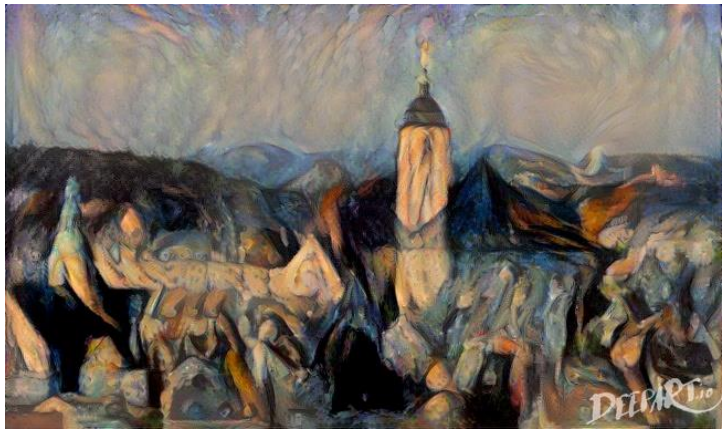
ZESS Lectures
Recent Advances in Machine Learning

State-of-the-art research in machine learning in various fields of applications

Lecture 0: Introduction and Course Organization



Michael Möller – michael.moeller@uni-siegen.de

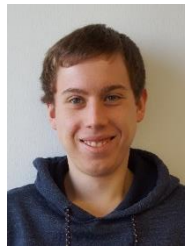
Not your average lecture…

April 4th+5th, me: Introducing the lecture and recalling machine learning

April 11th, Volker Blanz: Deep Learning and Morphable Face Models

April 12th, Birsen Yazici and Miguell Heredia Conde

April 18th, Hartmut Bauermeister: Recalling PyTorch



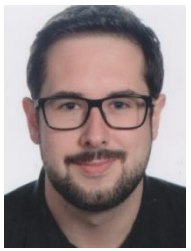
Not your average lecture…

April 25th+26th, Hubert Roth: Deep learning in robotics - applications, challenges and potentials

May 2nd and 3rd, me again: Combining model- and learning-based approaches for inverse problems in imaging

May 9th and 10th, Param Chandramouli: Deep Learning techniques for Computational Photography

May 16th and 17th, Alexander Hölzemann and Kristof Van Laerhoven: Activity Recognition and Time Series Analysis with Convolutional Neural Networks



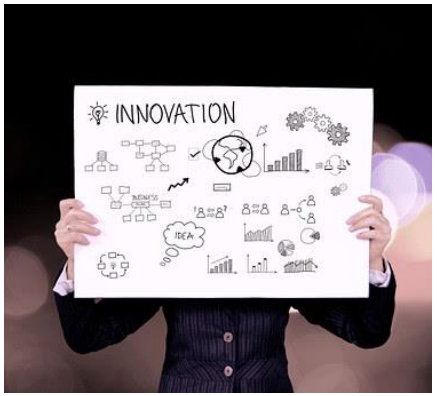
Not your average lecture…

May 23rd: Assignments of the projects

Project phase: Reading, understanding, coding, applying, summarizing

You will be supported by the project mentors. During the lecture times you can access the graphics computer pool to work on your project and access machines with decent GPUs.

July 11th and 12th, project presentation: Present your finding in 30 minute talks



Organizational Things

Necessary prior knowledge

- Linear Algebra
- Calculus
- Signal or Image Processing
- Programming
- Machine Learning basics

Organizational Things

- My office: H-A 7106
- My email: Michael.moeller@uni-siegen.de
- For appointments, please email the lecturer whose material you'd like to discuss
- The lecture starts at quarter past.
- Course website: http://www.vsa.informatik.uni-siegen.de/en/deep-learning
- Username: student Passwort: 100%brain

This lecture is worth 5 credits. You have to turn in a 6-page report and present your topic. This will determine your grade.

Please do not be shy to say something and ask questions during the lecture!

The more we discuss, the more interesting the lecture is!

Do you have any questions?

Deep Learning is Everywhere

These days it seems hard to google ANYTHING and NOT get a result containing „DEEP LEARNING“…

This Brewery Is Using Machine Learning to Create the Ideal IPA | Food ...
https://www.foodandwine.com › News ▾ Diese Seite übersetzen

New AI Toilets can Scan Poop to Detect Health Issues | MarkTechPost
https://www.marktechpost.com › ... › Applications ▾ Diese Seite übersetzen

Purpose of this lecture: Give you some insights on research in machine learning and its applications!

Where is the cutting edge?

