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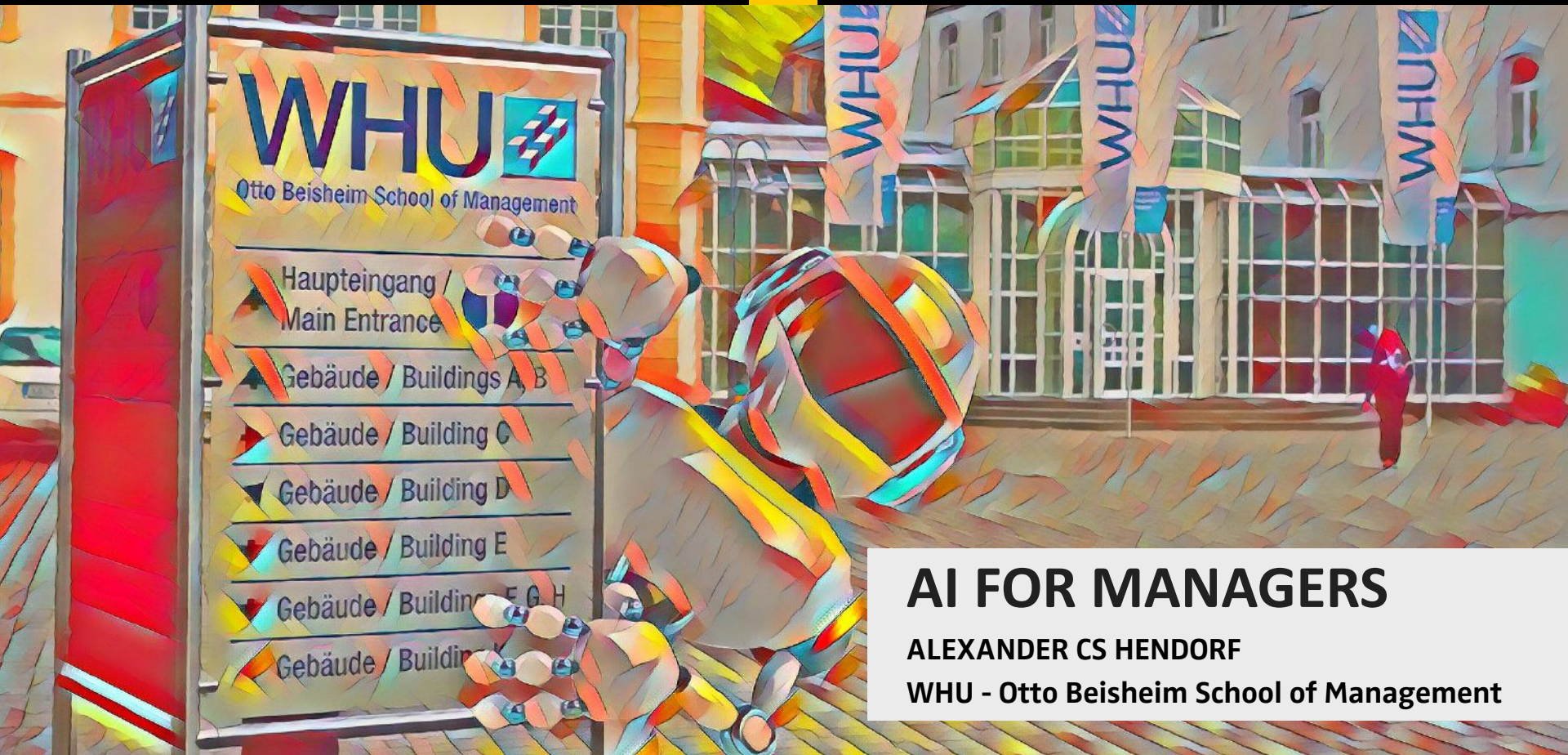

AI FOR MANAGERS

ALEXANDER CS HENDORF

WHU - Otto Beisheim School of Management

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Alexander C. S. Hendorf

ah@koenigsweg.com

@hendorf

—Partner & Principal Consultant Information Technology Consulting on AI & Data Science

—Python Software Foundation Fellow, Python Softwareverband chair, Program Chair of EuroSciPy, PyConDE & PyData Berlin, MongoDB Master, Emeritus EuroPython

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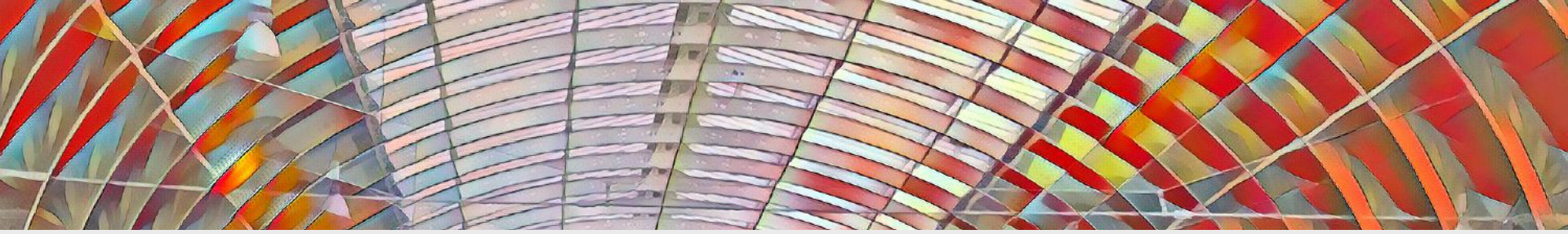

HOW TO BUY AI

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HOW TO BUY AI IN 2019

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CUT OR PIECE?

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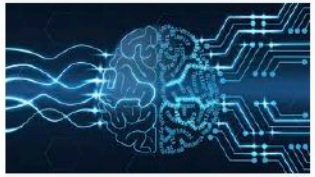
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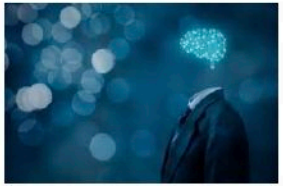
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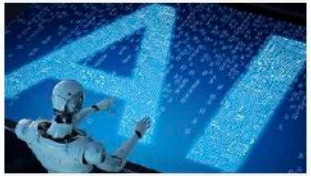

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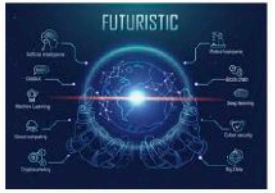

