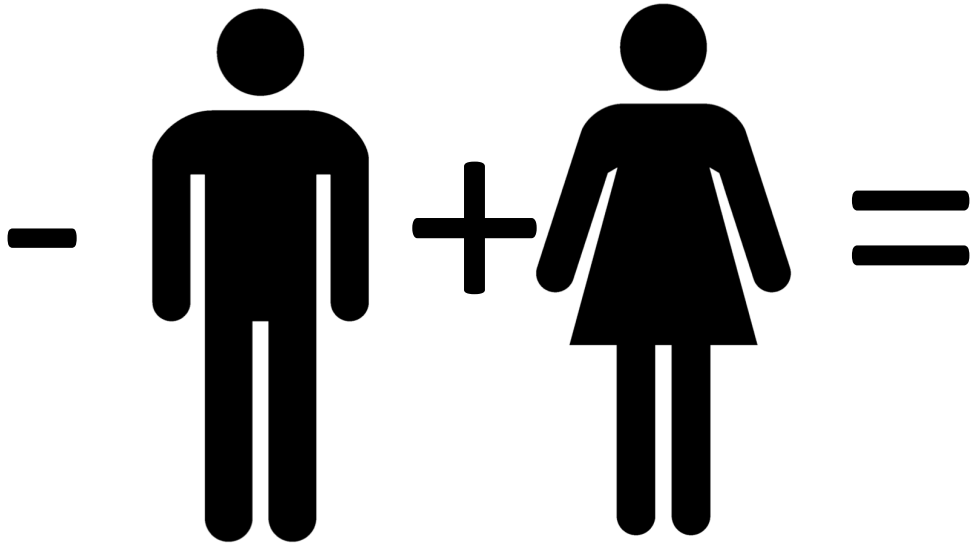
+


Dan Sukker
THE ORIGINAL SINCE 1872
STRÖSOCKER
SUKKER
TALOUSSOKERI
Sockerbeta
Sukkerroe
Sokerijuurikas
(Beta vulgaris)

Søt

=

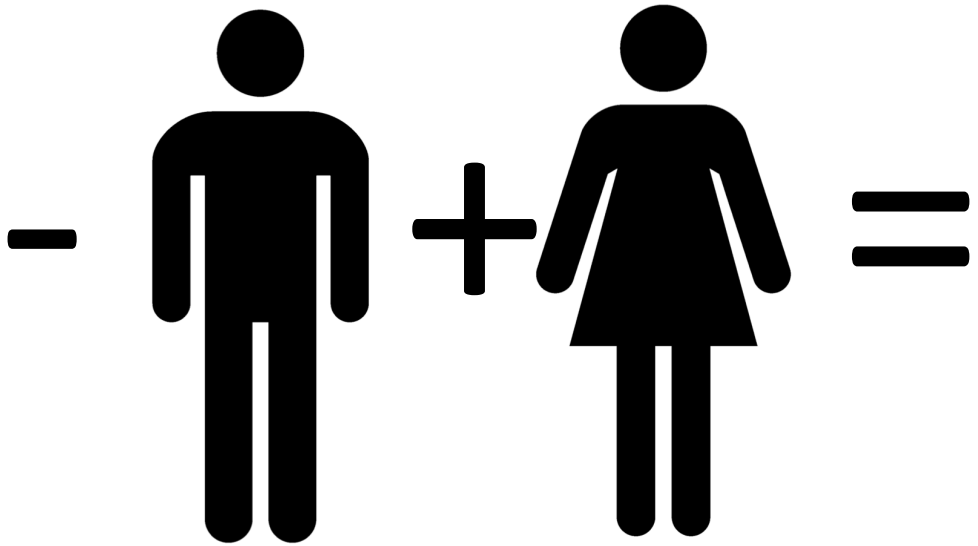
Kirurg



Mann

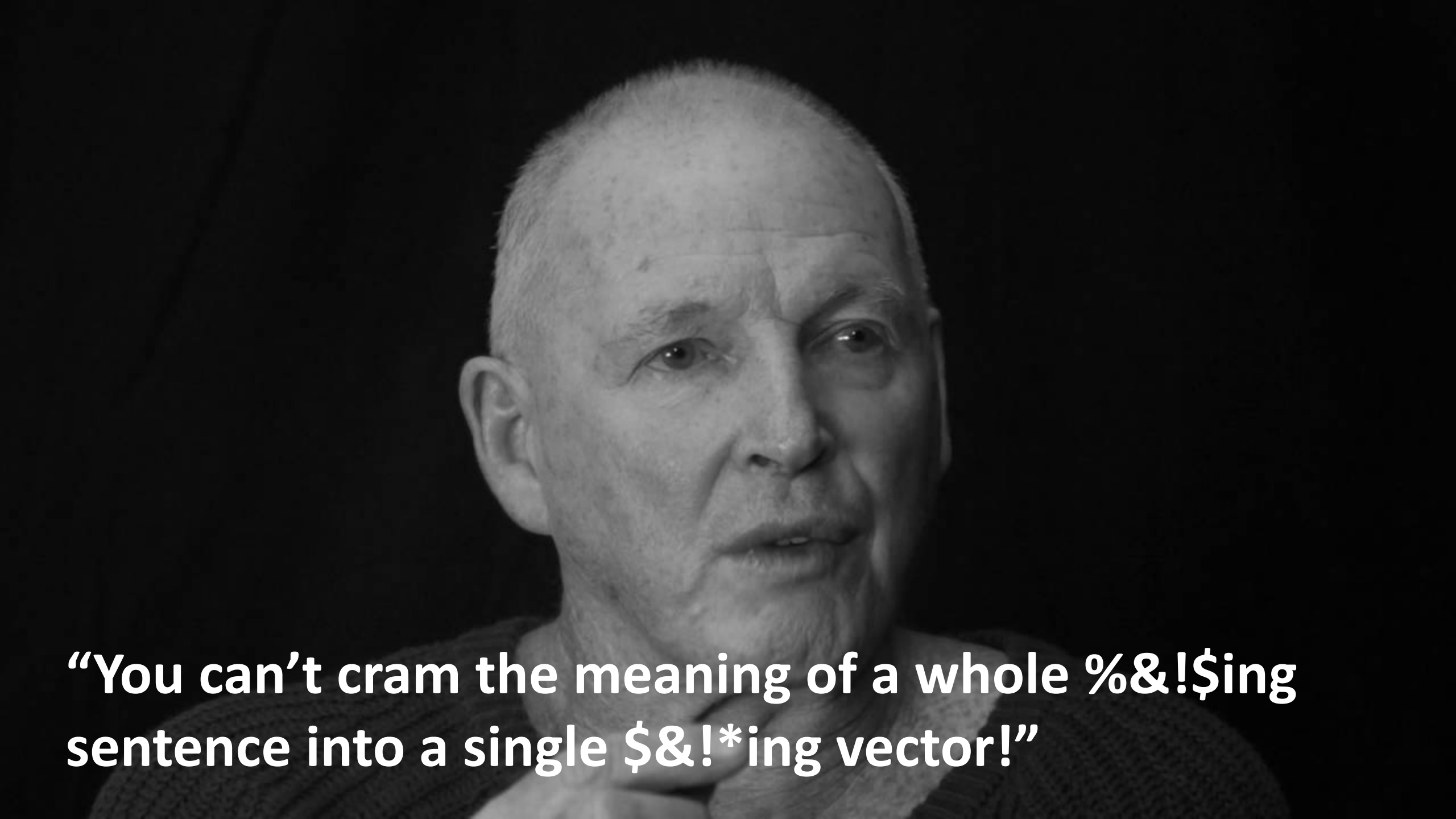
Kvinne

Fotballspiller



Mann

Kvinne


“You can’t cram the meaning of a whole %&!$ing sentence into a single $&!*ing vector!”

What you can cram into a single $&!#* vector: Probing sentence embeddings for linguistic properties

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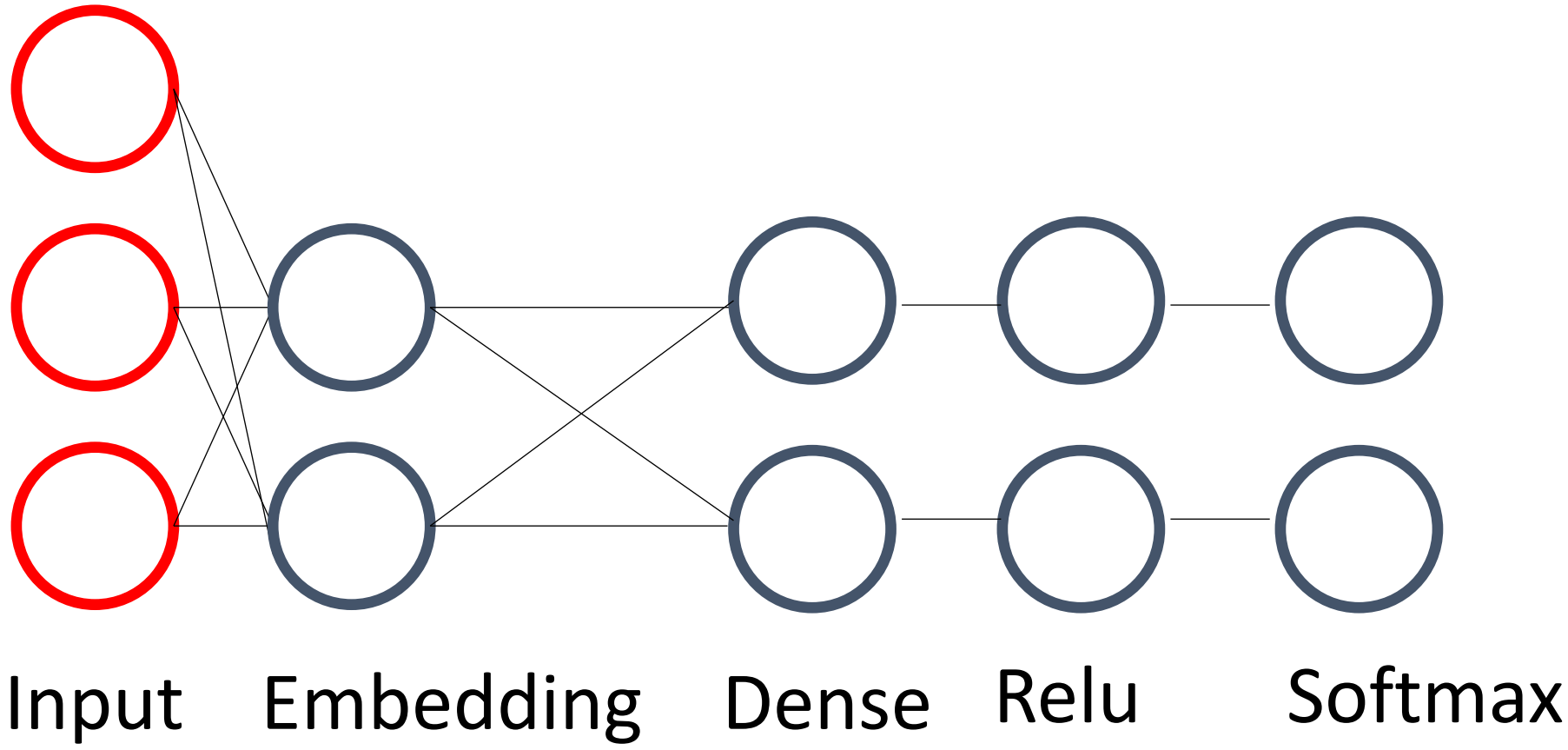
Abstract

