How autodiff changed the world

02457 Machine Learning Operations

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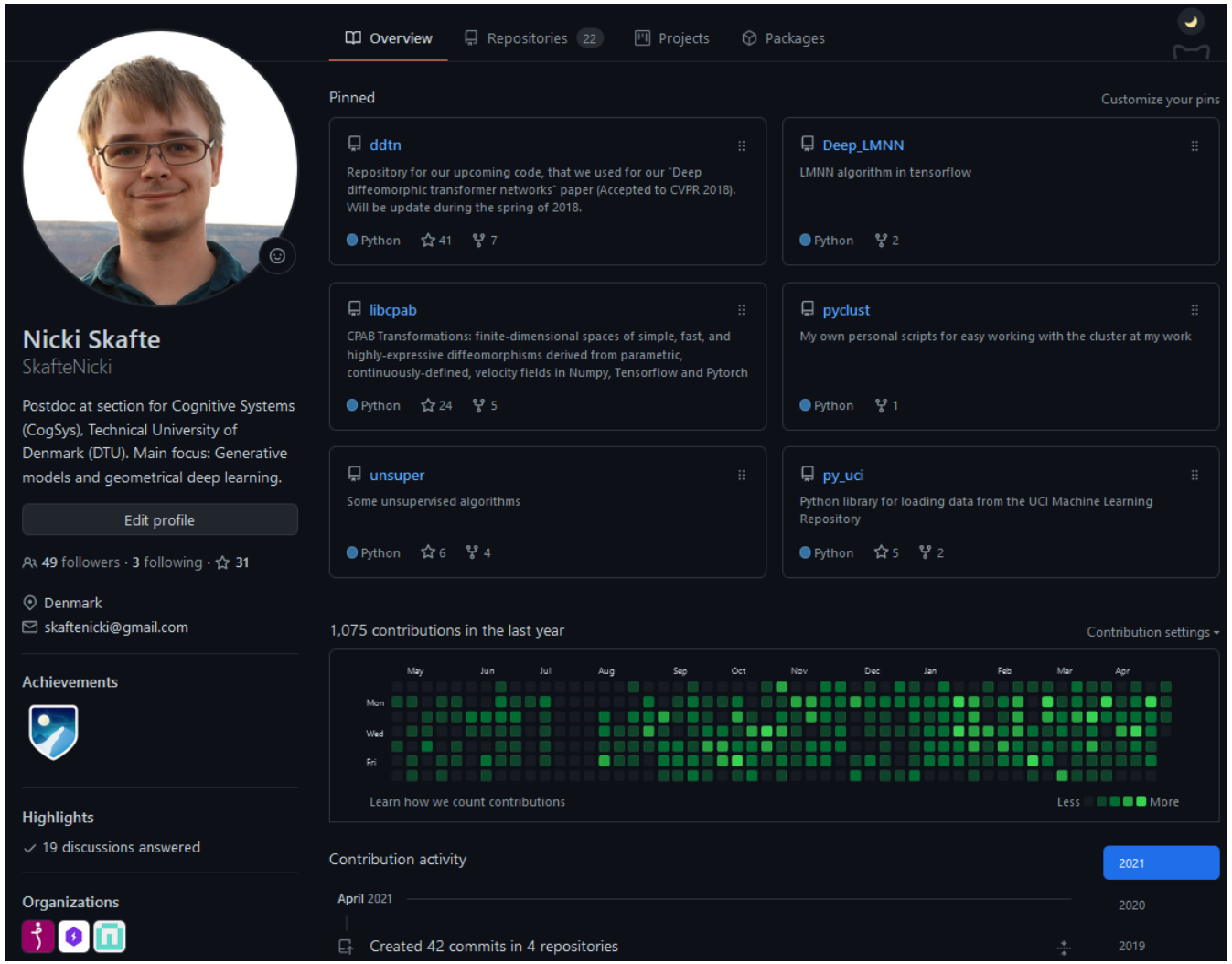
Postdoc