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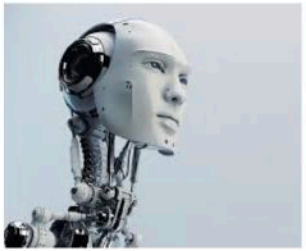
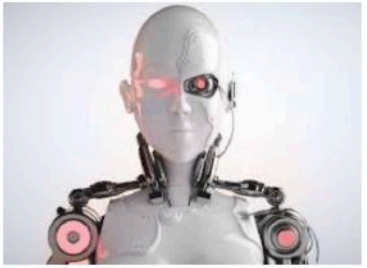
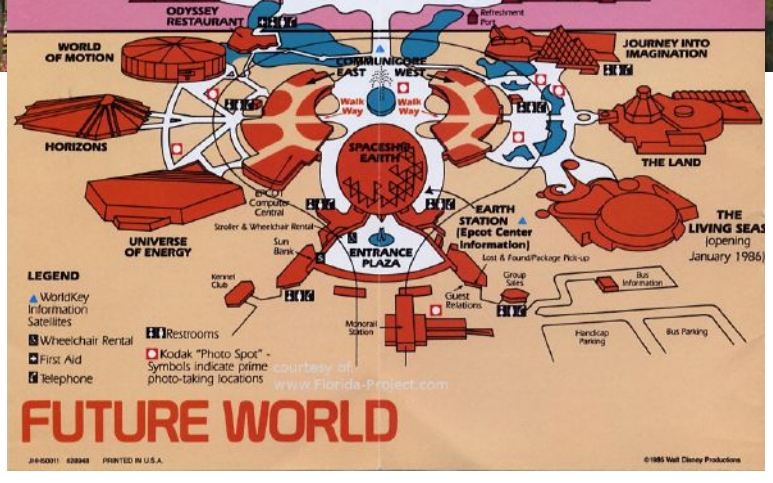


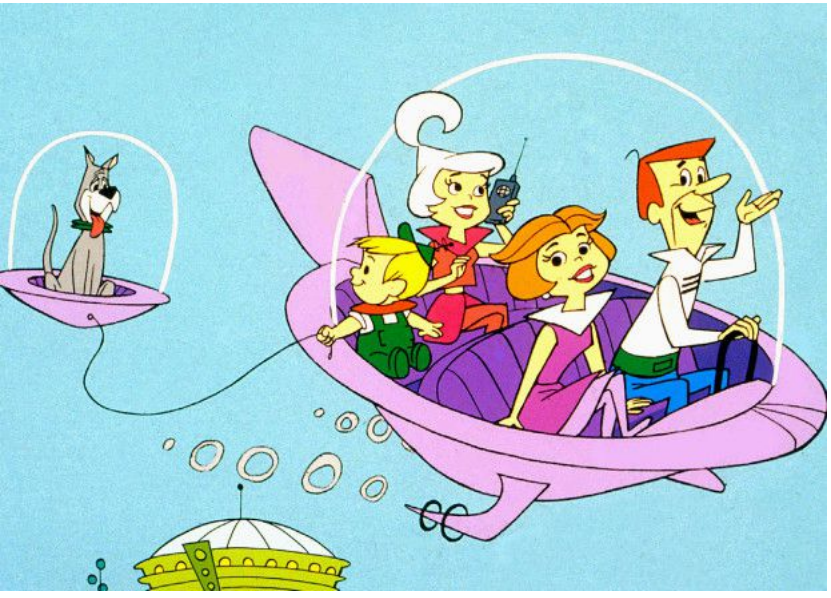


The Prologue and the Promise by Robert McCall @ Walt Disney World Horizons

Utopia, 1985



Future World section of Epcot at Walt Disney World



The Jetsons, 1962

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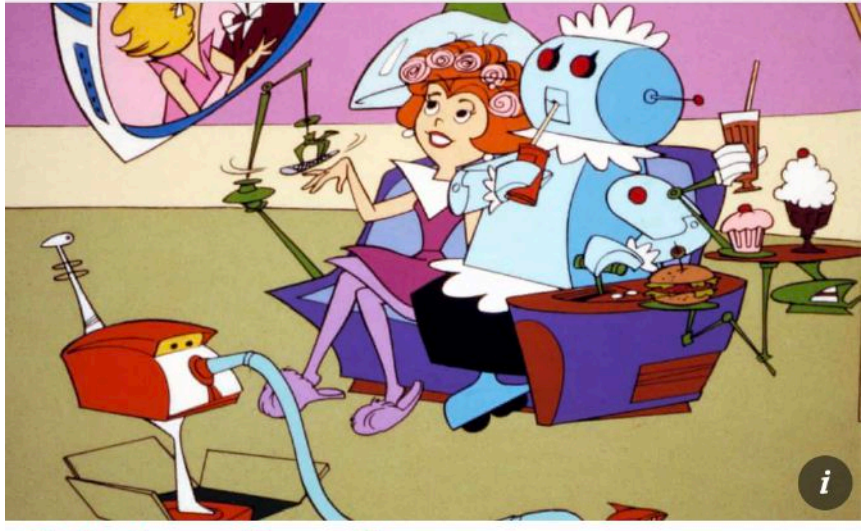
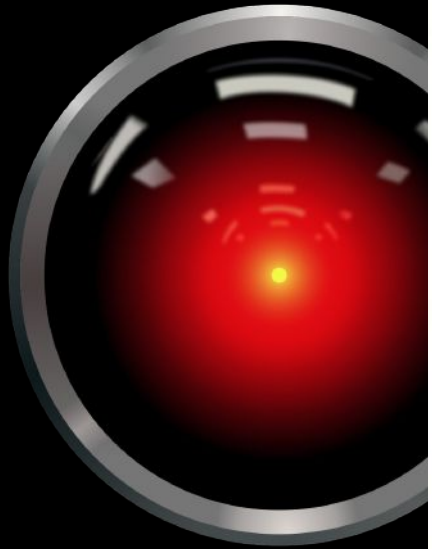