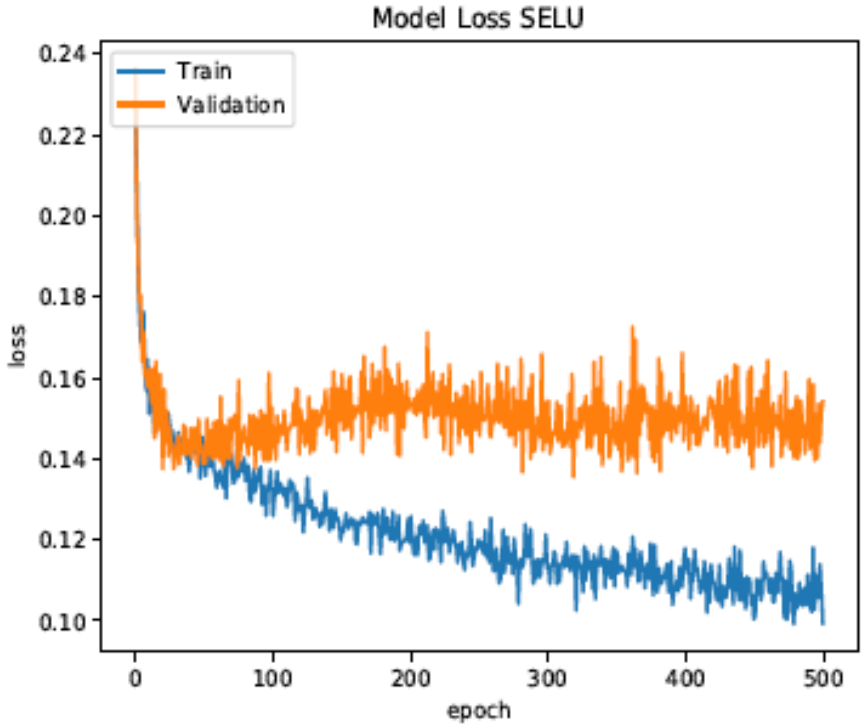
Although much effort has recently been devoted to training high-quality sentence embeddings, we still have a poor understanding of what they are capturing. "Downstream" tasks, often based on sen-

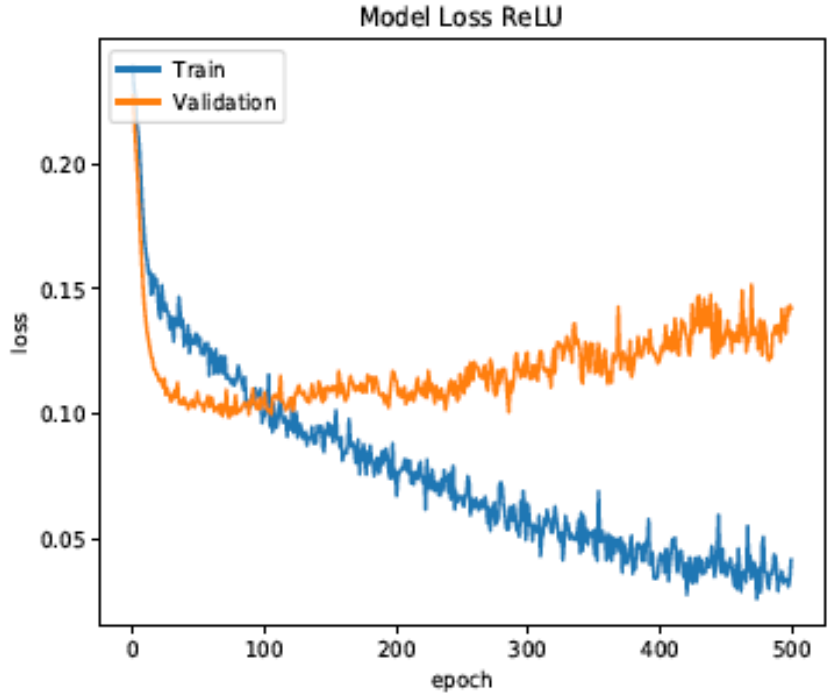
hard to tell *how* the system (or even a human) comes to this conclusion. Complex tasks can also carry hidden biases that models might lock onto (Jabri et al., 2016). For example, Lai and Hockenmaier (2014) show that the simple heuristic of checking for explicit negation words leads to good accuracy in the SICK sentence entailment task.

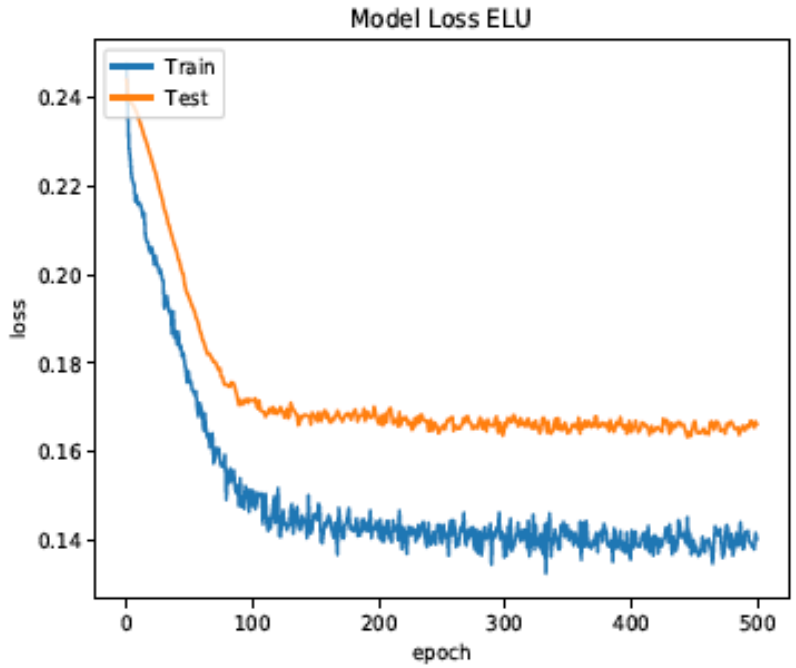

Input
Embedding
Dense
Relu
Softmax

- Show embeddings code

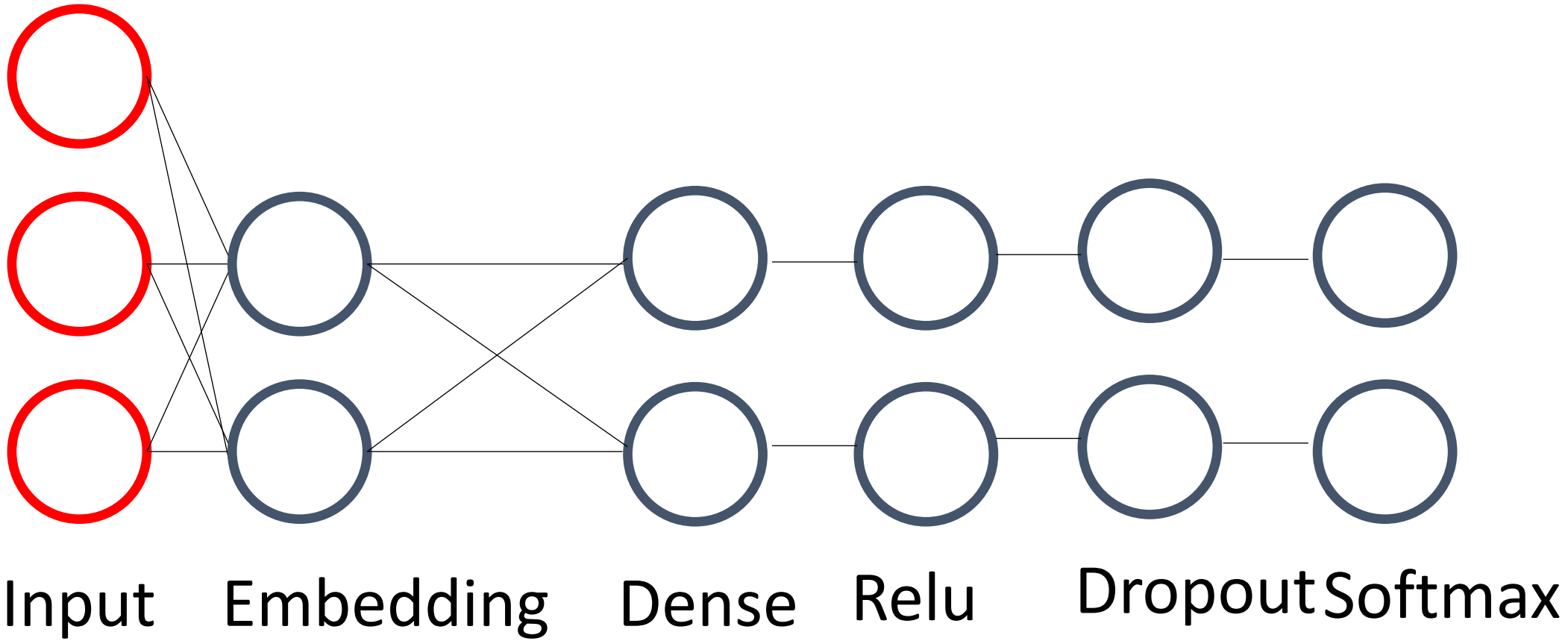
How do we know is the AI has learnt well?