Machine Learning

NeurIPS
(Neural Information Processing Systems**)**

ICML
(International Conference on Machine Learning**)**

ICLR
(International Conference on Learning Representations**)**

Computer Vision

CVPR
(Computer Vision and Pattern Recognition**)**

ICCV
(International Conference on Computer Vision**)**

ECCV
(European Conference on Computer Vision**)**

Graphics

SIGGRAPH
(Special Interest Group on Graphics and Interactive Techniques**)**

Robotics

ICRA
(International Conference on Robotics and Automation**)**

IROS
(International Conference on Intelligent Robots and Systems**)**

Ubiquitous Computing

UbiComp
(Ubiquitous Computing**)**

And many, many more applications!!

Exemplary look at NeurIPS

NeurIPS (formerly known as NIPS)

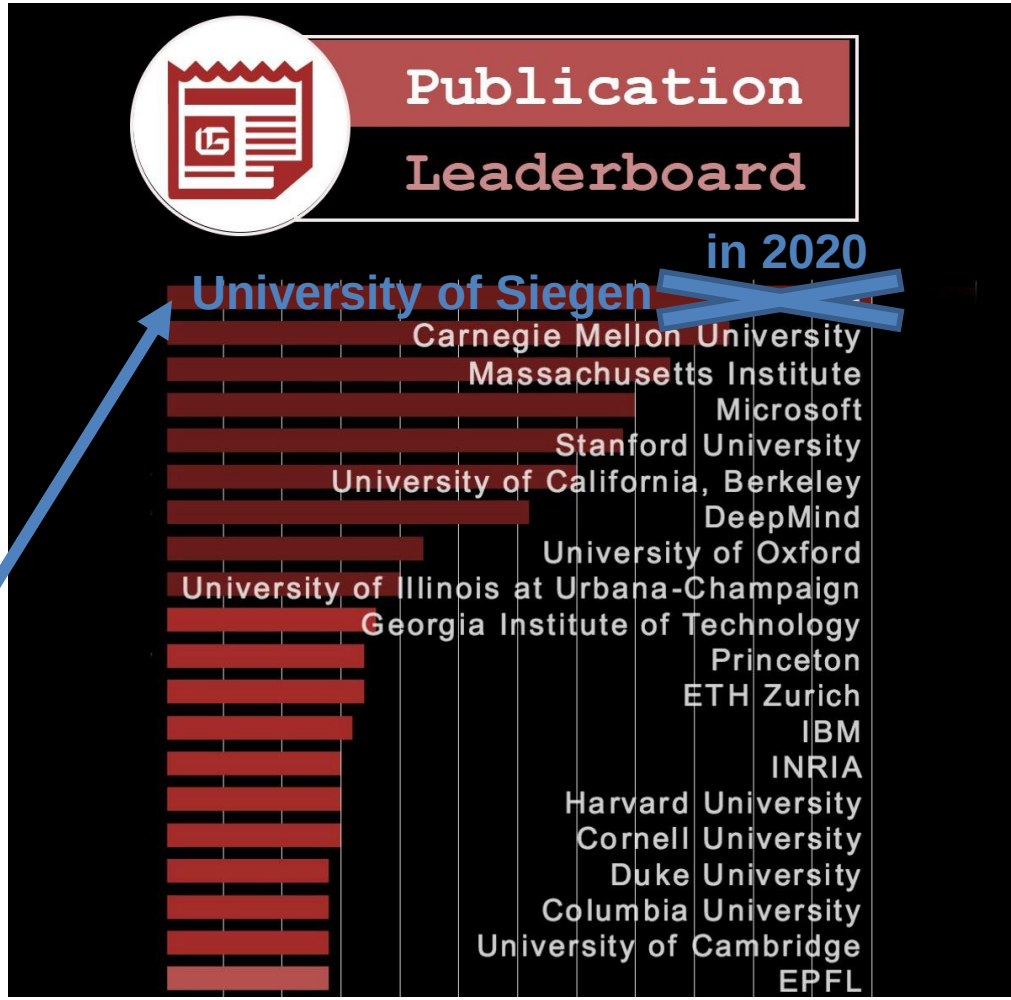
Had 8000 attendees in 2017
– tickets solds out in ~2 weeks

Had 6000 attendees in 2016…

Has acceptance rates ~25%

About 1-2% of the submissions get a spot for an oral presentation

Declared goal of this lecture



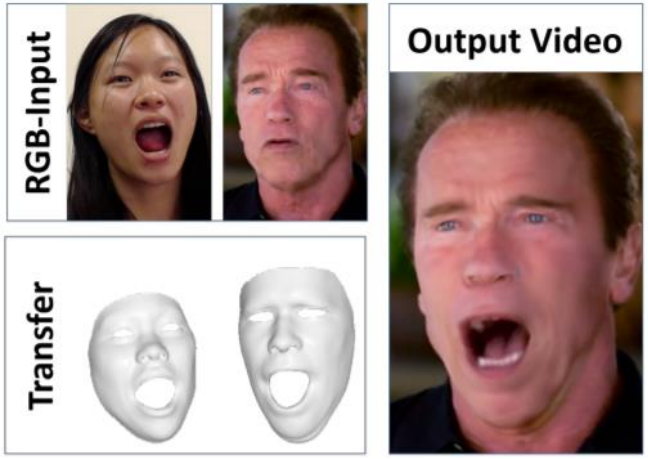
From: https://medium.com/syncedreview/a-statistical-tour-of-nips-2017-438201fb6c8a

Why has ML become so popular?