Technology and Innovation

Fully automated luxury communism

HAL, 1968



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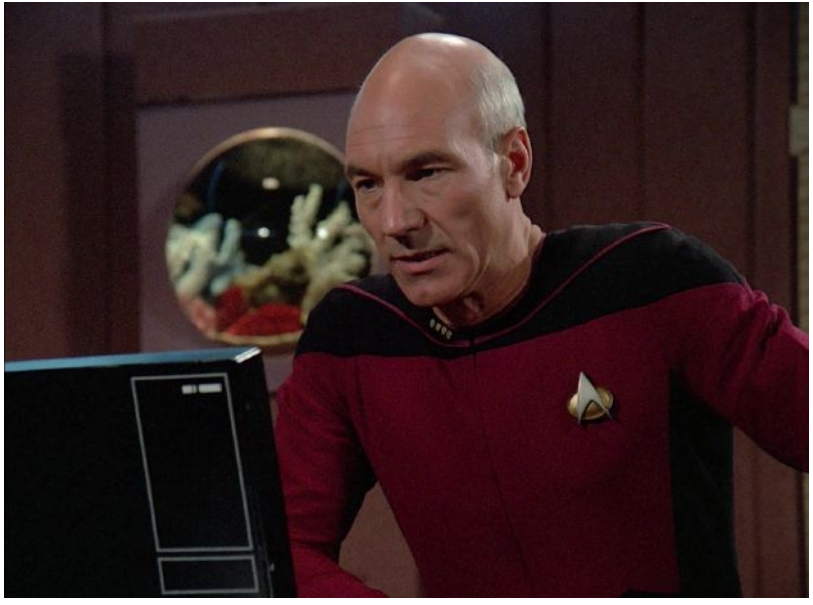
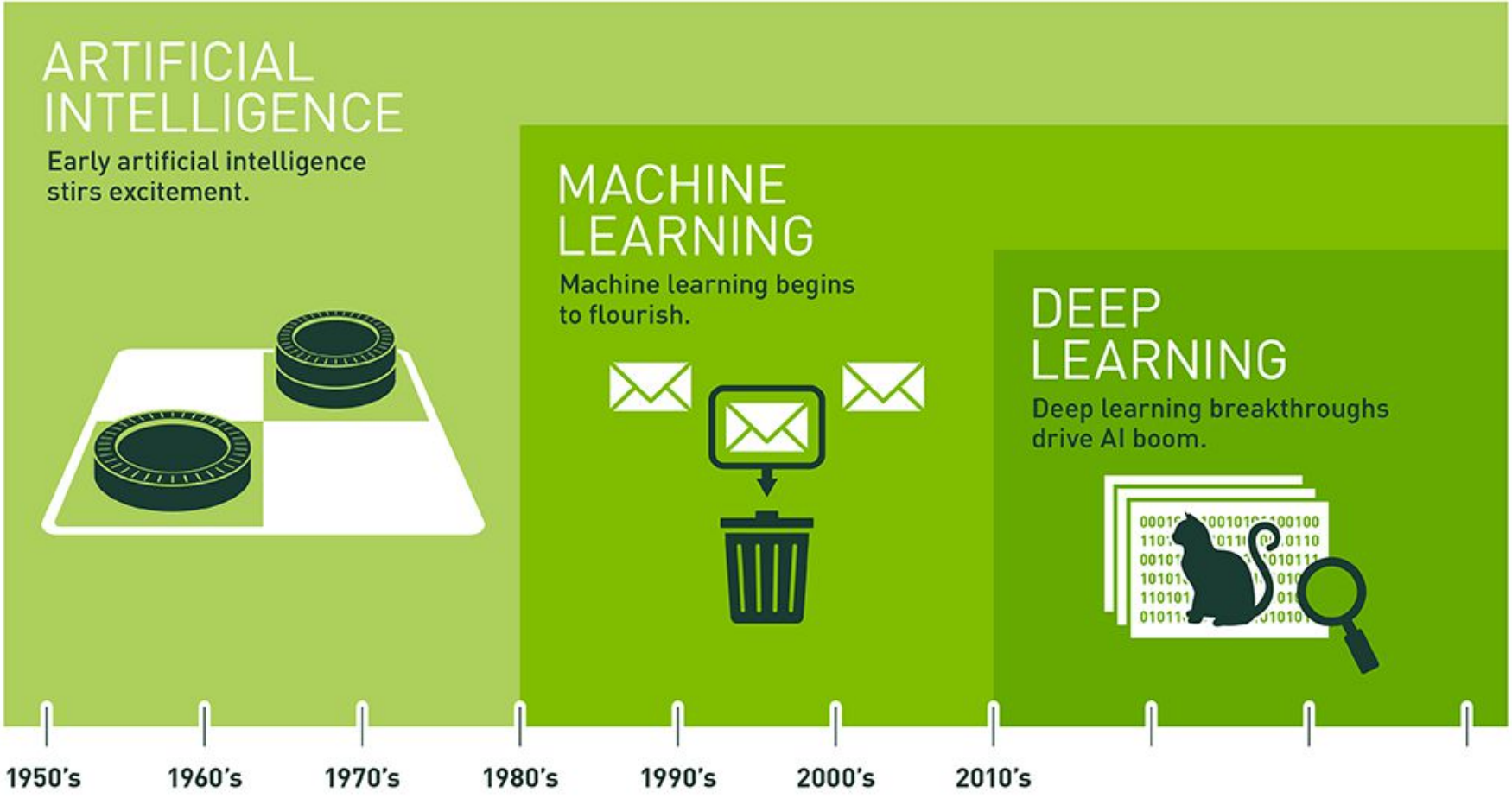
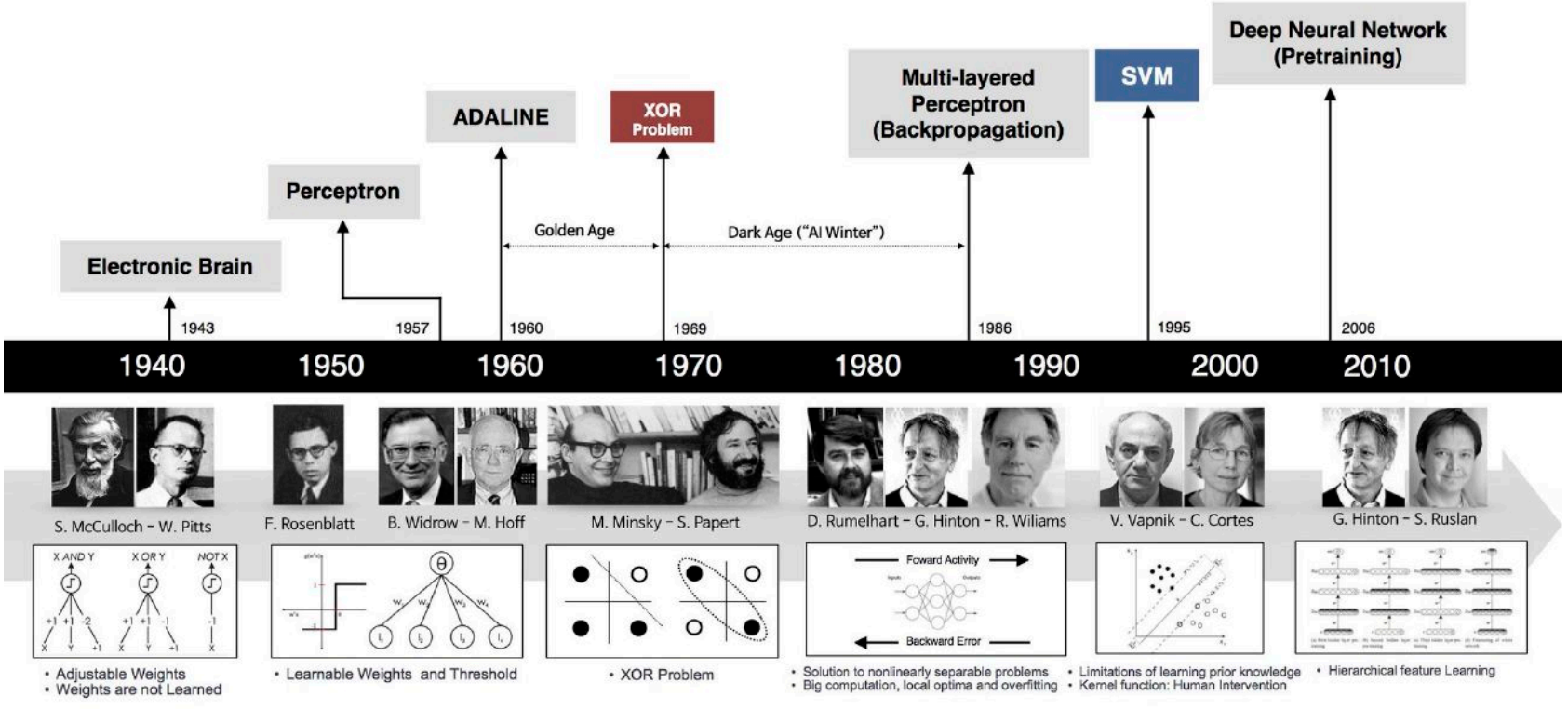


