Zürcher Hochschule
für Angewandte Wissenschaften

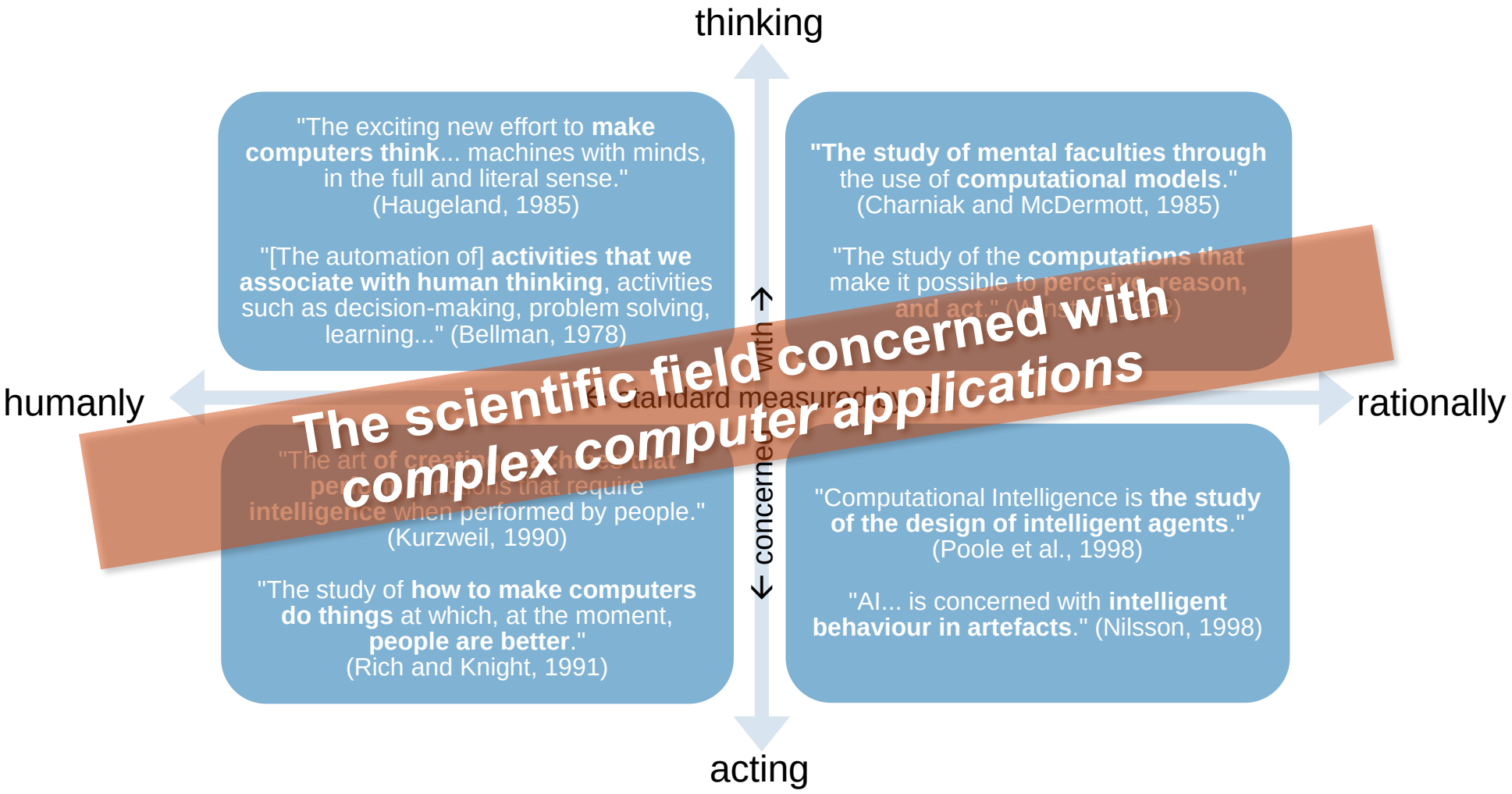
KI zwischen Hype und Anwendung

Innovationsapero "Machine Learning – wie starte ich mein eigenes Projekt", Technopark Winterthur

