How autodiff changed the world

02457 Machine Learning Operations

Nicki Skafte Detlefsen,

Postdoc

DTU Compute

Who am I?

- Bachelor, Master and PhD from DTU

- Currently: Postdoc at section for cognitive systems

- Focus: Inductive biases in deep learning

- Eager open-source contributer

Course settings

- 5 ECTS
- 3 weeks period
- Level: Master
- Grade: Pass/not passed
- Type of assessment: weekly project updates + final oral examination/presentation
- Recommended prerequisites: 02456 (Deep Learning) or
  - General understanding of machine learning (datasets, probability, classifiers, overfitting etc..) and
  - Basic knowledge about deep learning (backpropagation, convolutional neural network, auto-encoders etc..)
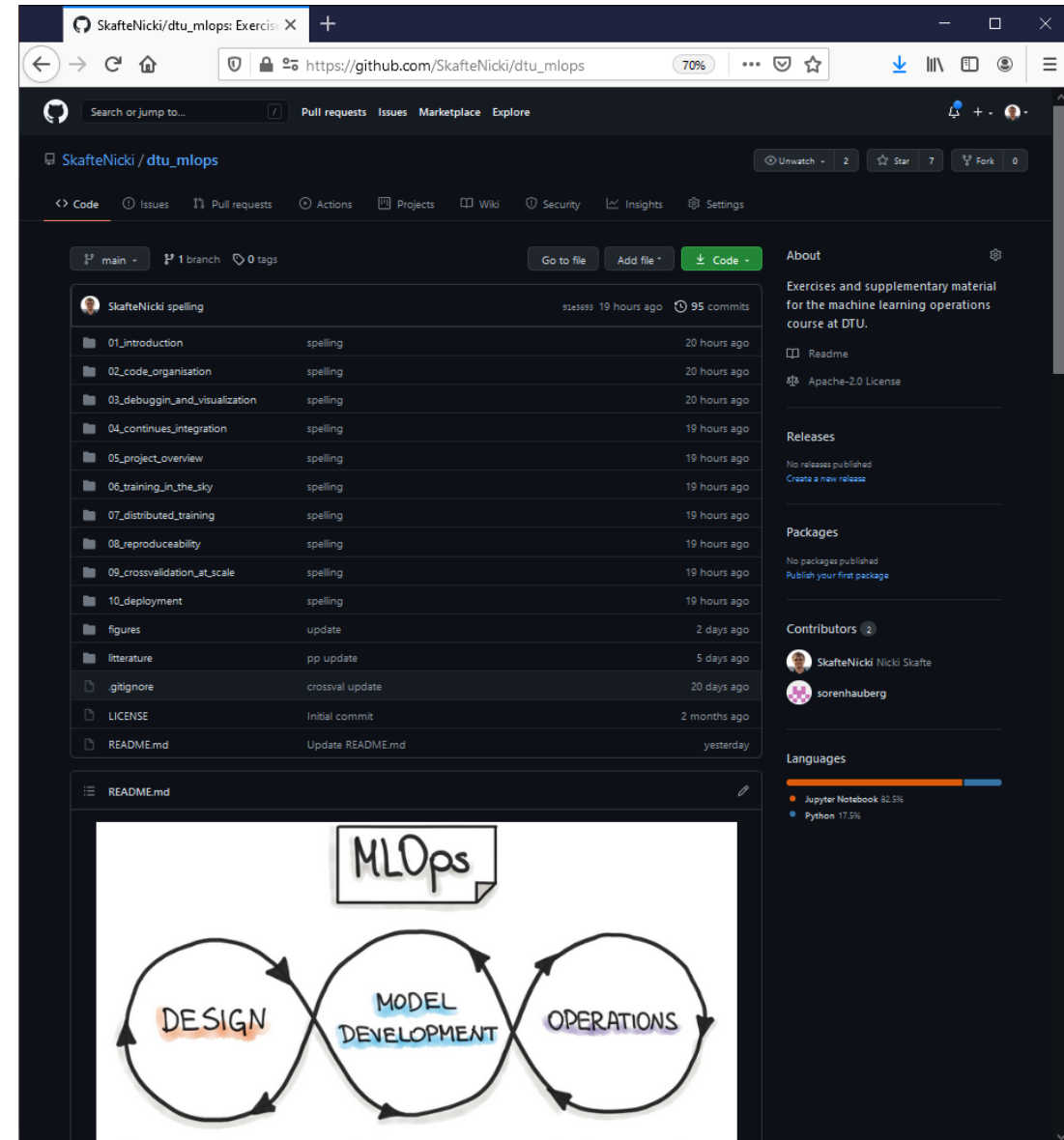 - Coding in Pytorch