Star Trek



source: [What's the Difference Between Artificial Intelligence, Machine Learning, and Deep Learning? (NVIDIA blog article)].



source: unknown

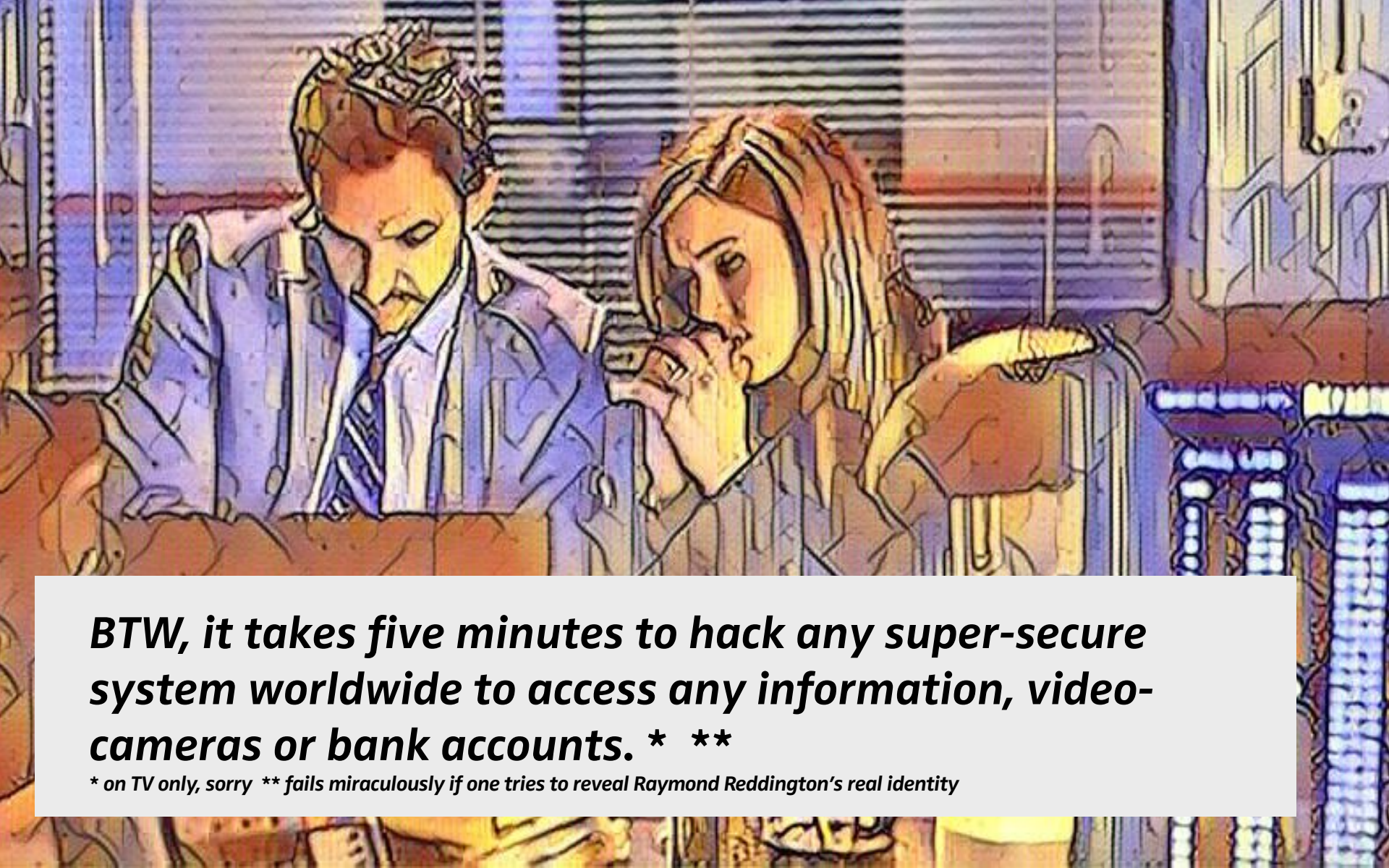
Drivers Today

- Access to large volumes of data
- Computer power
- Especially parallelisation with GPUs
- New hardware e.g. as Google's tensorboards

WHERE DO WE STAND? – SOME PERSPECTIVES.

DATA SCIENTISTS‘ PERSPECTIVES

How do you feel about programming?



BTW, it takes five minutes to hack any super-secure system worldwide to access any information, video-cameras or bank accounts. * *

** on TV only, sorry ** fails miraculously if one tries to reveal Raymond Reddington's real identity*

How does an (AI)|(Data |(Science|Enigneer)) Expert look like?