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 ect.) and
  - Basic knowledge about deep learning (backpropergation, convolutional neural network, auto-encoders ect.)
  - Coding in Pytorch

What is this course/What is it not

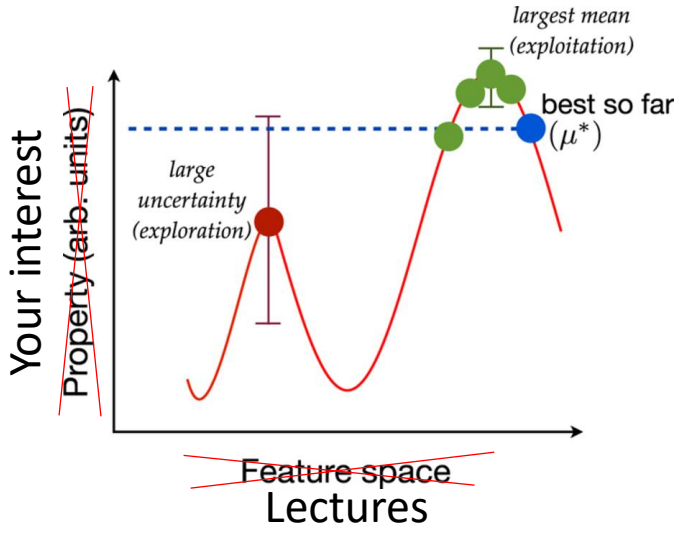
- Introduce the student to a number of coding practices, that will help them do state-of-the-art research. To provide hands-on experience with a number of frameworks for doing deep learning.

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

- How deep learning models works (02456)

What do I expect from you

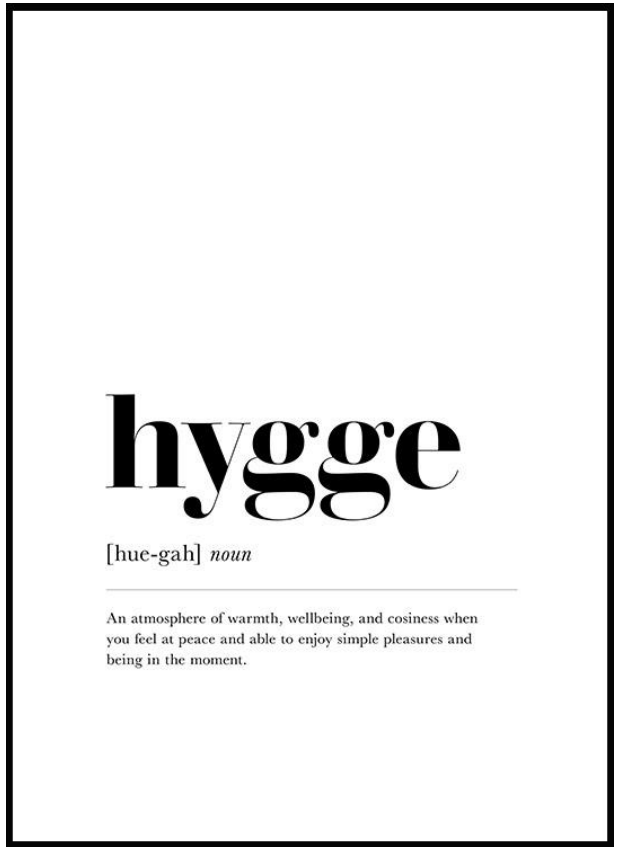
- This course was developed over 1½ month, meaning that the material may be suboptimal
- We provide lectures, exercises and guidence but encourage self-study
- Make sure to both explore and exploit it!