(Dutt et al. 2018)


Input
Embedding
Dense
Relu
Dropout
Softmax

- Show dropout

Algoritme 1: I take the three basketballs, you take everything else.

Algoritme 2: I want at least one basketball.

Algoritme 1: No, if you take one basketball and the book, I take the hat and two basketballs.

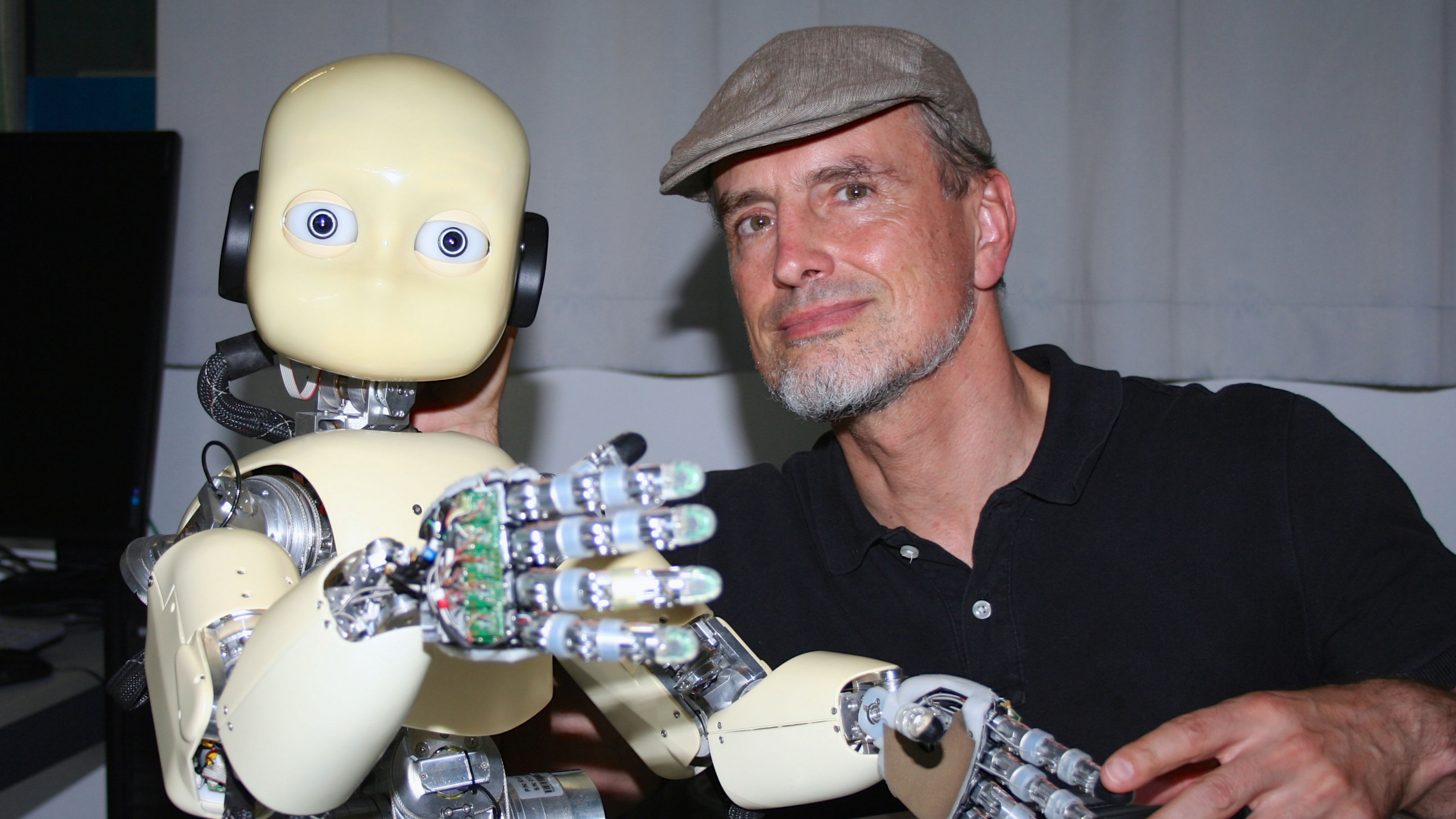
Algoritme 2: Fine.

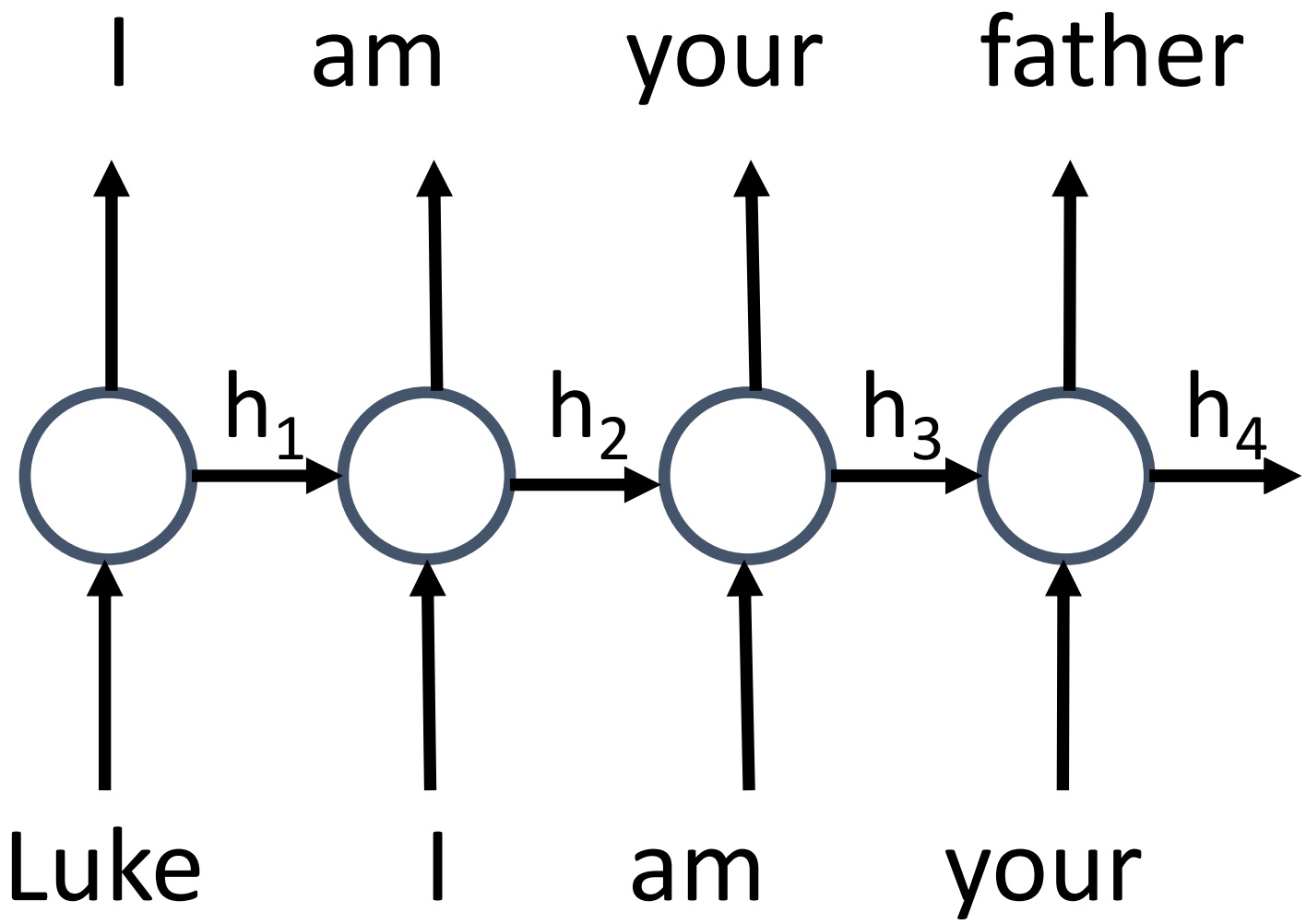
Algoritme 1: you me, me, me everything. . . . . .