Course webpage

Webpage with lectures + exercises:

https://github.com/SkafteNicki/dtu_mlops

Join slack for communication:

https://join.slack.com/t/slack-ddr8461/shared_invite/zt-qzk7ho8z-1tBT_SkkkxtpgMU8x197pg

What is this course/What is it not

- Introduce the student to a number of coding practices, that will help them do state-of-the-art research. To provide hands-on experience with a number of frameworks for doing deep learning.

- Keywords:
  - Organization
  - Scalability
  - Reproducibility
  - Hands-on experience

- How deep learning models works (02456)

What do I expect from you

- This course was developed over 1½ month, meaning that the material may be suboptimal

- We provide lectures, exercises and guidence but encourage self-study

- Make sure to both explore and exploit it!
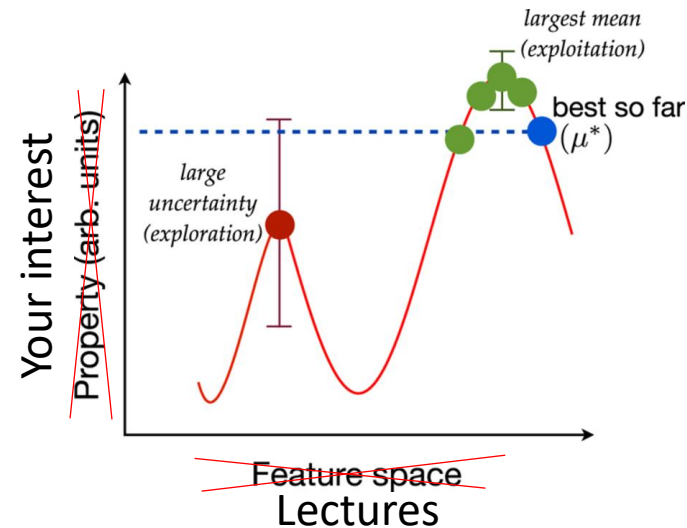
- Provide all the feedback you have, I can take it!

What I hope from this course

- Have fun!
- Playing around with the different frameworks
- Maybe learn something along the way