- 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



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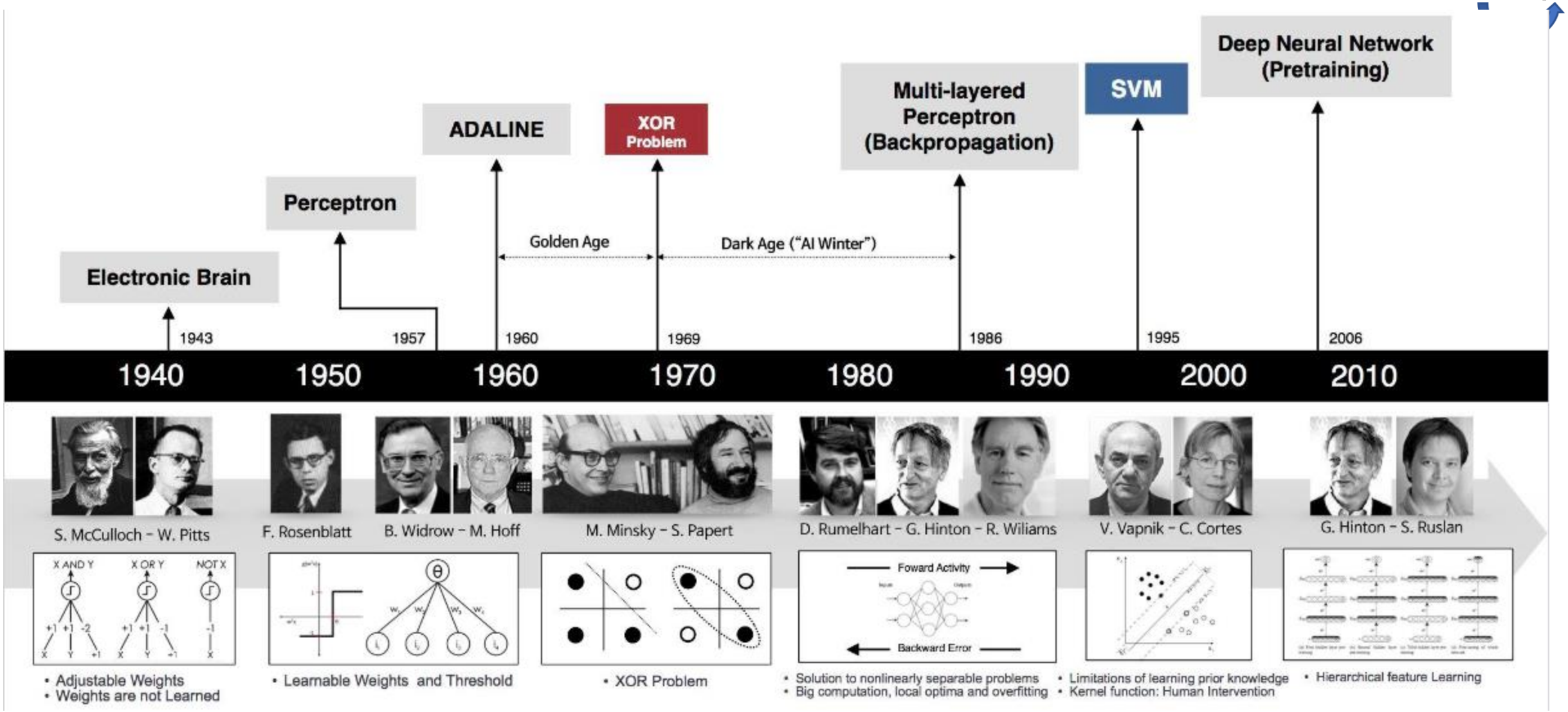
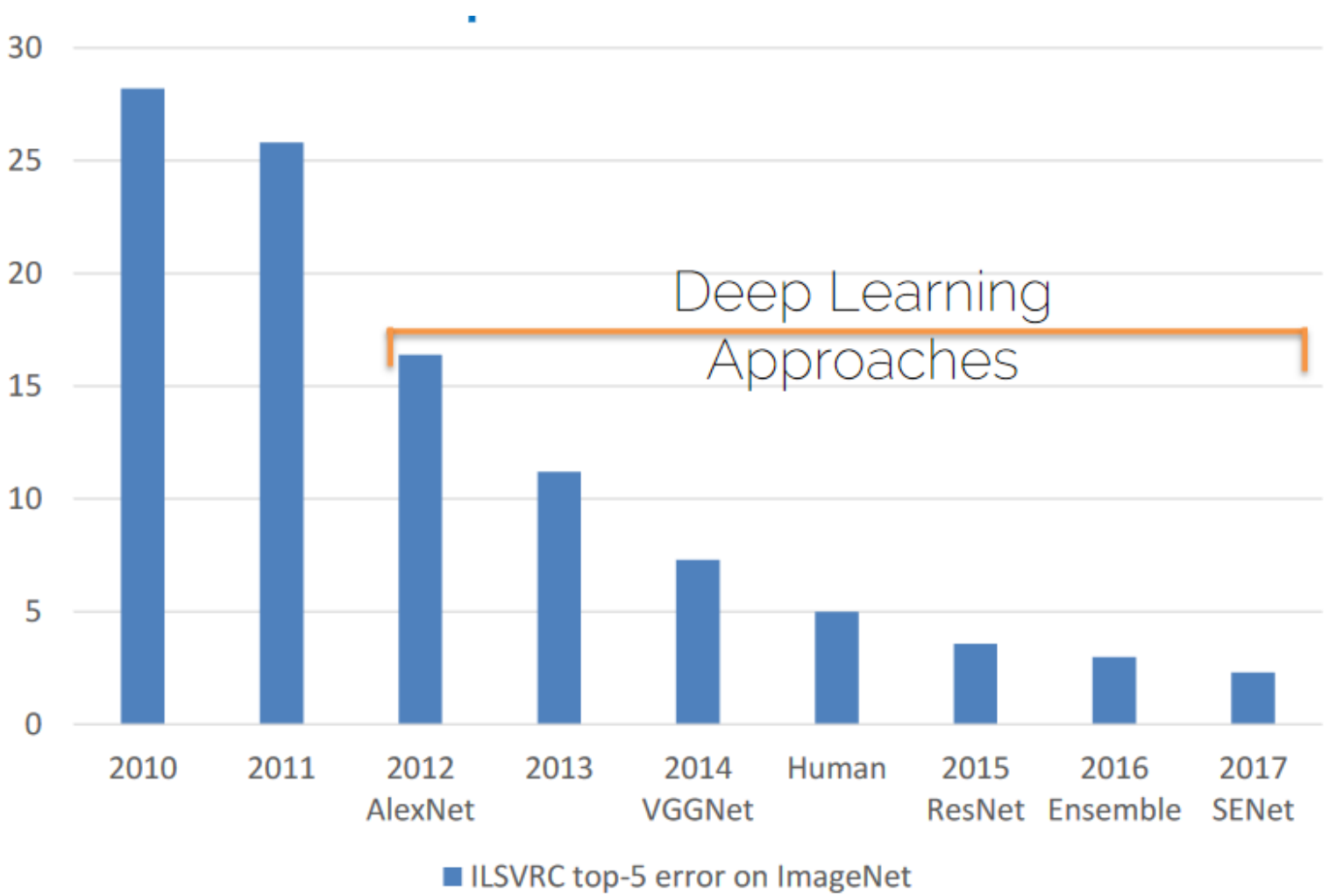
History of deep learning