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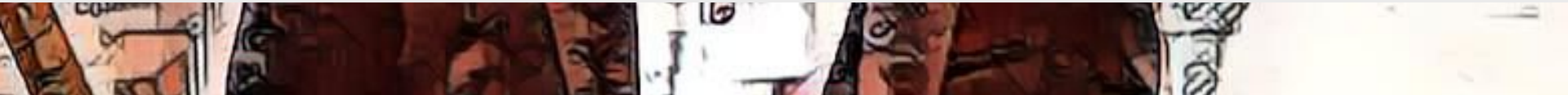

How does an (AI)|(Data |(Science|Enigneer)) Expert look like?

HACKER?

ENTREPENEUR?

SUPERSTAR?

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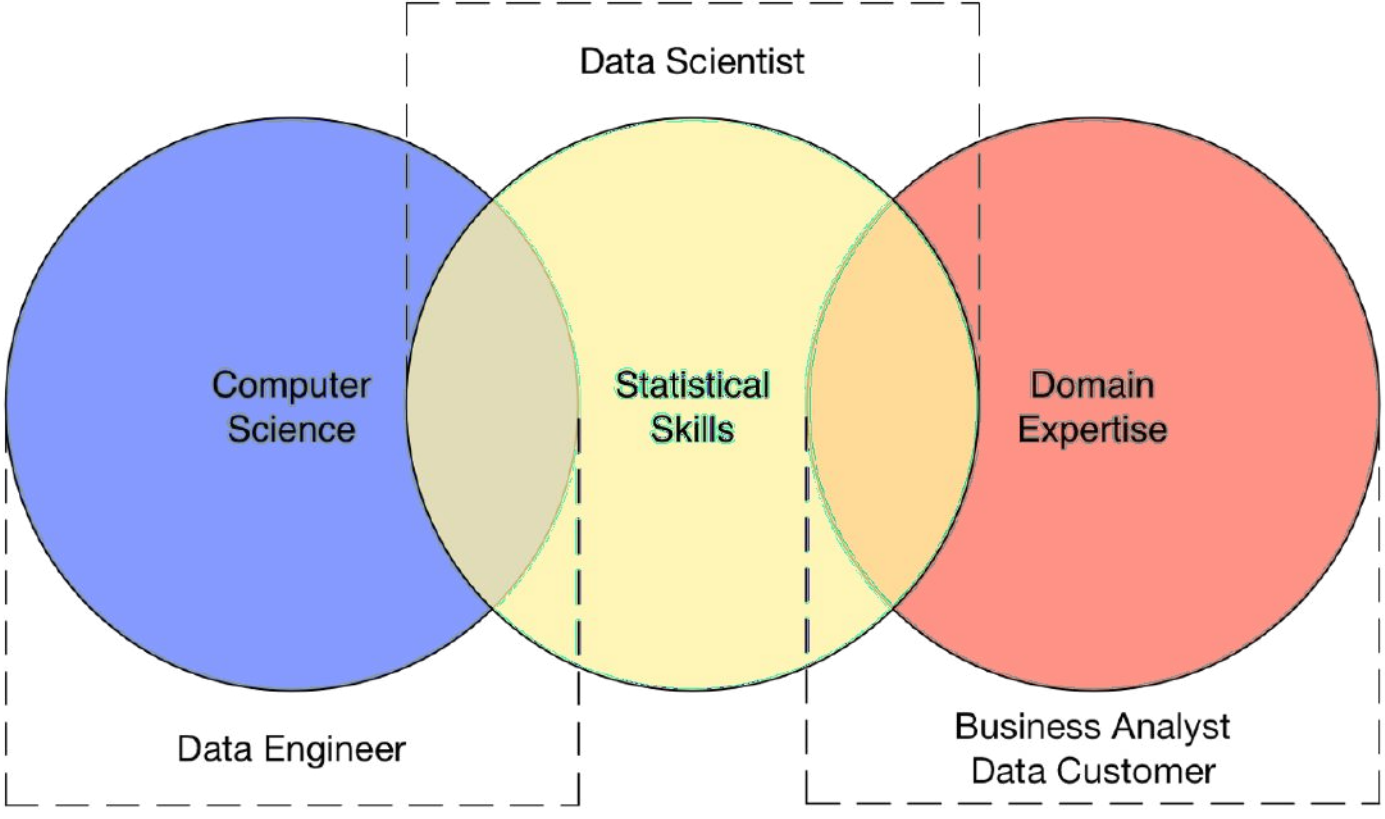
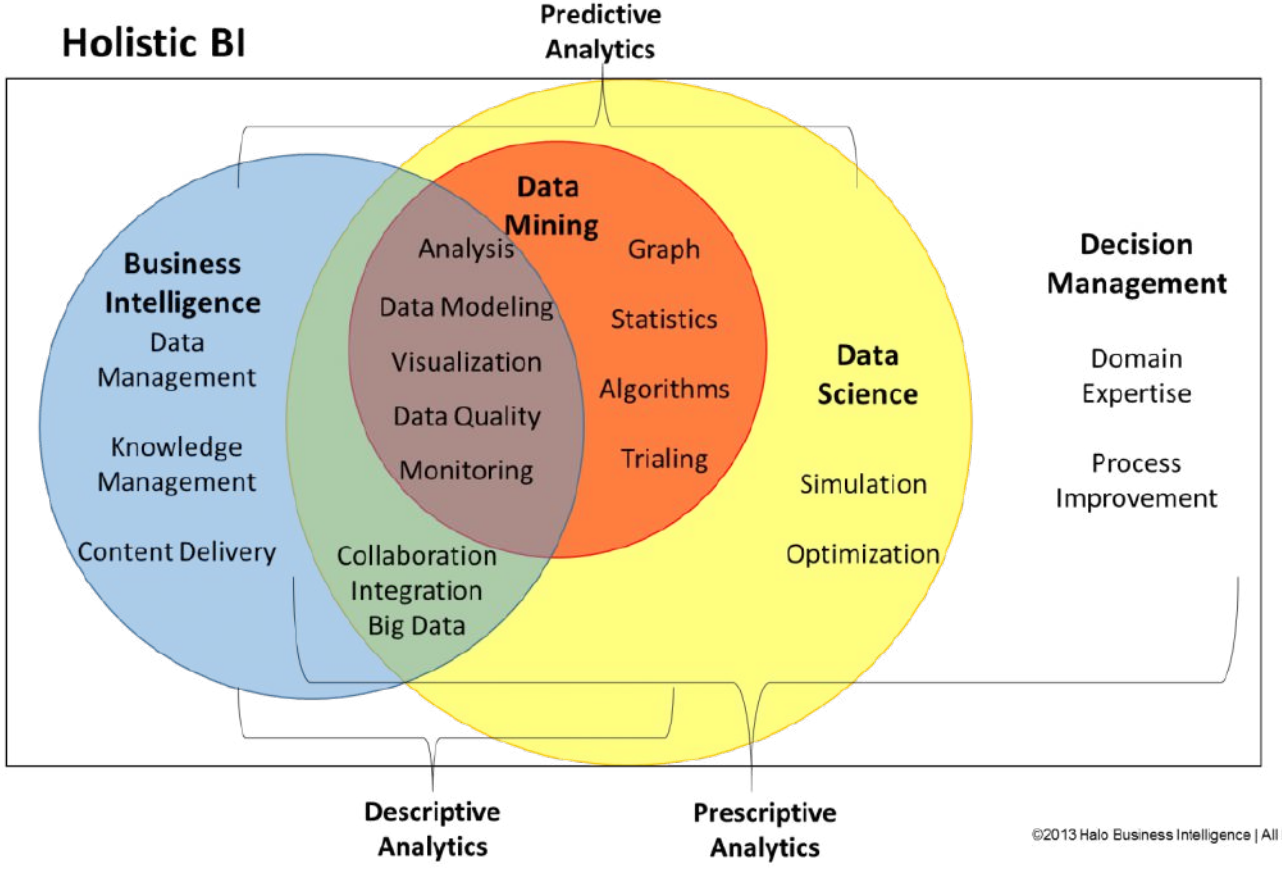
Data Scientists' & AI Engineers' Backgrounds