History of deep learning

Nicki Skafte Detlefsen

History of deep learning
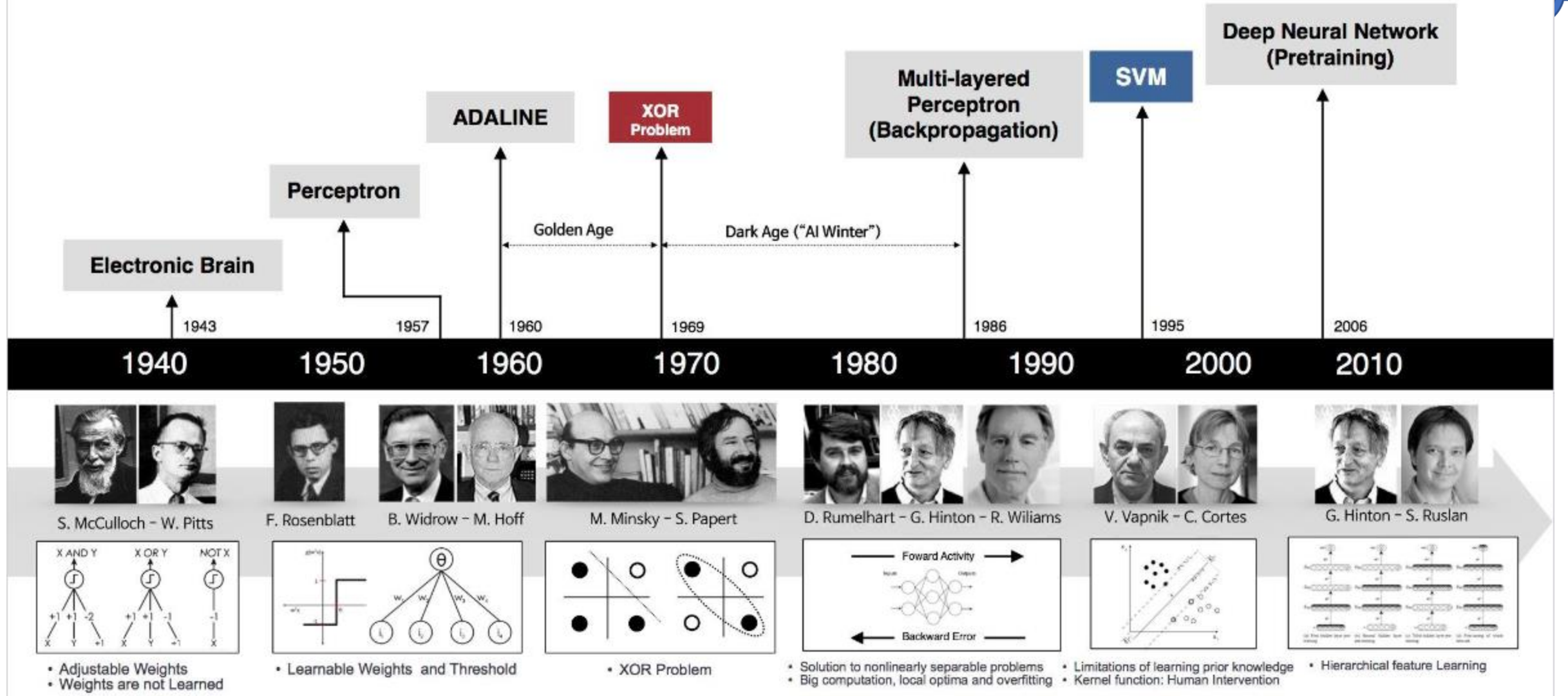
The Deep Learning Revolution