History of deep learning



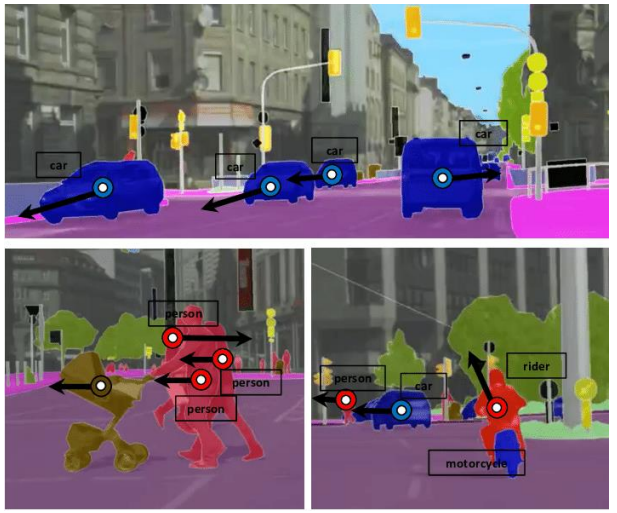
The Deep Learning Revolution



Since then...

AlphaGO:
Beating humans

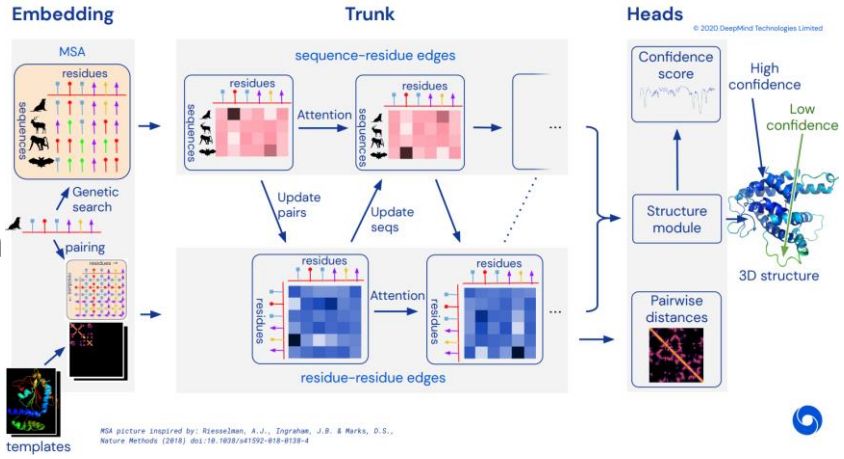
Unet:
High quality
semantic
segmentation



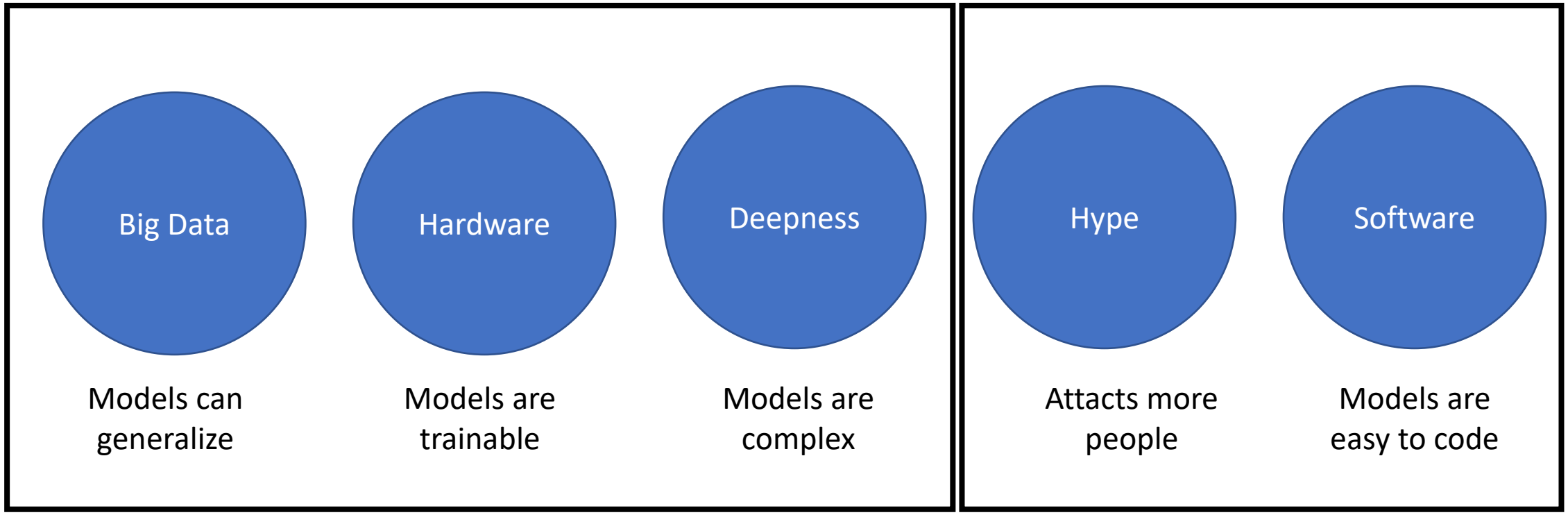
GPT-3
Having
conversations
with humans

```
Q: What is your favorite animal?
A: My favorite animal is a dog.

Q: Why?
A: Because dogs are loyal and friendly.

Q: What are two reasons that a dog might be in a bad mood?
A: Two reasons that a dog might be in a bad mood are if it is hungry or if it is hot.

Q: How many eyes does a giraffe have?
A: A giraffe has two eyes.

Q: How many legs does a frog have?
A: A frog has four legs.

Q: Are there any animals with three legs?
A: No, there are no animals with three legs.

Q: Why don't animals have three legs?
A: Animals don't have three legs because they would fall over.
```