Because it has enabled amazingly impressive applications, particularly in Visual Computing!

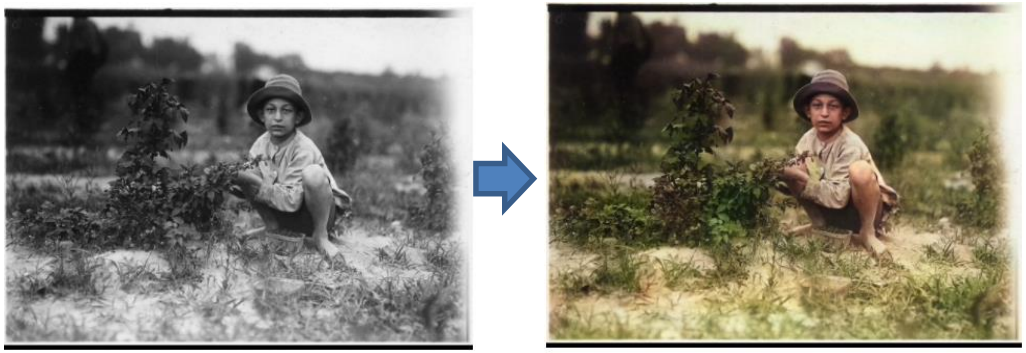
Example 1: Video Reanactment, e.g.

https://youtu.be/MVBe6_o4cMI



Example 2: Image colorization, e.g.

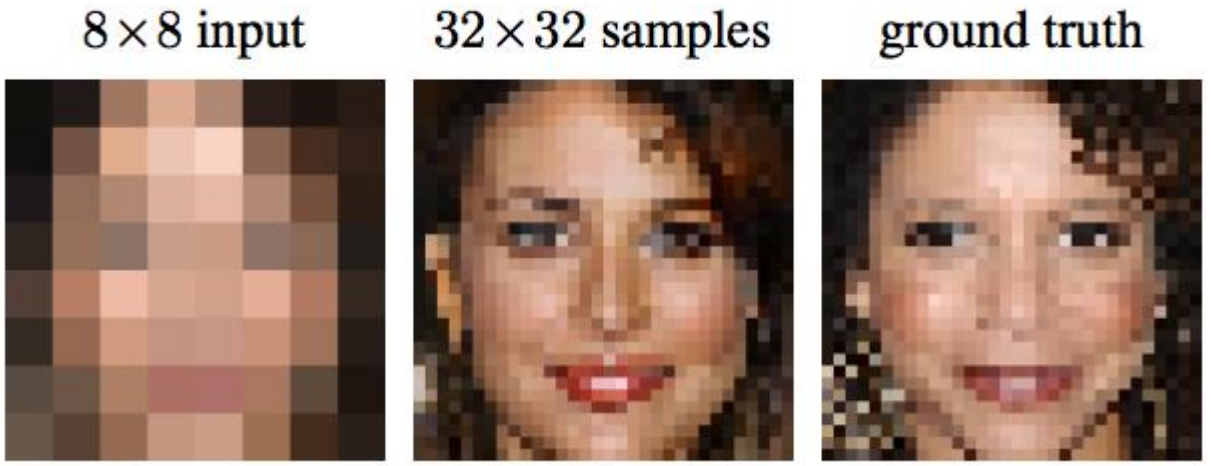
https://youtu.be/ys5nMO4Q0iY



Motivated by http://www.yaronhadad.com/deep-learning-most-amazing-applications/

Why has ML become so popular?

Example 3: Super Resolution, e.g.



Example 4: Sketch 2 Image, e.g.

https://affinelayer.com/pixsrv/

Motivated by http://www.yaronhadad.com/deep-learning-most-amazing-applications/

Why has ML become so popular?

Example 5: Music generation, e.g. https://youtu.be/j60J1cGINX4

Example 6: Lip reading, e.g. https://www.youtube.com/watch?v=5aogzAUPilE

Example 7: Image inpaint, e.g. https://www.youtube.com/watch?v=gg0F5JjKmhA

Some fun things to soon be accomplished perfectly, e.g.

https://www.youtube.com/watch?v=PCBTZh41Ris

And of course some of the most life-changing applications to soon enter the consumer market like self-driving cars and service robots!

Up next: Short technical summary of machine learning!