Deep Learning Approaches

ILSVRC top-5 error on ImageNet

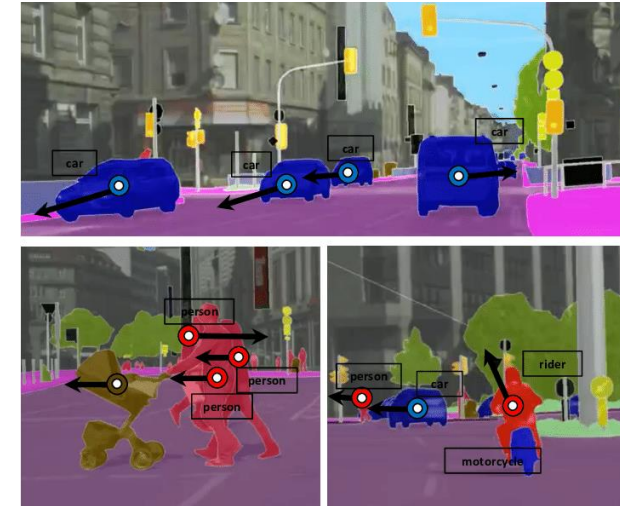2010 | 2011 | 2012 AlexNet | 2013 | 2014 VGGNet | Human | 2015 ResNet | 2016 Ensemble | 2017 SENet
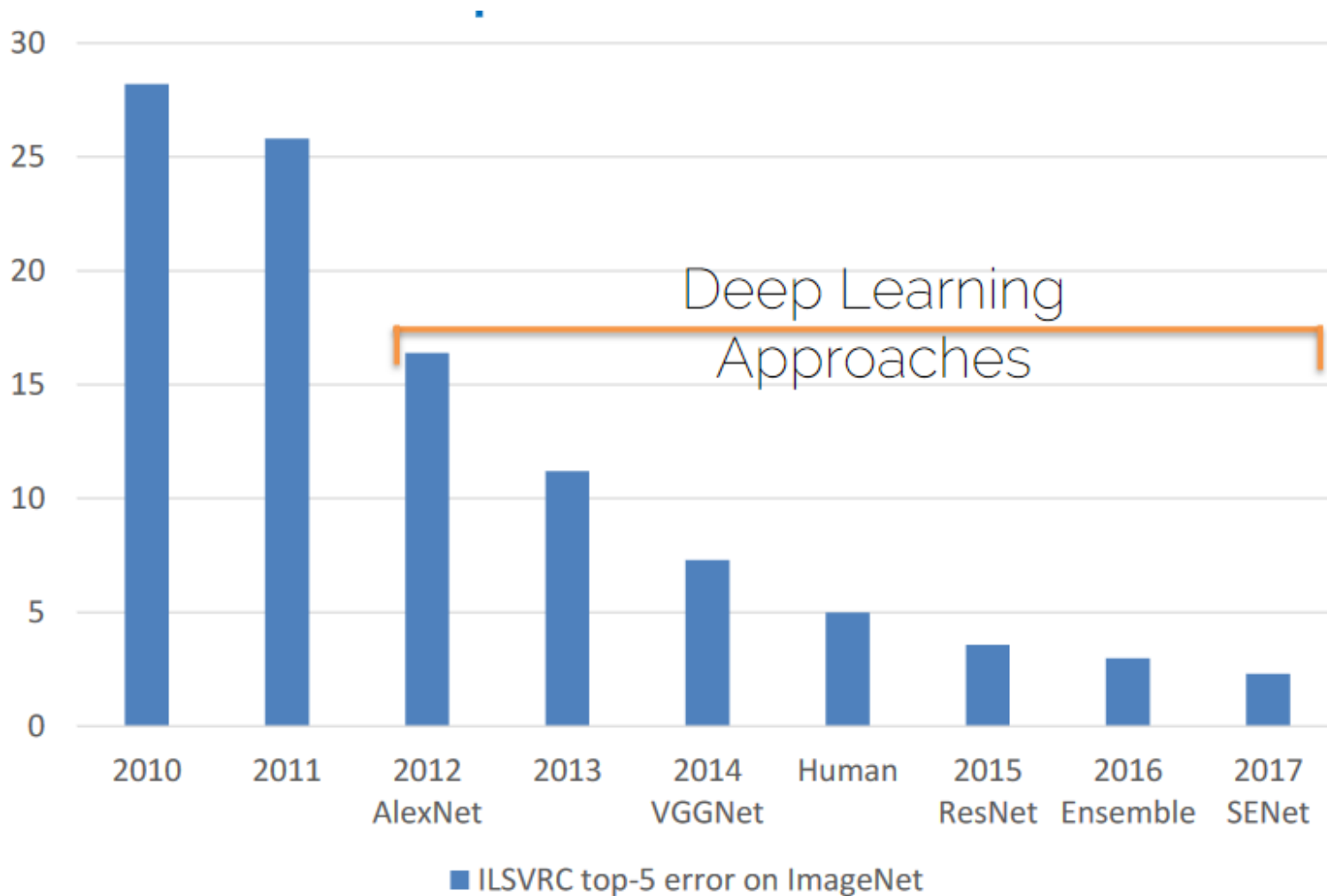
Since then…

AlphaGO:
Beating humans

Unet:
High quality
semantic
segmentation

GPT-3
Having
conversations
with humans

AlphaFold:
Solving protein
engineering

What has changed?

MLOps

Big Data	Hardware	Deepness		Hype	Software
Models can generalize	Models are trainable	Models are complex		Attacts more people	Models are easy to code