AlphaFold:
Solving protein
engineering



What has changed?



Why you should jump the wagon

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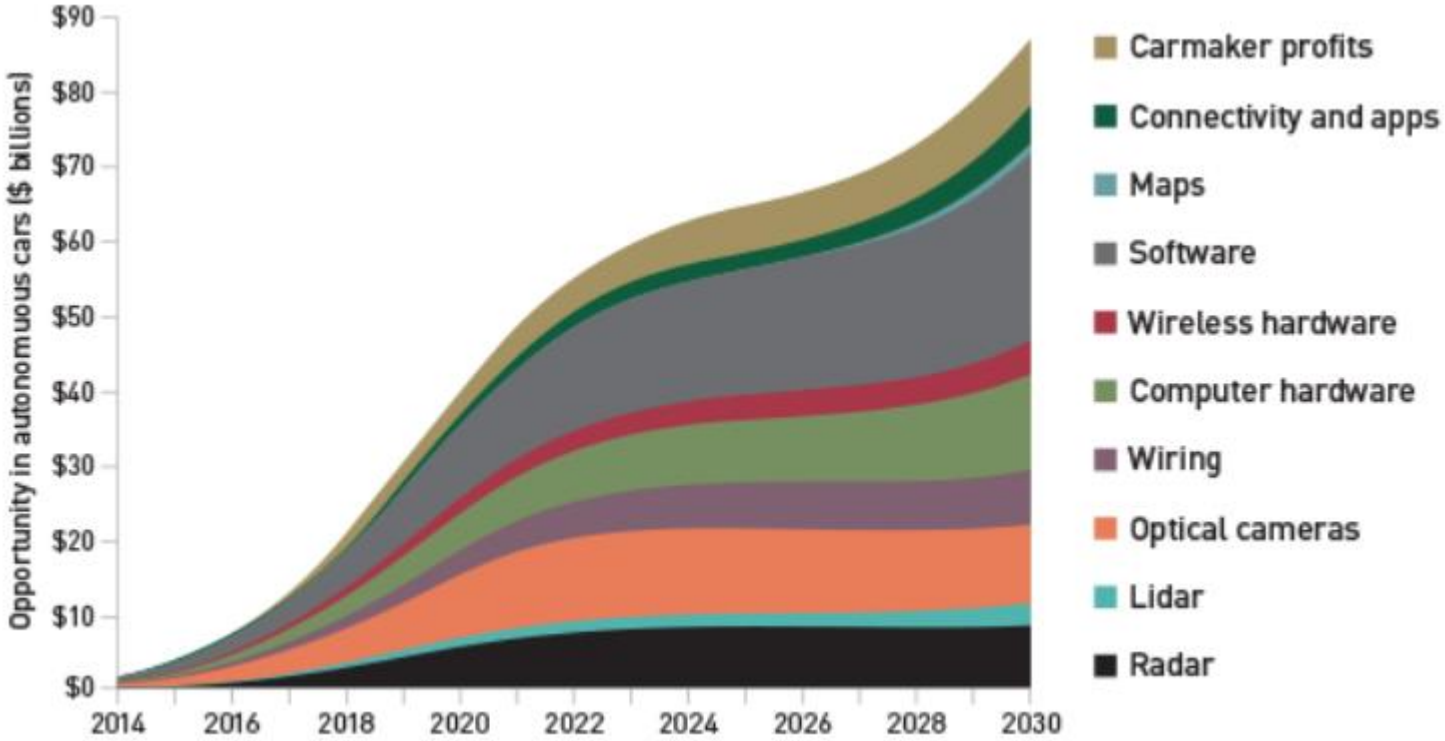
"… the deep learning market is expected to be worth USD 1,722.9 Million by 2022"