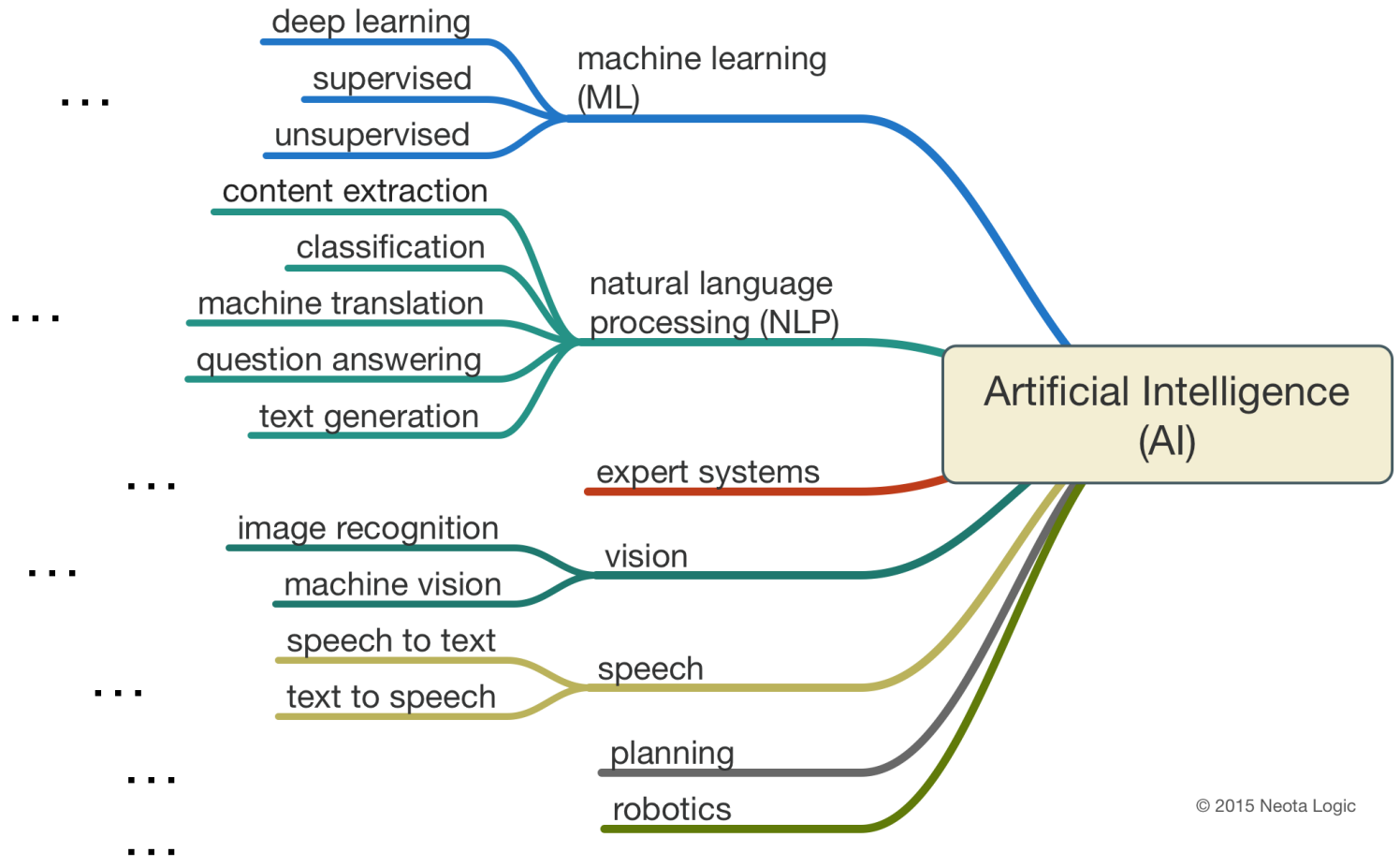
10. September 2019

Thilo Stadelmann