Commonly agreed on

Not talked about
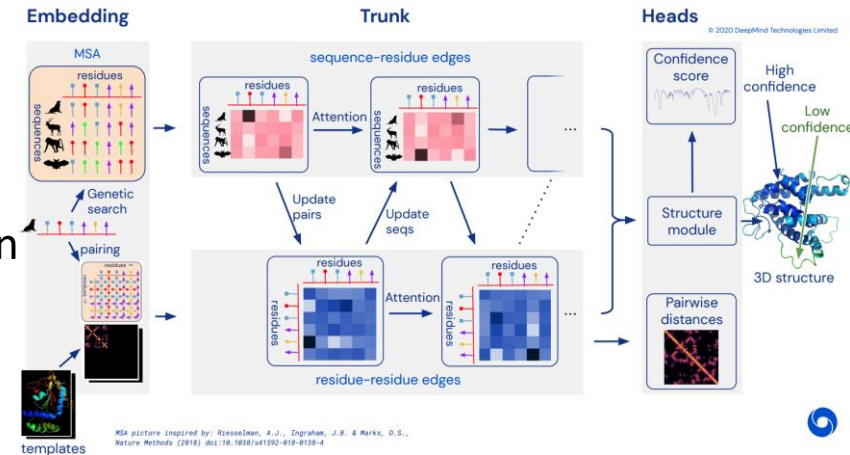