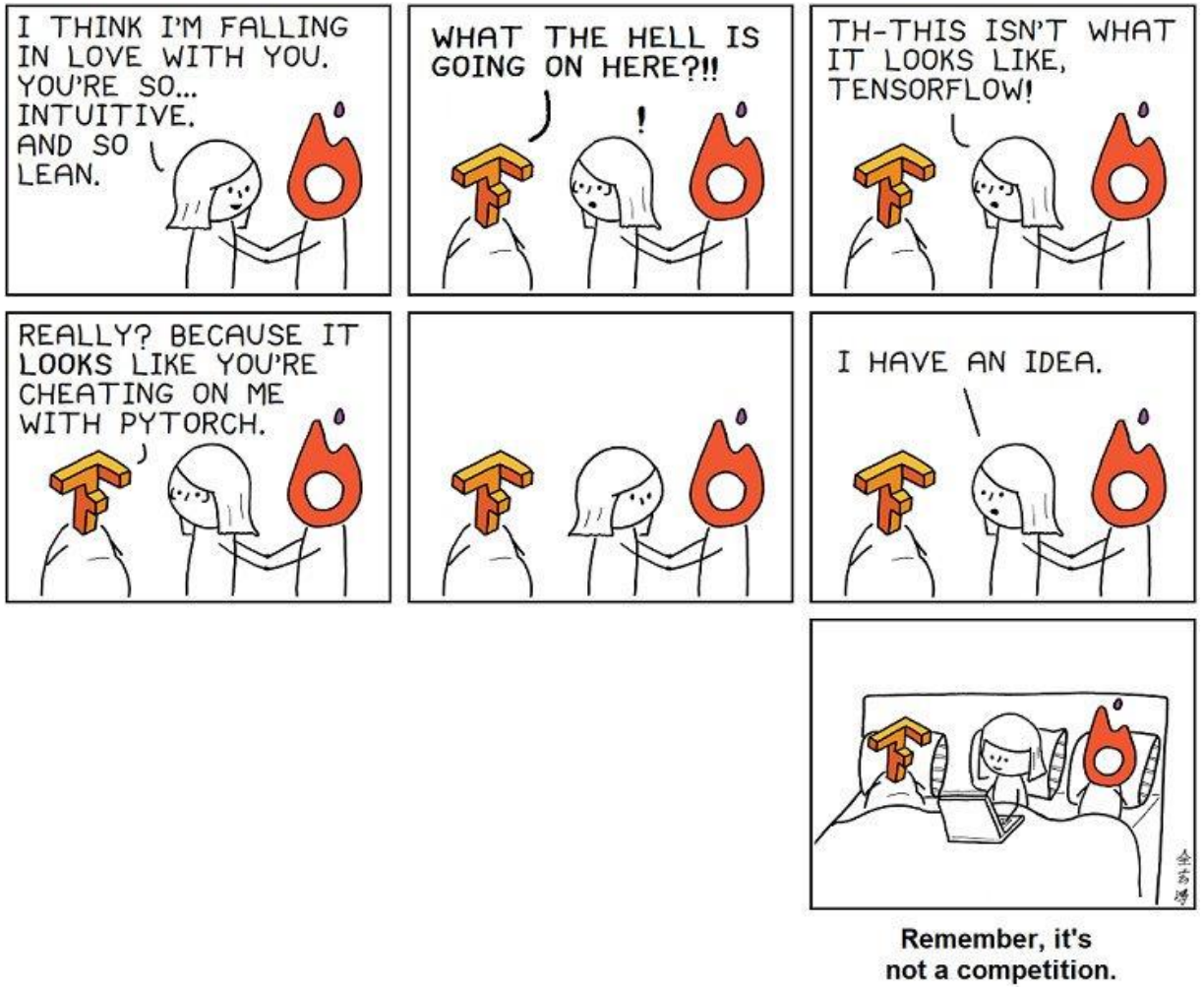


The DL software landscape

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

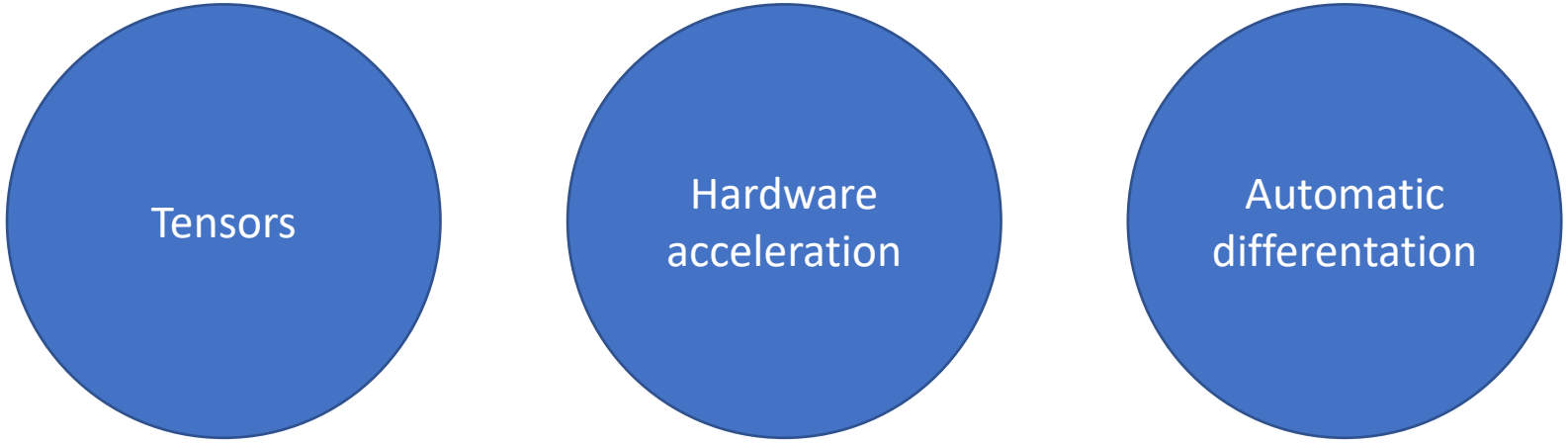
- Tensorflow are too a large extend used in production
- Pytorch is used in research

If you have the time, I recommend learning both



How to make a modern deep learning framework

3 key elements



Meme of the day

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