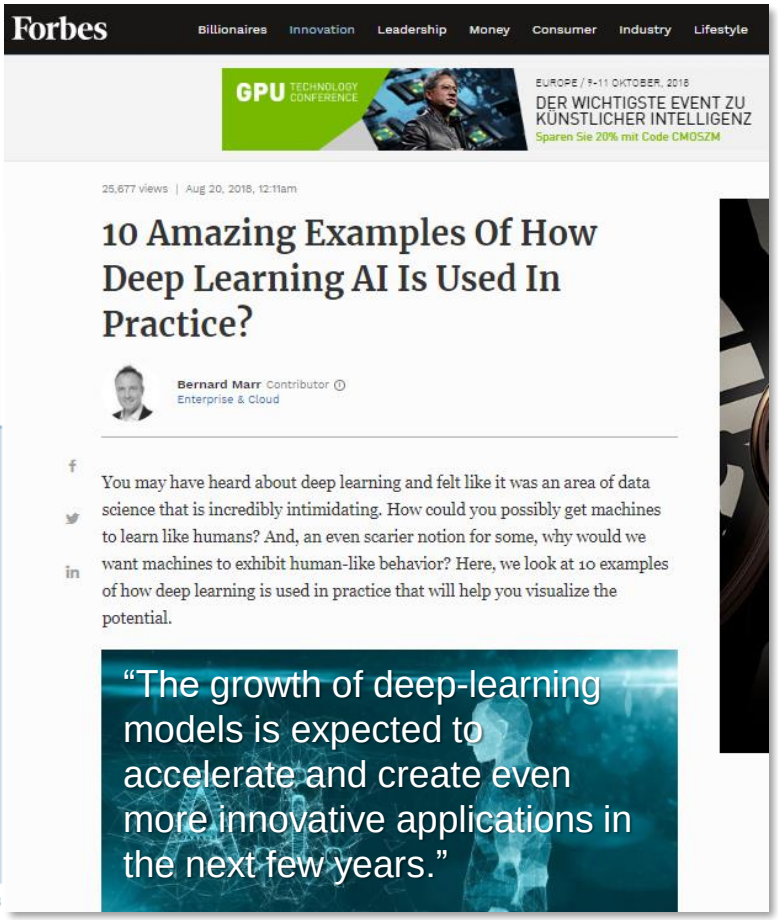
Was ist künstliche Intelligenz?