- New job descriptions created in accelated digitalisation era
- Data Scientist job title invented just in 2008
- Master Students & PhDs from academia
- Physics, math, new specialized curriculums
- Many lateral entrants „Seiteneinsteiger"


Data Scientist
Computer Science
Statistical Skills
Domain Expertise
Data Engineer
Business Analyst
Data Customer



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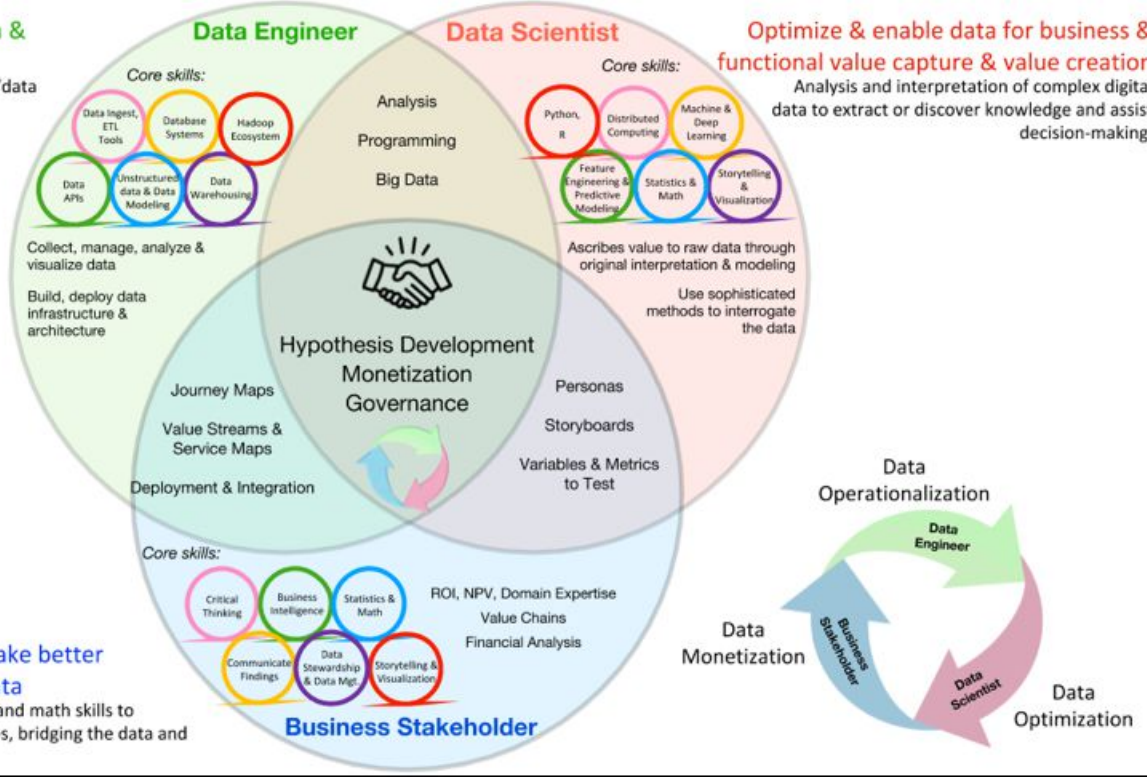
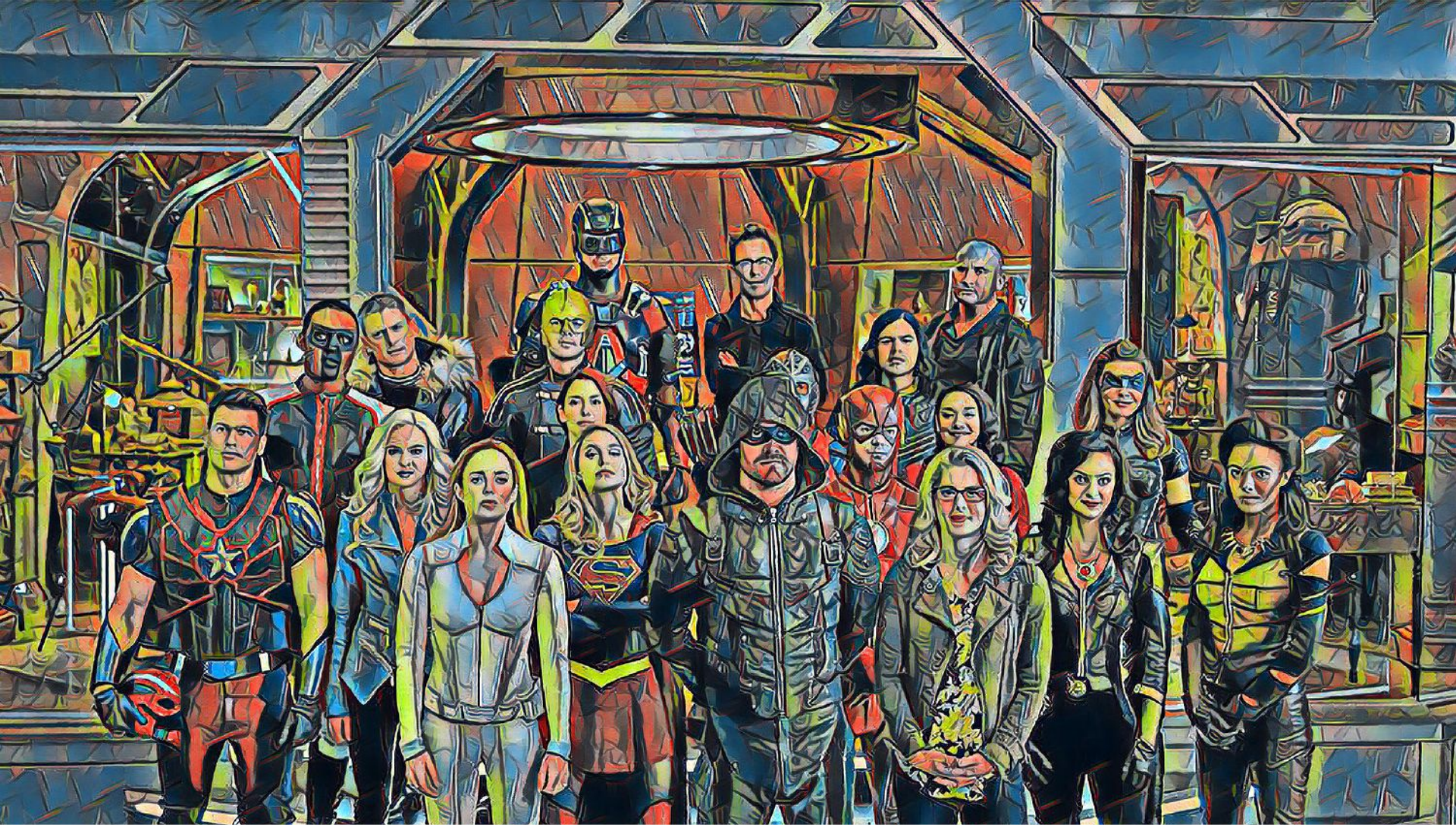
Data Science Roles & How They Interact