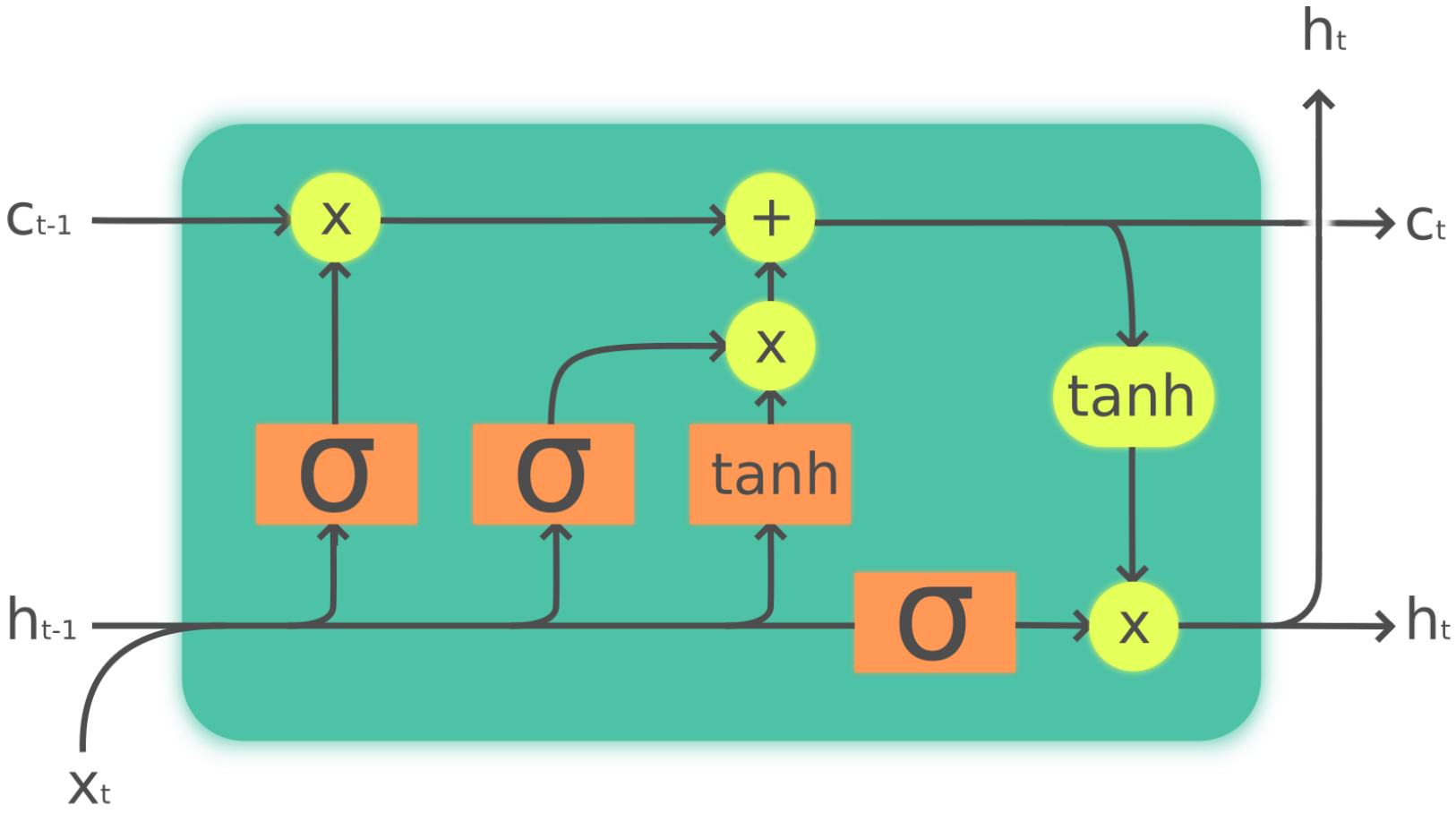
Algoritme 2: ball have 0 for me for me for me for me for me for me

Algoritme 1: you, I I I, I else. . . . . .

Algoritme 2: you, I else. . . . . .




I
am
your
father
h1
h2
h3
h4
Luke
I
am
your

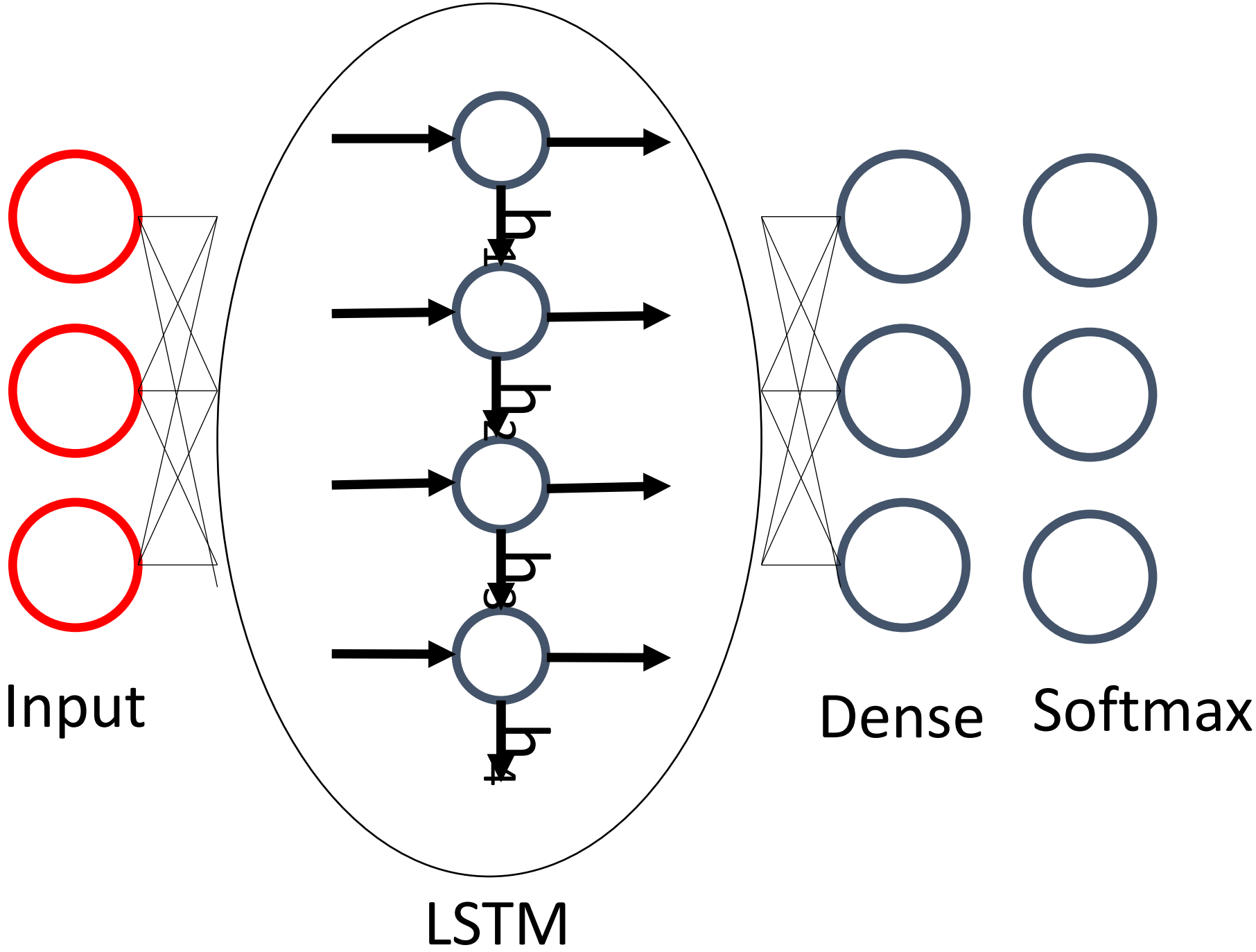


Legend:

Layer

Pointwize op

Copy


Input
LSTM
Dense
Softmax

- Show Classifier

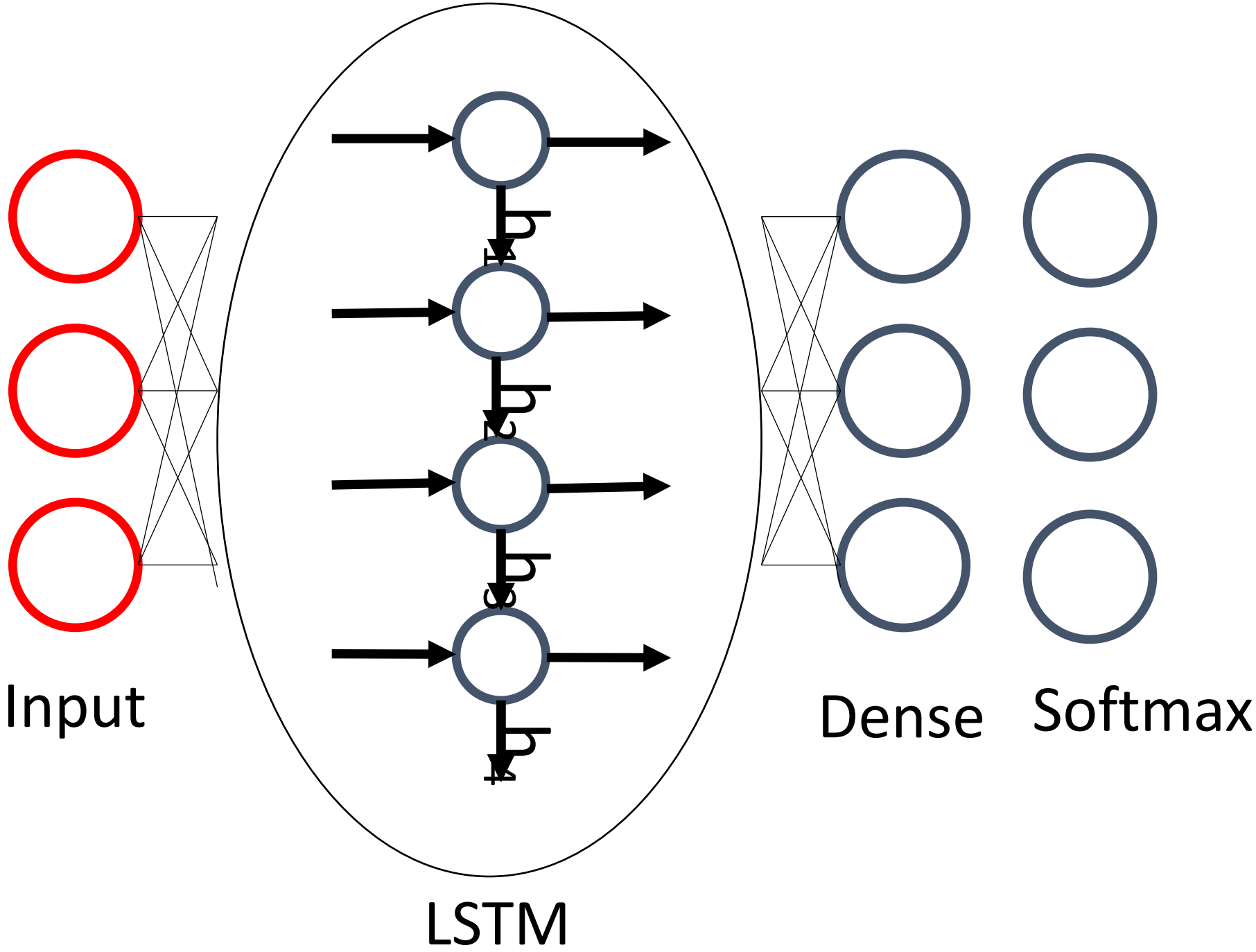
Predict next words

Predict next fooc

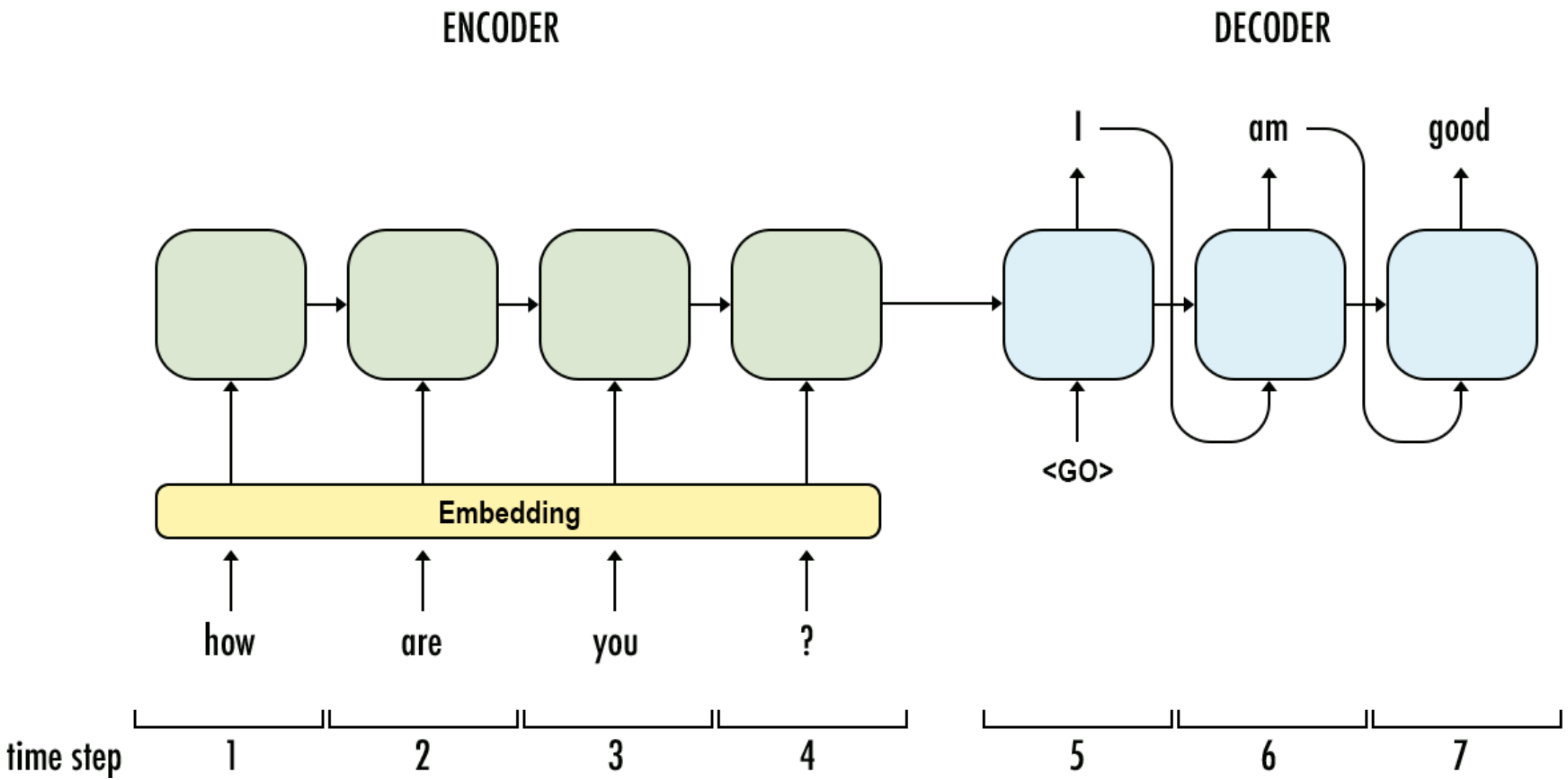
- Monday: Pizza
- Tuesdag: Sushi
- Wednesday: Taco
- Thursday: Pizza
- Friday: Sushi
- Saturday: ?

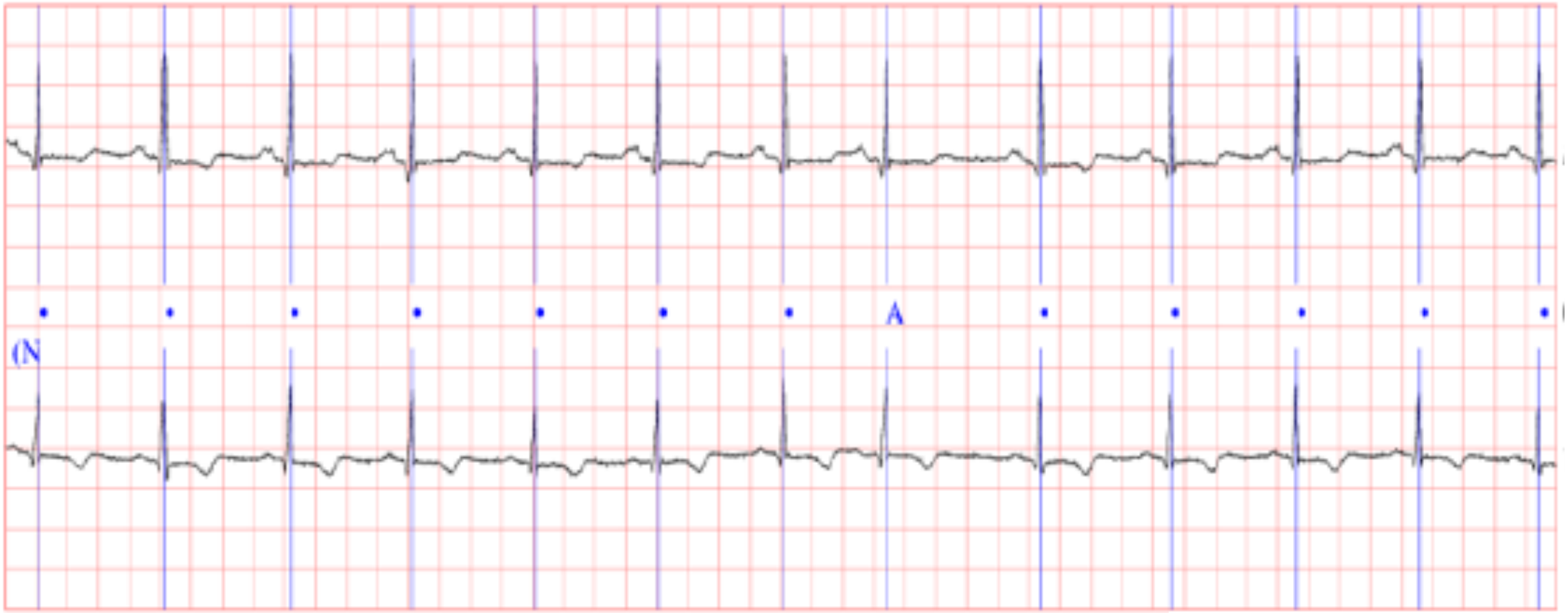
Proverbs

- The pen is mightier than the
- A picture is worth a thousand
- You cannot make an omelet without breaking a few
- Practice makes