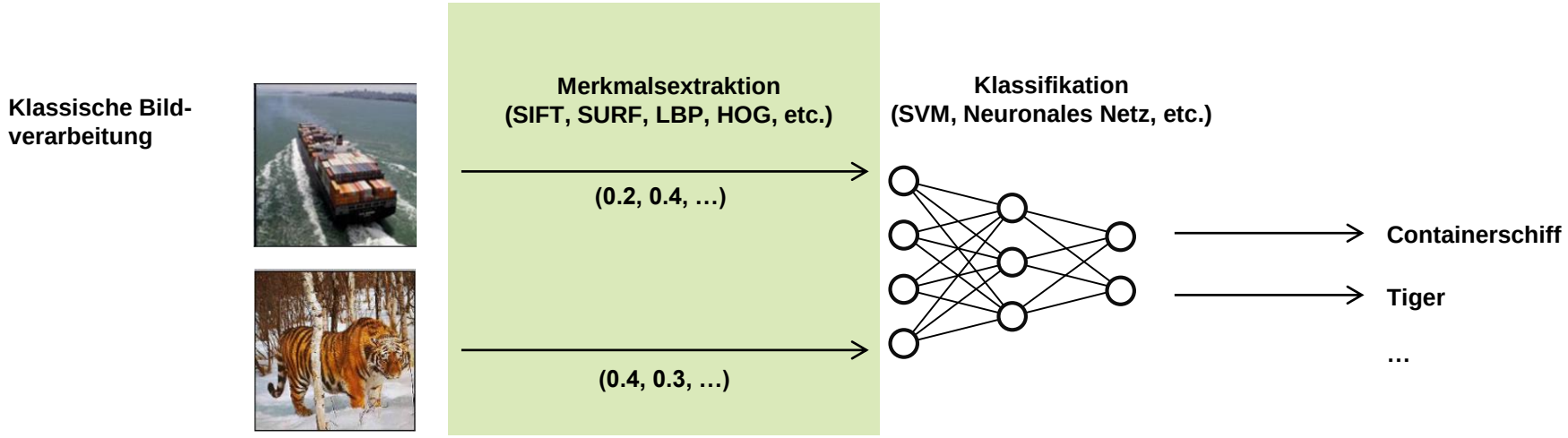
Was gehört zu künstlicher Intelligenz?



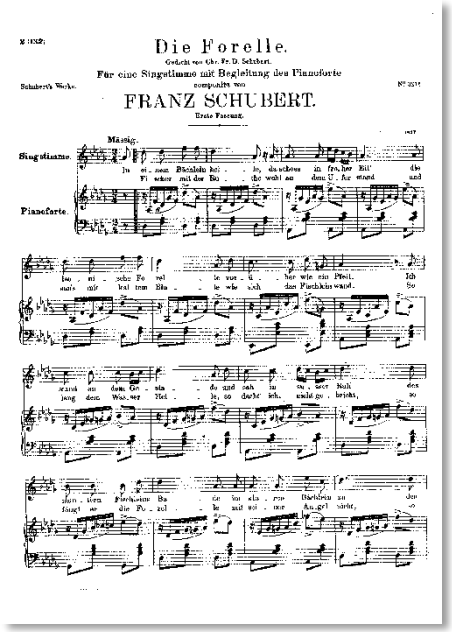
Warum der Hype?