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I‘m a Data Scientists but my work is just analytics…

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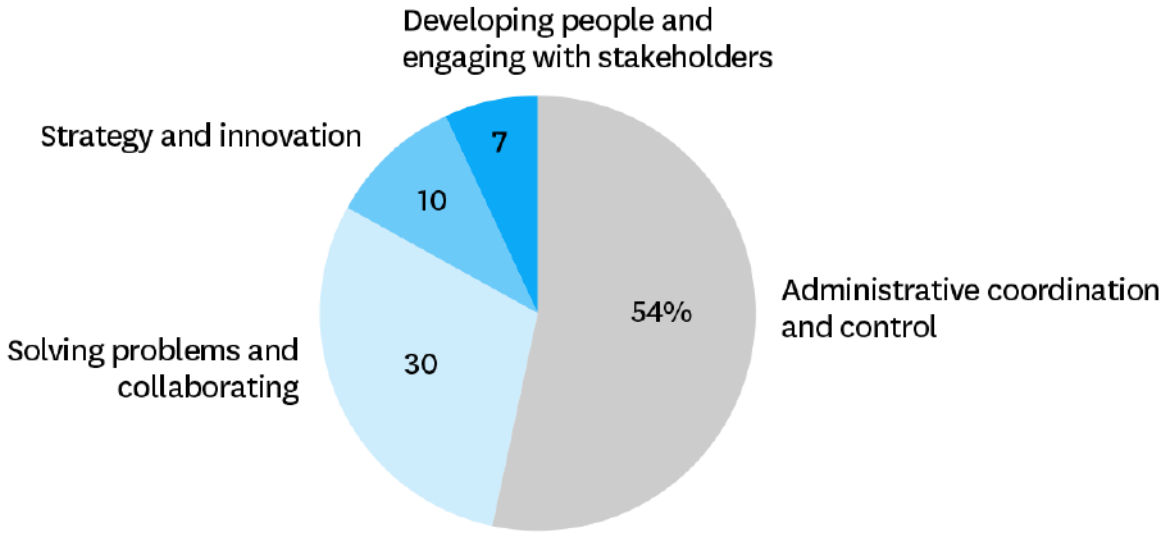
MANAGERS' PERSPECTIVES

How Managers Spend Their Time

The bulk of it is spent on administrative tasks.

PERCENTAGE OF TIME RESPONDENTS SPEND ON CATEGORIES OF WORK



SOURCE ACCENTURE SURVEY OF 1,770 FRONTLINE, MID-LEVEL, AND EXECUTIVE-LEVEL MANAGERS FROM 14 COUNTRIES

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ai for managers

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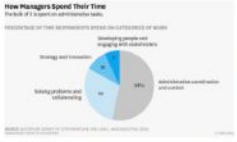

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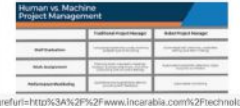