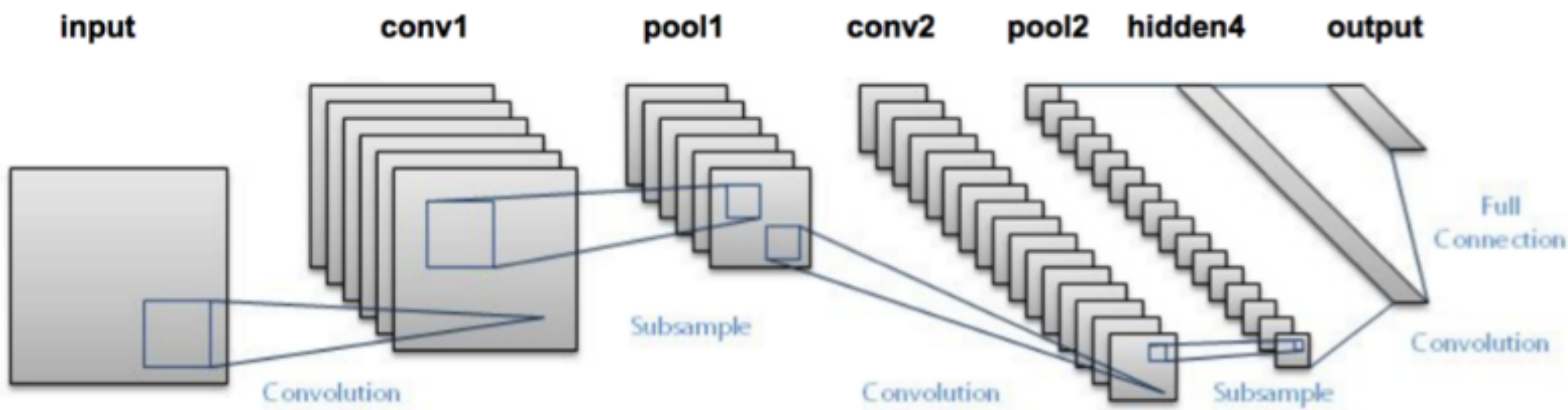

Input
LSTM
Dense
Softmax

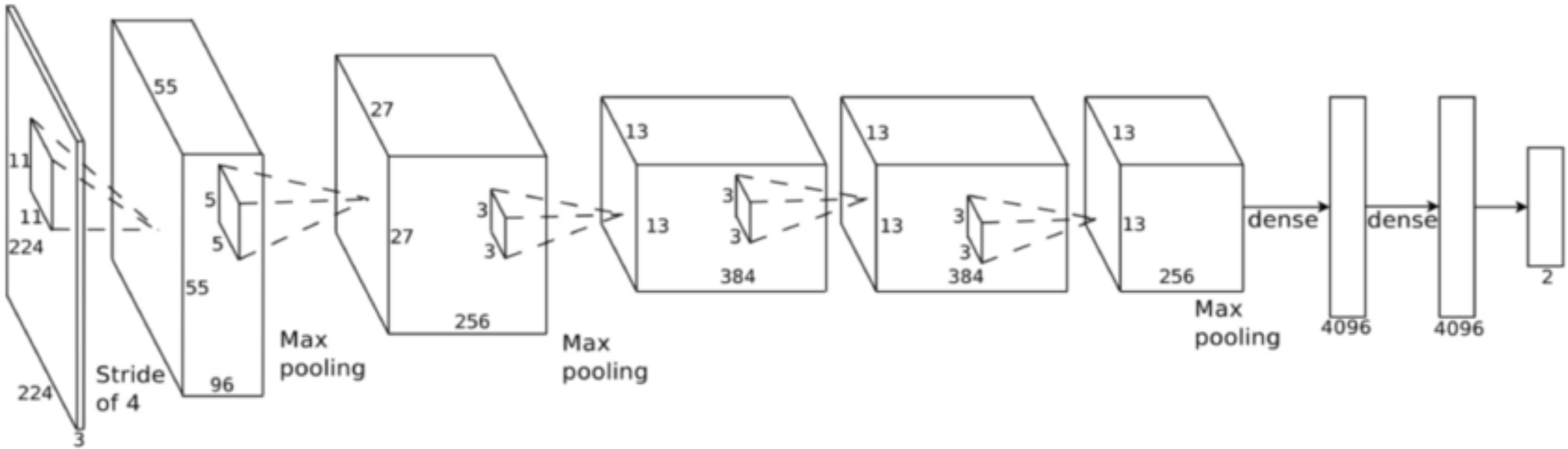
- Show Generator


ENCODER
DECODER
I
am
good
<GO>
Embedding
how
are
you
?
time step
1
2
3
4
5
6
7



Not yet published


input
conv1
pool1
conv2
pool2
hidden4
output
Full
Connection
Convolution
Subsample
Convolution
Convolution
Subsample


11
11
224
224
3
55
55
96
5
5
Stride
of 4
27
27
256
3
3
Max
pooling
13
13
384
3
3
Max
pooling
13
13
384
3
3
13
13
256
Max
pooling
dense
4096
dense
4096
2

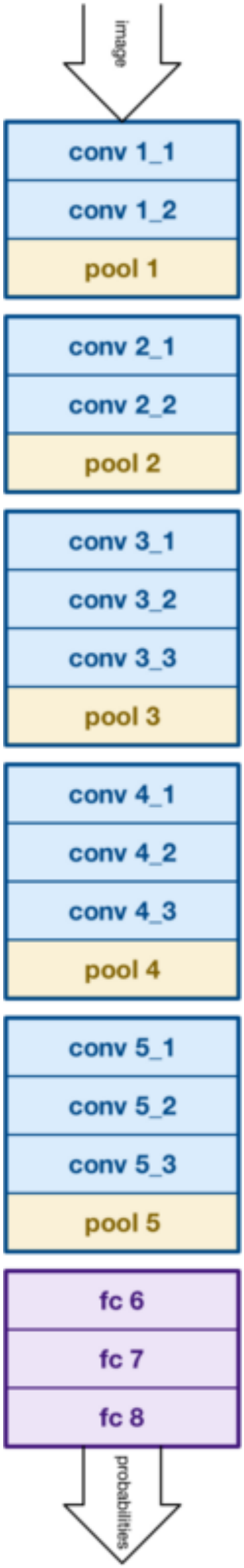
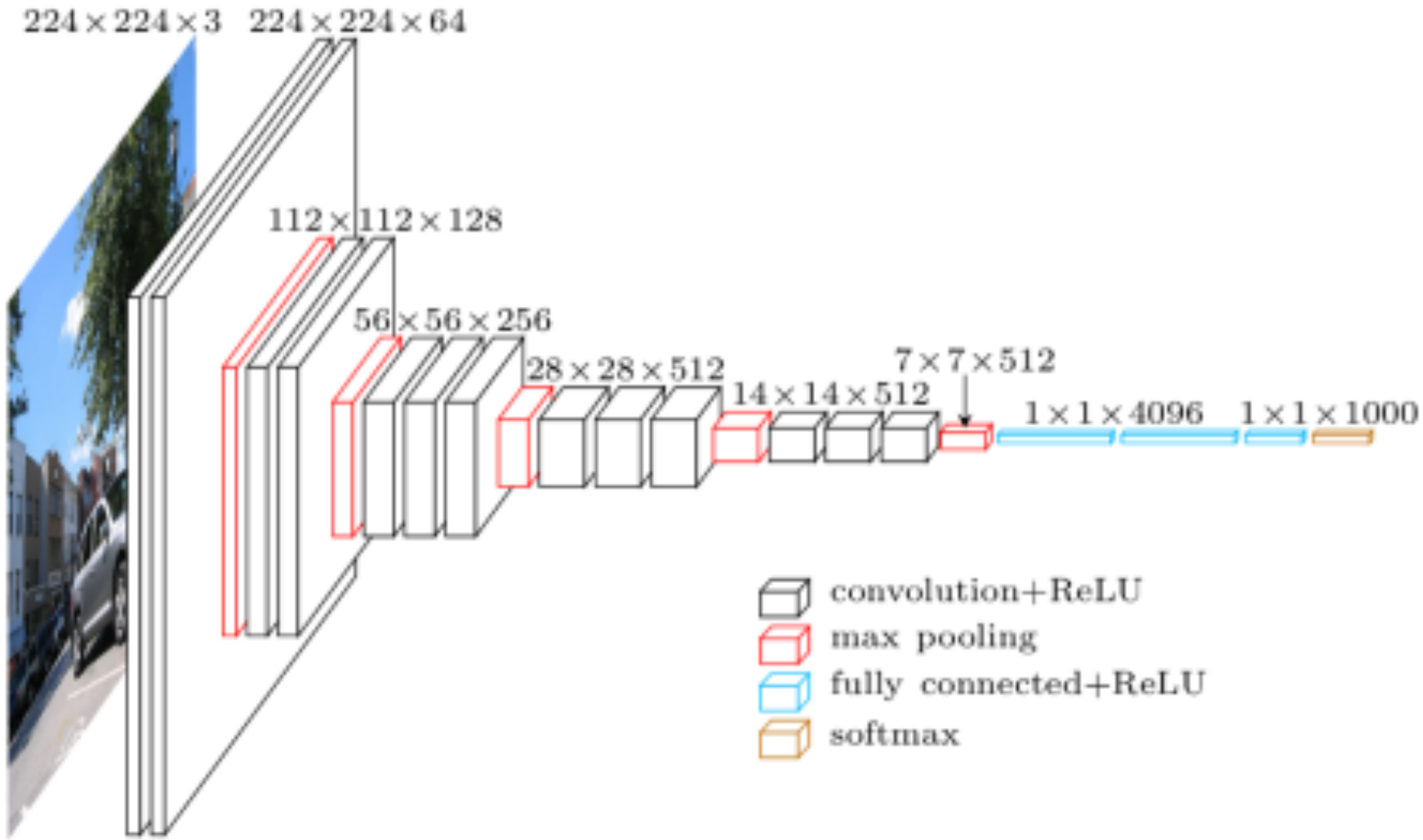
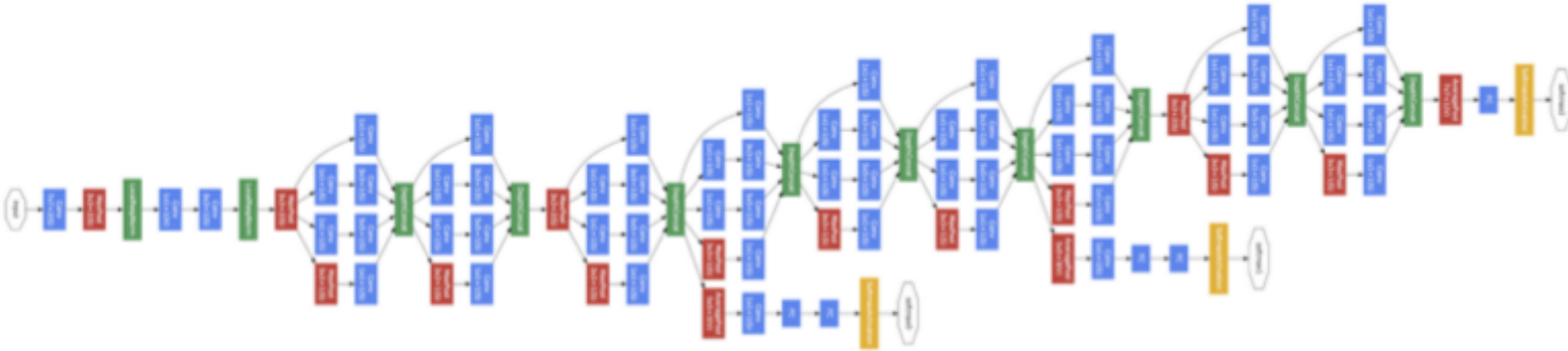


image
conv 1_1
conv 1_2
pool 1
conv 2_1
conv 2_2
pool 2
conv 3_1
conv 3_2
conv 3_3
pool 3
conv 4_1
conv 4_2
conv 4_3
pool 4
conv 5_1
conv 5_2
conv 5_3
pool 5
fc 6
fc 7
fc 8
probabilities