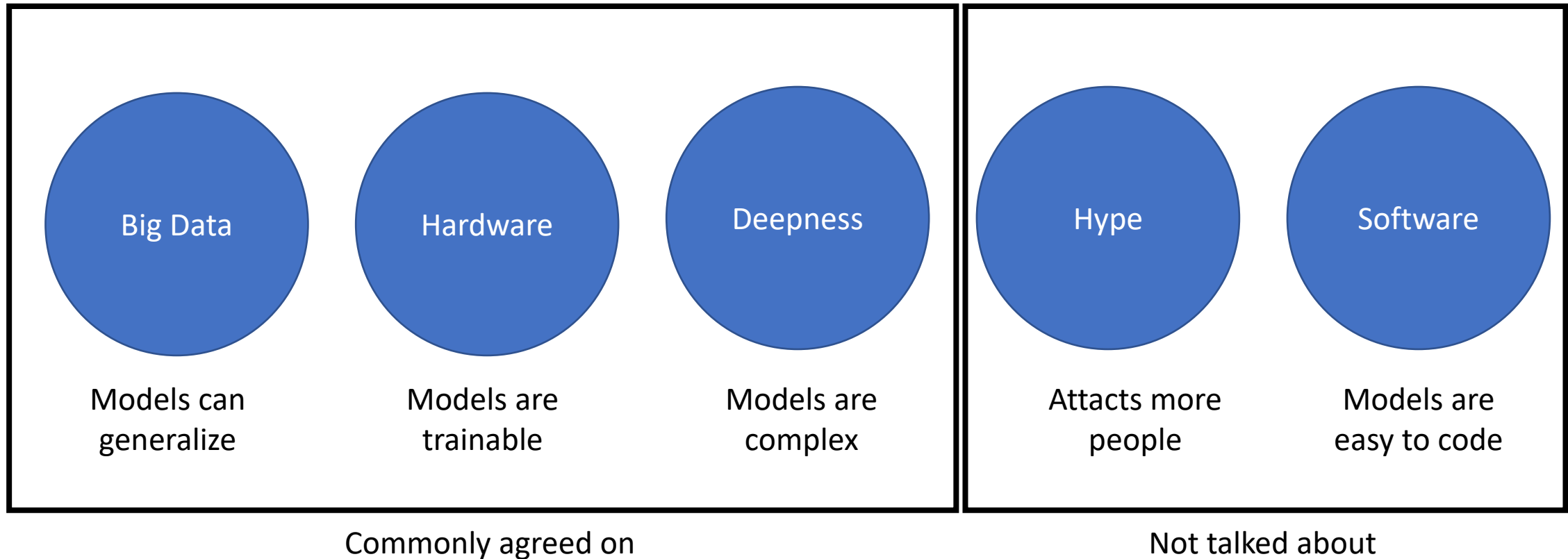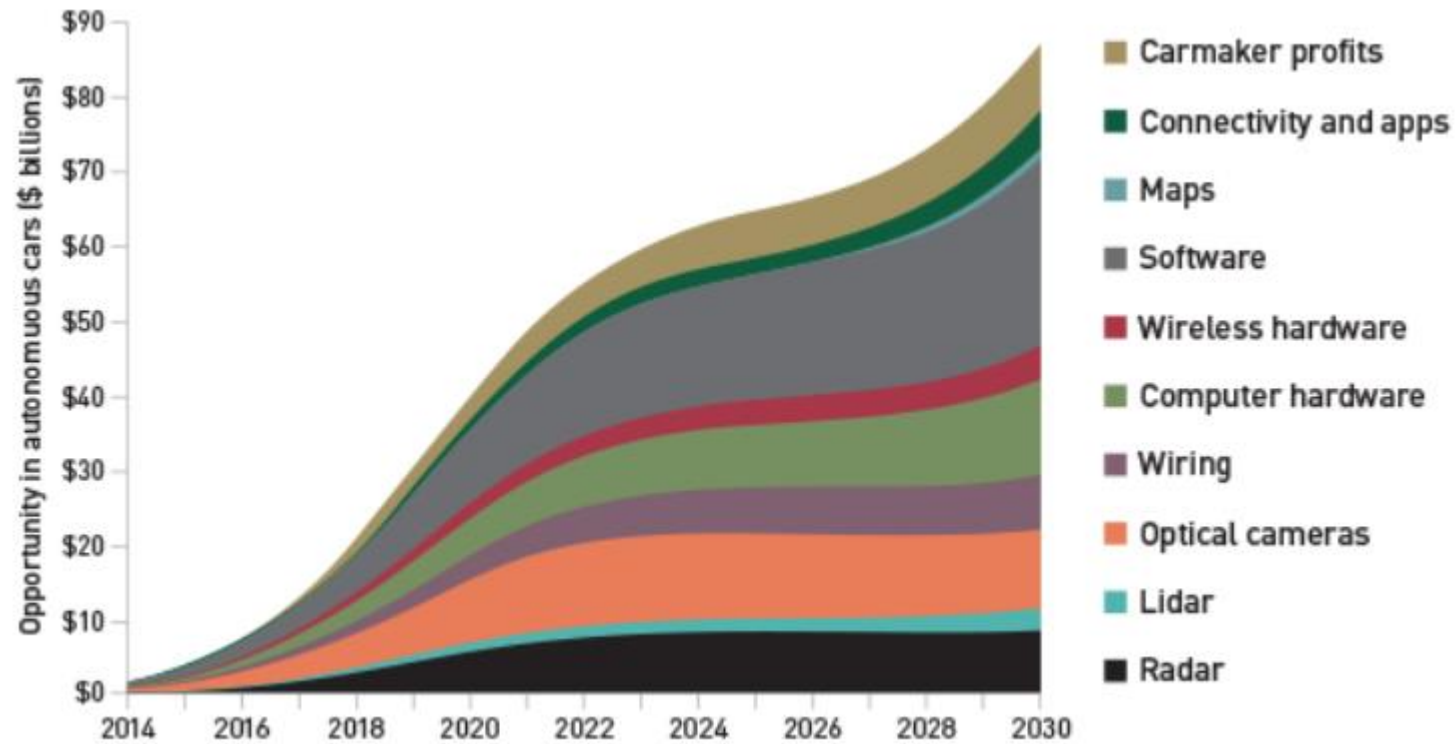
Why you should jump the wagon