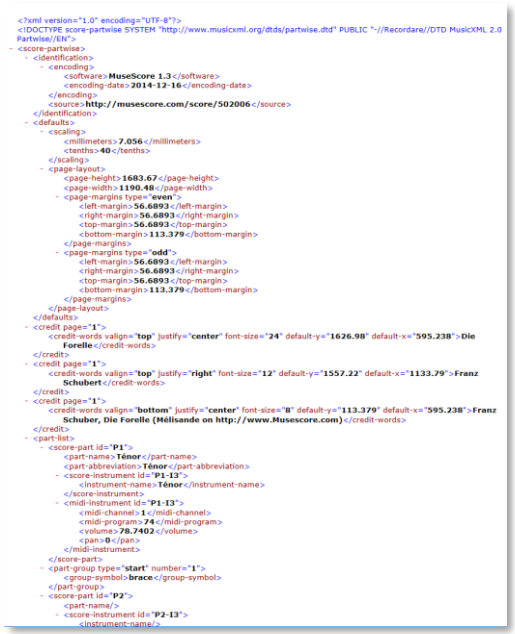


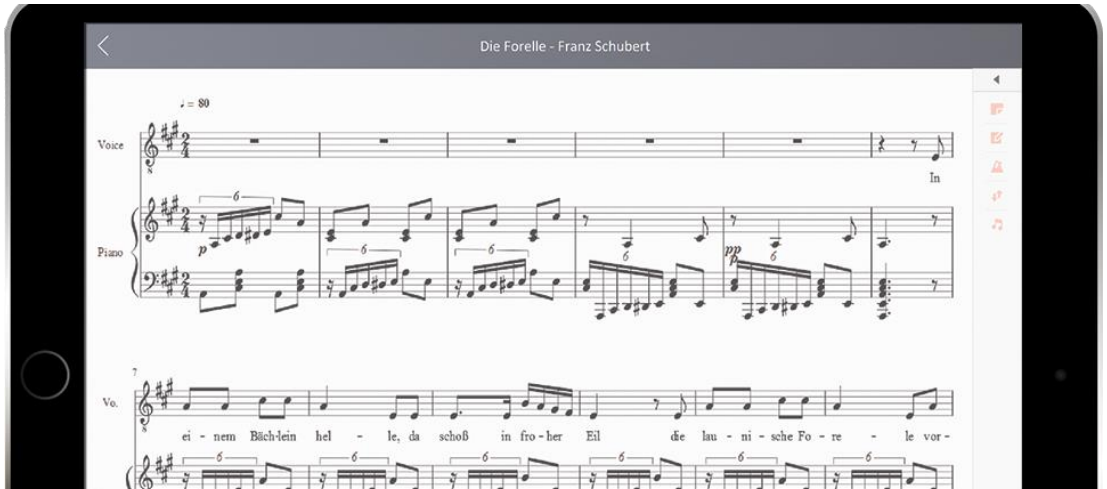
Idee «Deep Learning»: Mehr «Tiefe» zum automatischen Lernen von Merkmalen



Praxis: Musikalien digitalisieren







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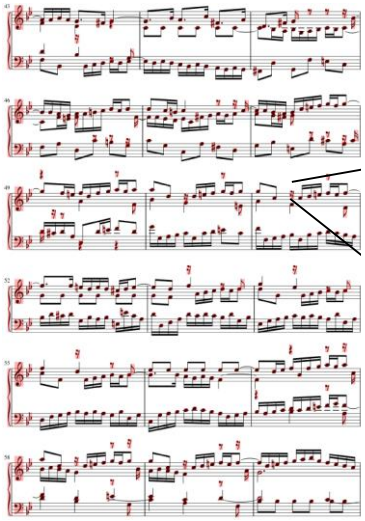
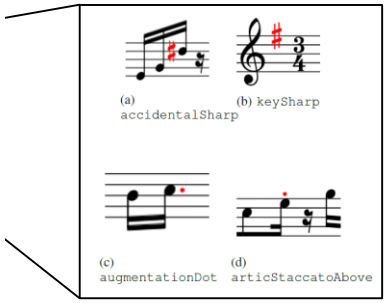
Herausforderungen und Lösungsansätze





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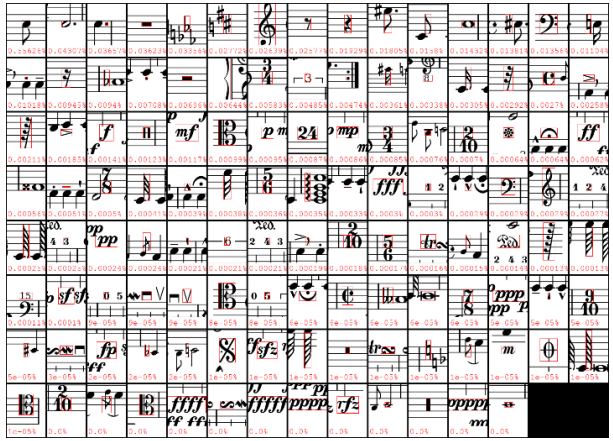