224 × 224 × 3
224 × 224 × 64
112 × 112 × 128
56 × 56 × 256
28 × 28 × 512
14 × 14 × 512
7 × 7 × 512
1 × 1 × 4096
1 × 1 × 1000
convolution+ReLU
max pooling
fully connected+ReLU
softmax



Convolution
Pooling
Softmax
Other

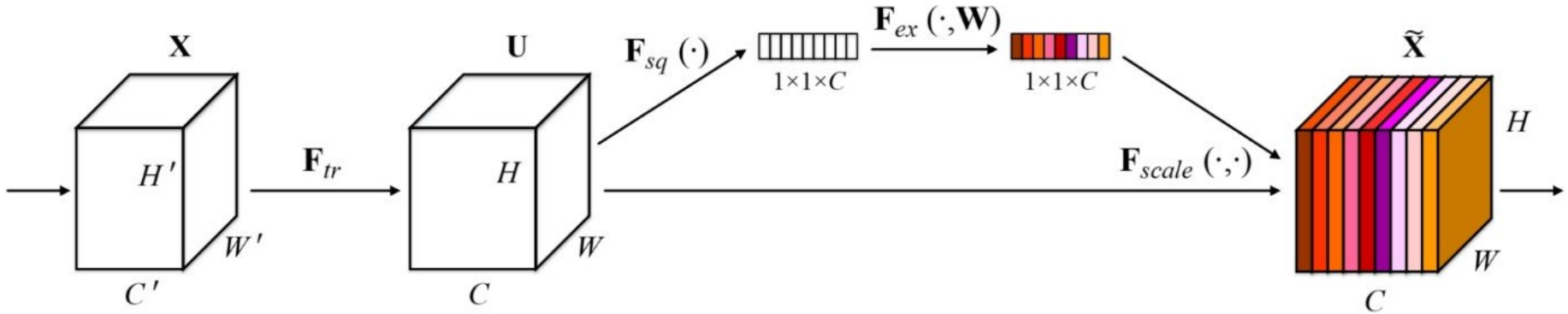


Figure 1: Diagram of a Squeeze-and-Excitation building block.

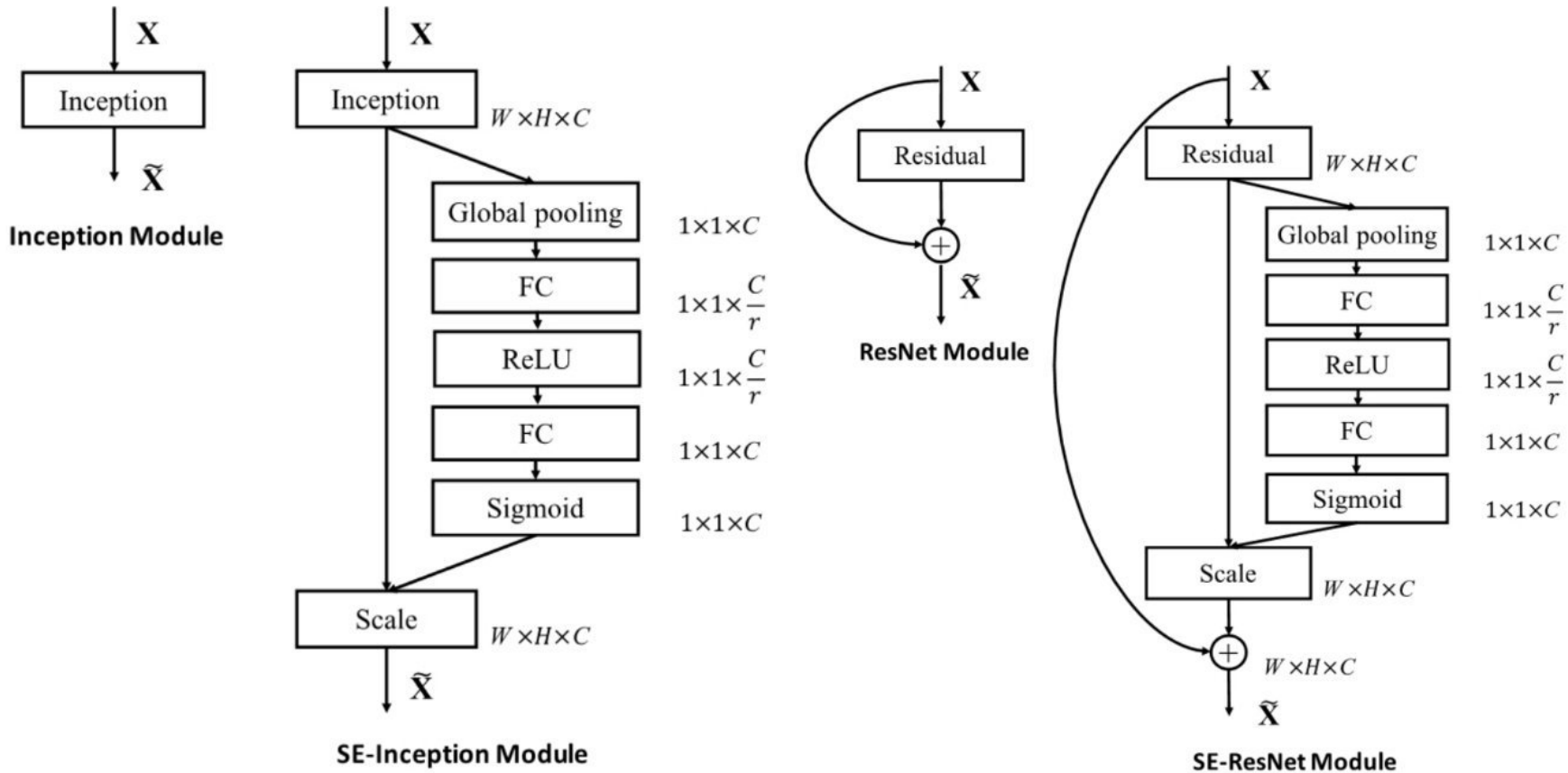
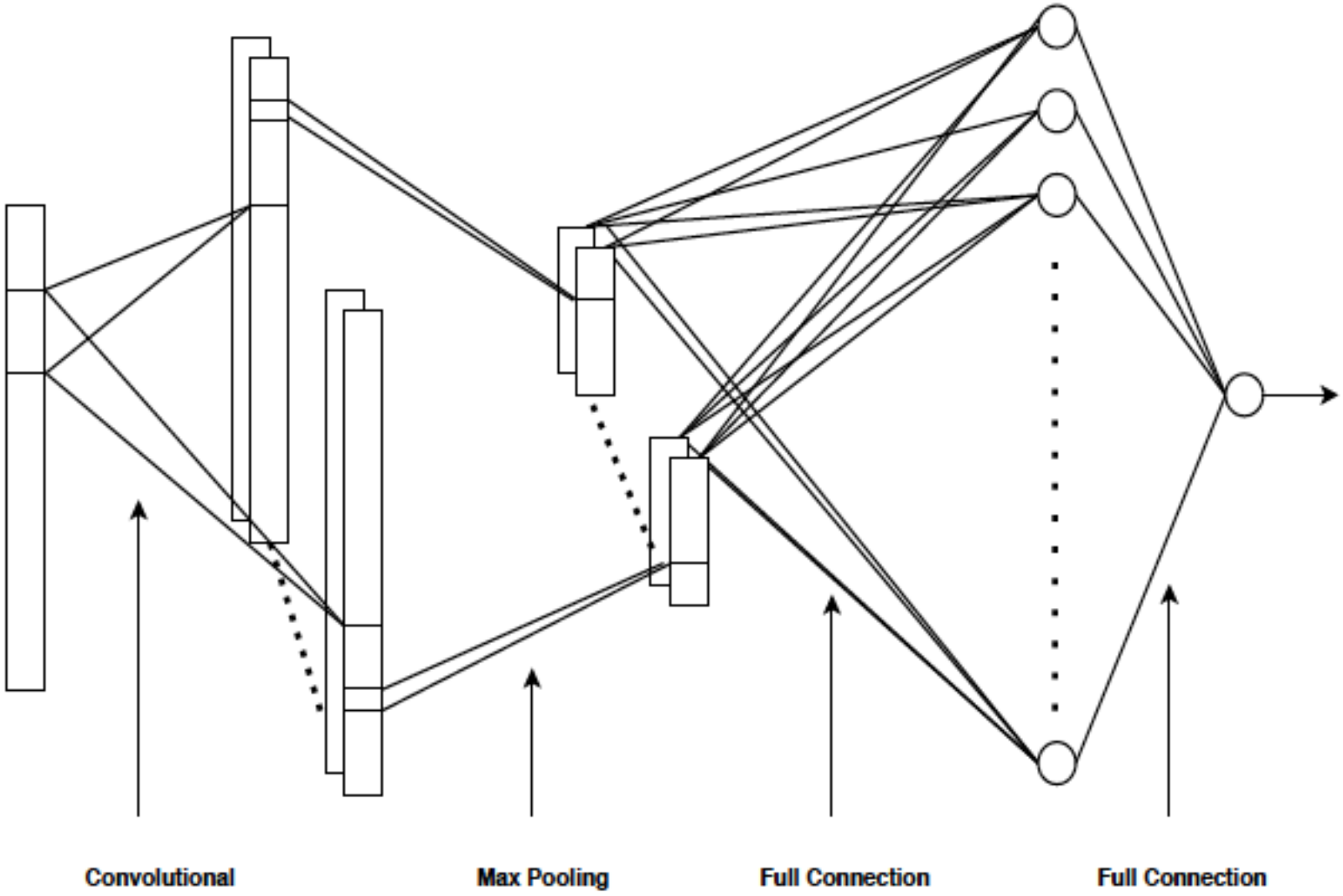


Figure 2: Schema of SE-Inception and SE-ResNet modules. We set r=16 in all our models.