"... the deep learning market is expected to be worth USD 1,722.9 Million by 2022"

The DL software landscape
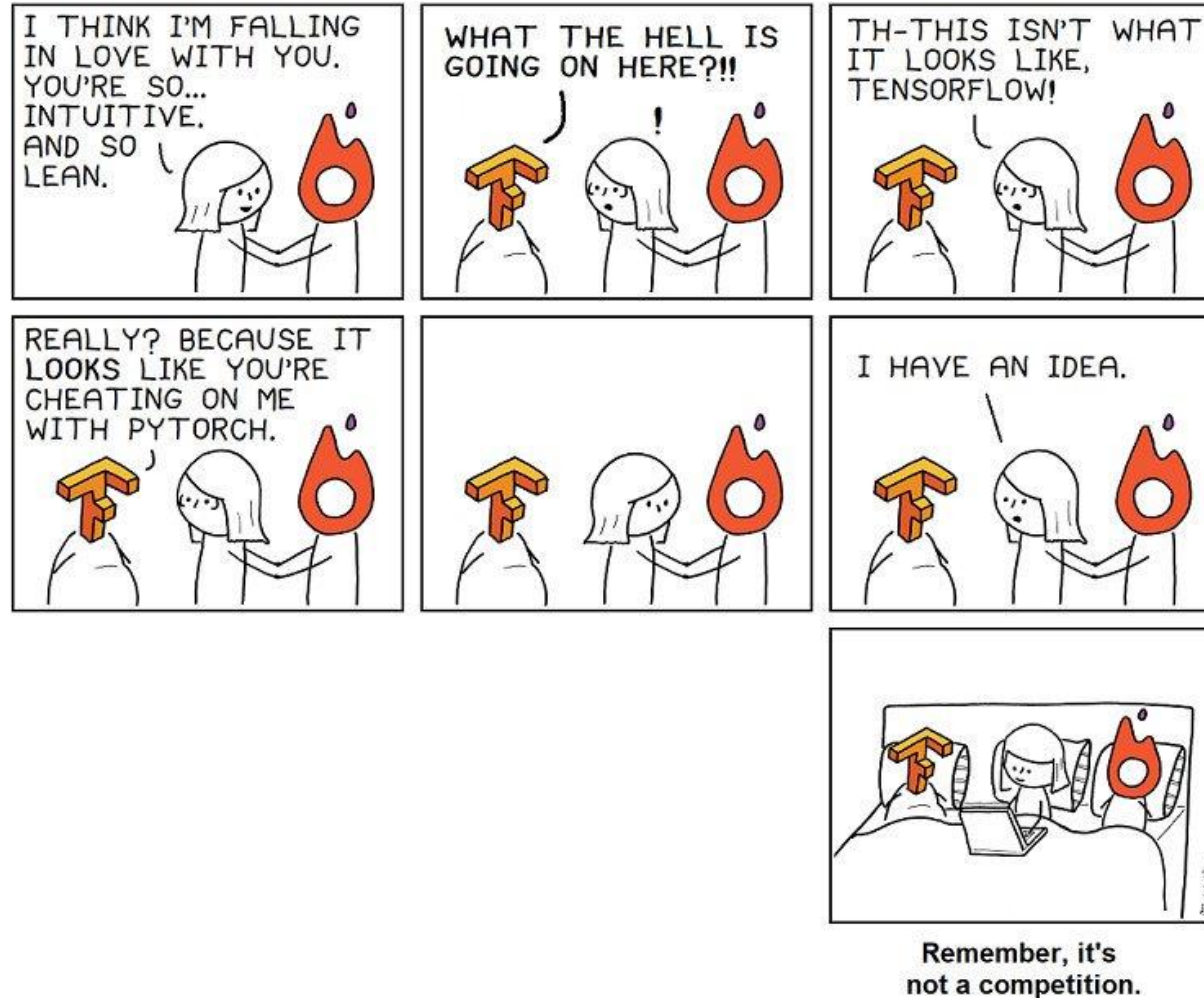
No point in discussion who is best. The (biased) facts are:

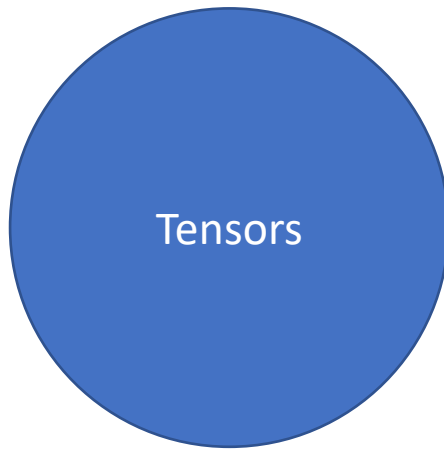- Tensorflow are too a large extend used in production
- Pytorch is used in research

Nicki Skafte Detlefsen

If you have the time, I recommend learning both

Remember, it's not a competition.

How to make a modern deep learning framework

MLOps

3 key elements

Tensors

Hardware acceleration

Automatic differentation

Abstraction to higher order data

Faster computations
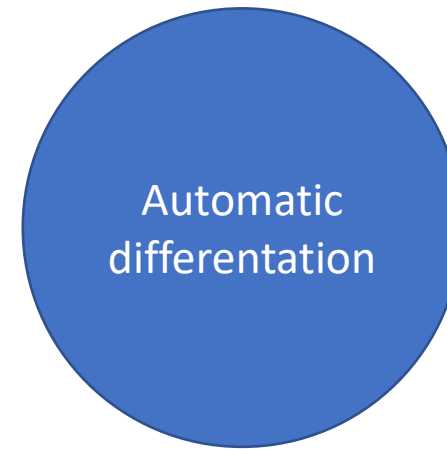
Ease of use

Meme of the day

Nicki Skafte Detlefsen