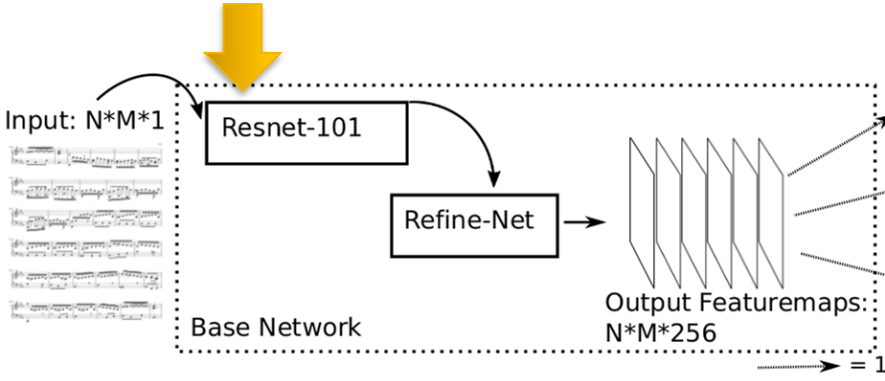

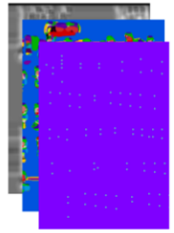

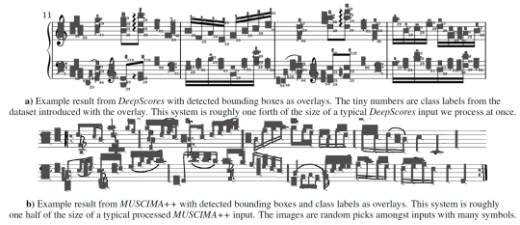

Tuggener, Elezi, Schmidhuber, Pelillo & Stadelmann (2018). *«DeepScores – A Dataset for Segmentation, Detection and Classification of Tiny Objects»*. ICPR'2018.
Tuggener, Elezi, Schmidhuber & Stadelmann (2018). *«Deep Watershed Detector for Music Object Recognition»*. ISMIR'2018.

Schlussfolgerungen

- Deep Learning hat zu Paradigmenwechsel in *Mustererkennungsaufgaben* geführt
- Die Zeit vom Grundlagenresultat zur praktischer Anwendung beträgt wenige Monate
- Spezifische Aufgaben lassen sich sehr gut automatisieren (z.B. Ähnlichkeitssuche)
- KMU sind gut positionert: schon wenige Ressourcen können grossen Unterschied machen

datalab
www.zhaw.ch/datalab

swiss group for artificial intelligence and cognitive science
sgaico

data service
Swiss Alliance for Data-Intensive Services

Zu mir:

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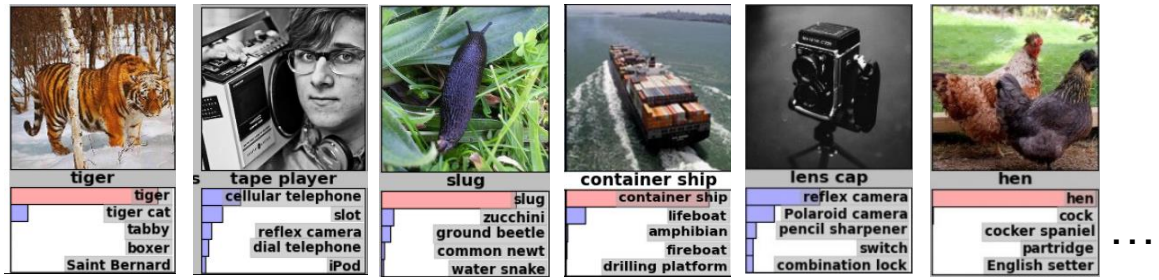
Mehr zum Thema:

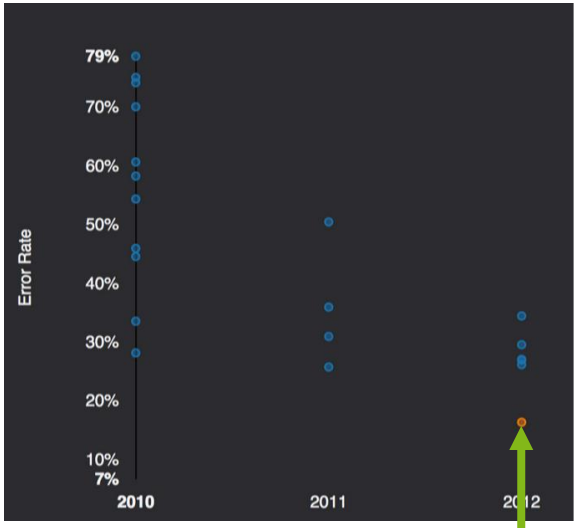
- Data+Service Alliance: www.data-service-alliance.ch
- KI: https://sgaico.swissinformatics.org/
- Zusammenarbeit: datalab@zhaw.ch

ANHANG

Was ist passiert?
Der ImageNet Wettbewerb

1000 Kategorien
1 Mio. Beispiele





A. Krizhevsky verwendet als erster ein sog. «Deep Neural Network» (CNN)

2015: Computer *haben "Sehen" gelernt*

4.95% Microsoft (06. Februar)
→ Besser als Menschen (5.10%)

4.80% Google (11. Februar)

4.58% Baidu (11. Mai)

3.57% Microsoft (10. Dezember)

Industrialisierung der Notenerkennung

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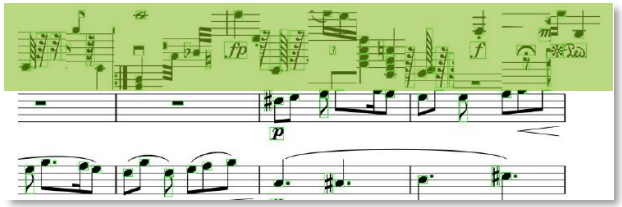
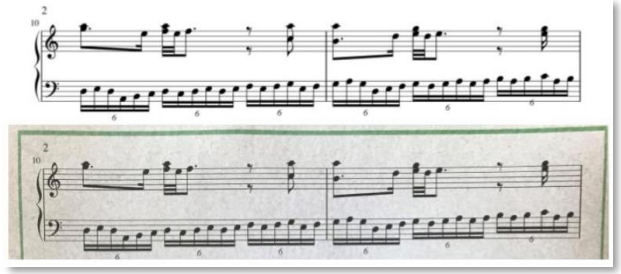
Recent results on class imbalance and robustness challenges

1. Added sophisticated **data augmentation** in every page's margins



2. Put additional effort (and compute) into hyperparameter **tuning** and **longer training**
3. Trained also on scanned (more **real-worldish**) scores

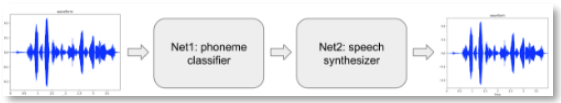


➔ **Improved** our **mAP** from 16% (on purely synthetic data) **to 73%** on more challenging real-world data set (additionally, using Pacha et al.'s evaluation method as a 2nd benchmark: from 24.8% to 47.5%)

Elezi, Tuggener, Pelillo & Stadelmann (2018). *«DeepScores and Deep Watershed Detection: current state and open issues»*. WoRMS @ ISMIR'2018.
Pacha, Hajic, Calvo-Zaragoza (2018). *«A Baseline for General Music Object Detection with Deep Learning»*. Appl. Sci. 2018, 8, 1488, MDPI.

Ausblick: Innovation aus neuronalen Netzen?





- *Deep Learning* ist der Kern vieler erstaunlicher Anwendungen im Bereich der Automatisierung von Wahrnehmung (Synthese & Analyse)
  ➔ Code & Datensätze laden “Maker” zum Ausprobieren ein

- *Automated Deep Learning* macht in Zukunft vielleicht manche Anwendung einfacher

- Aktuell braucht es ein gutes Verständnis der Details der Methode, um kreativ neue Szenarien zu erdenken (Stichwort “mTrainer” anstatt Programmierer?)