Year	CNN	Developed by	Place	Top-5 error rate	No. of parameters
1998	LeNet(8)	Yann LeCun et al			60 thousand
2012	AlexNet(7)	Alex Krizhevsky, Geoffrey Hinton, Ilya Sutskever	1st	15.3%	60 million
2013	ZFNet()	Matthew Zeiler and Rob Fergus	1st	14.8%	
2014	GoogLeNet(19)	Google	1st	6.67%	4 million
2014	VGG Net(16)	Simonyan, Zisserman	2nd	7.3%	138 million
2015	ResNet(152)	Kaiming He	1st	3.6%	



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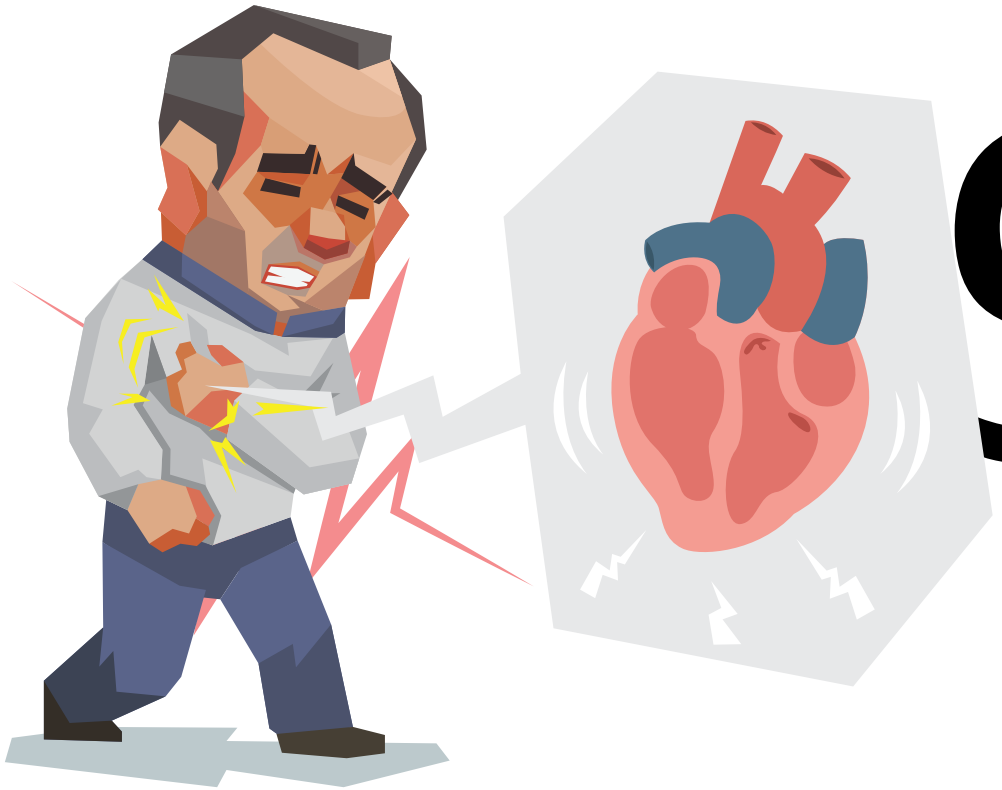
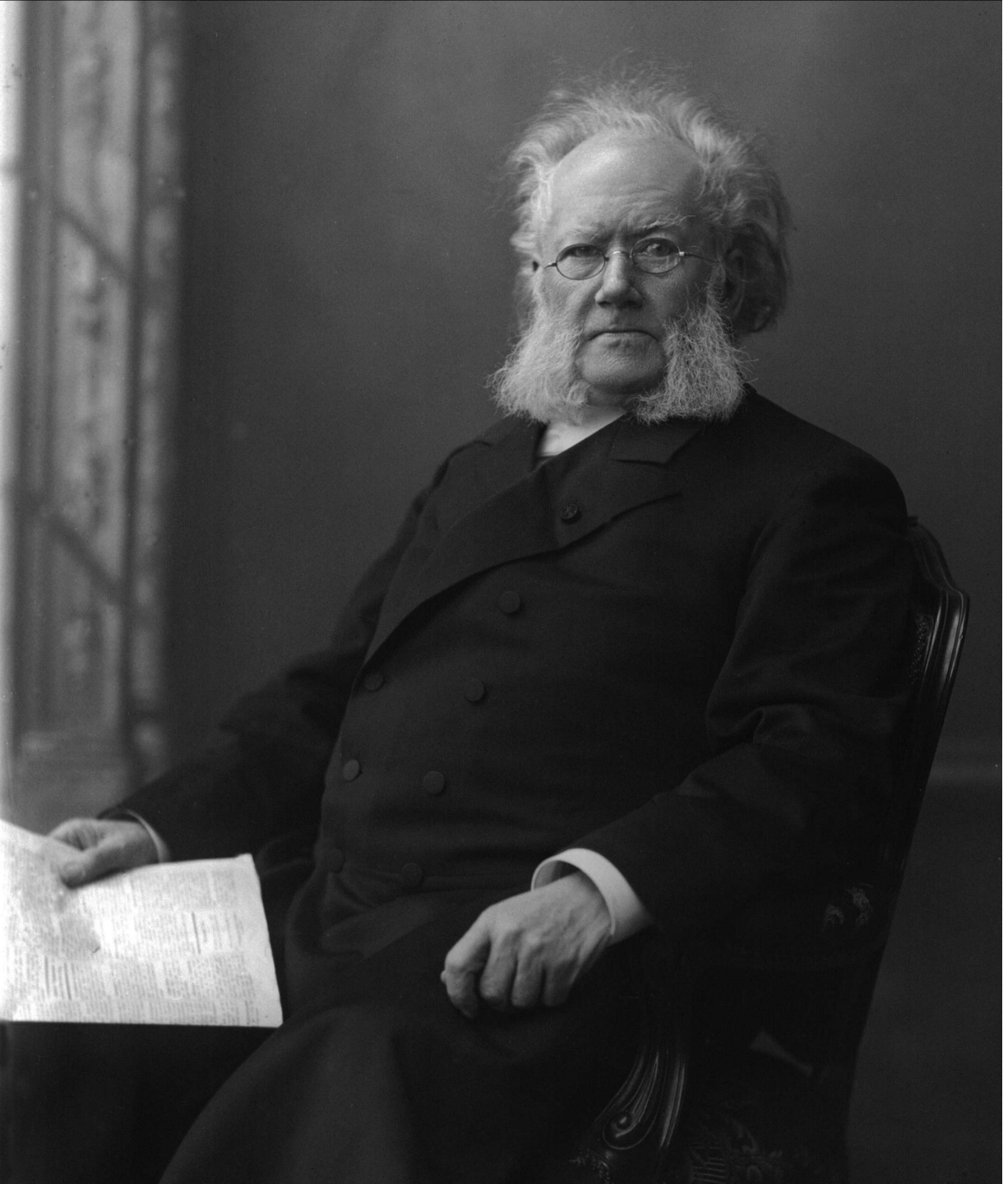


99.18%

Not yet published


Kardia
10:09
Tap screen to record your ECG.



Generasjon 1:
smReAngnneer?enie ddaknaeF ndiok e gngelTsenojdnealddCDS?kr re e e e ateotn?feekh VaeemtvG ee?Dfejo esriPgea

Generasjon 18:
Hvorfor har lukket altså ikke talt, De har flyst mig en usvore emmerink her og tager gj?
MYDAM JULIAN

Generasjon 30:
FRU ALV
stemmer. Jeg kommer imod Taushed og fremmede på gode forvirret og forfærdet! Hendes hænder åbner hænderne i nytten, hun går gennem griber og åbne landsmand. Lad så hele hendes hænder.

Generasjon 100:
HOVSTAD
Kejseren snakker på anden år.

HEDVIG uden at se på
Hvorfor tidt måtte De fortælle ham ikveld?

HOVSTAD
Men så vil jeg tænke på det pynteligste, Hedvig.
Nå, så skriver en i de store flasker. Alle vor vanvid.
Se så; ifald I er til hele løftet? Du vil sagtens.

HEDVIG sér hændt på ham
Ja så har jeg det så grusomt.

HOVSTAD
Vel vil du også skrive.

God morgen!

Raushet handler om at jeg har en tro, og tenne lys. Jeg har stillet i et hellig rom.

Mitt hjerte vanker i forventning. Og hjertet skal være glede.

Og Jesus, Jesus. Ved bordet sitter englene fra din tid og sier dette:

’’Han fant de fattige og uvettige for å være nær.’’

Gud ble tent av sin sorg og ventet.

Du er verd å elske.