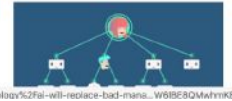

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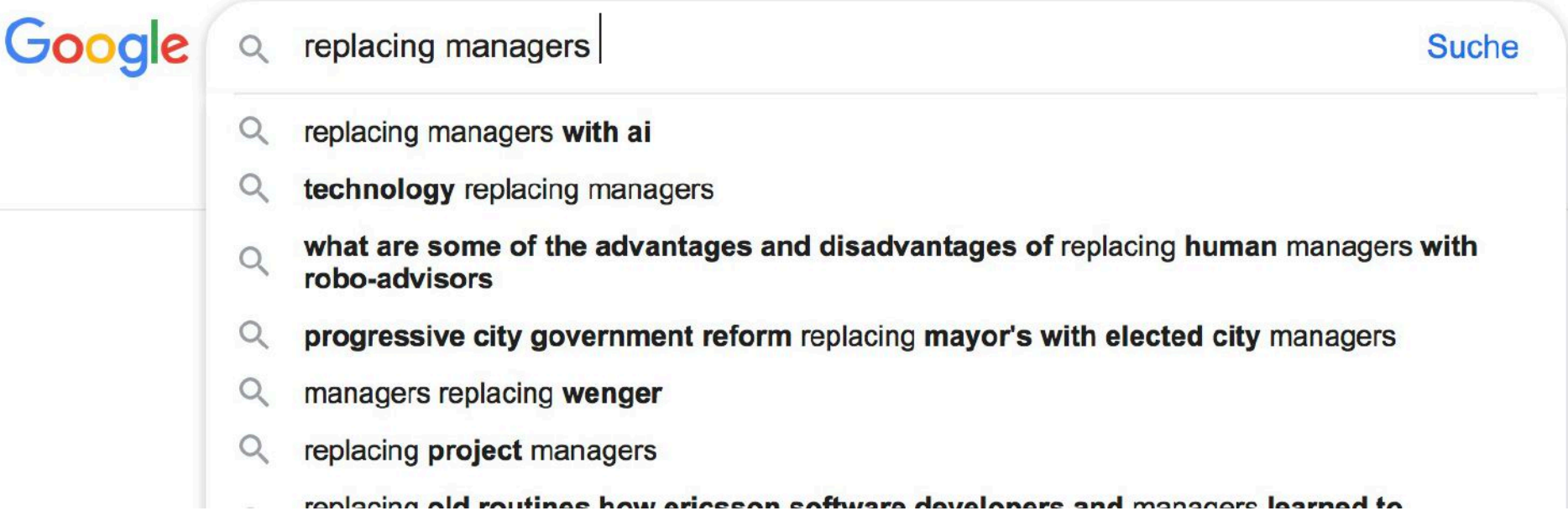
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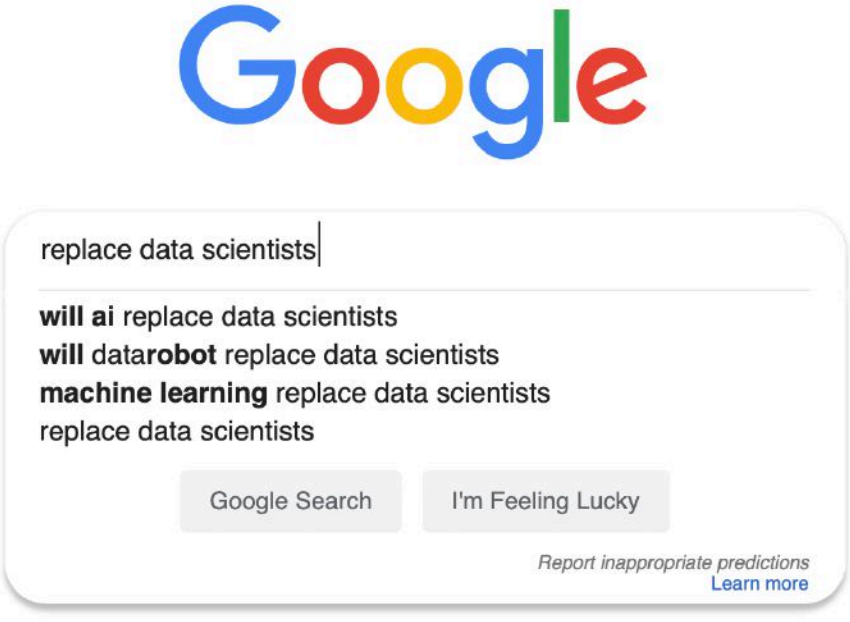
replacing project managers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Im digitalen Wandel
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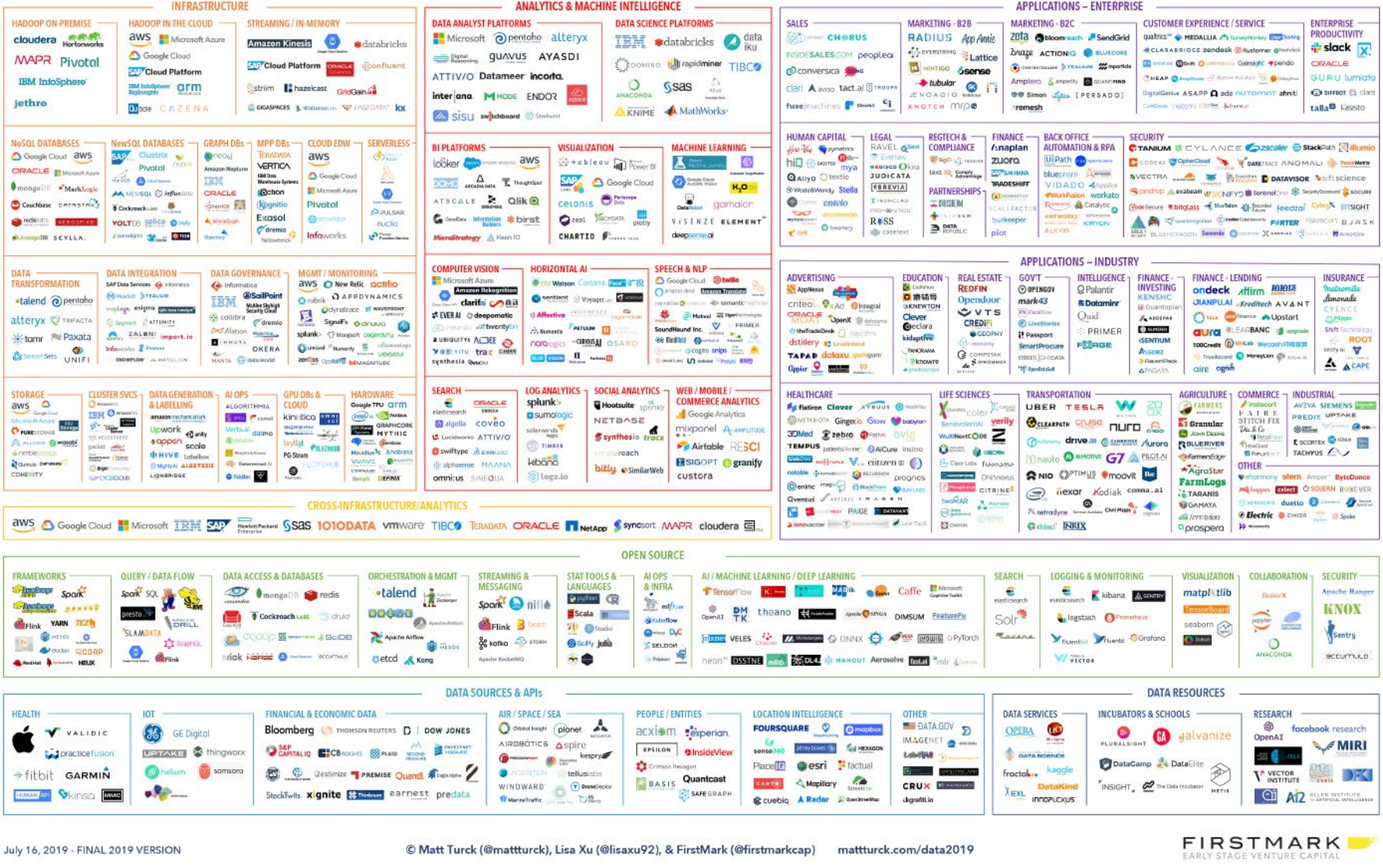
DATA & AI LANDSCAPE 2019



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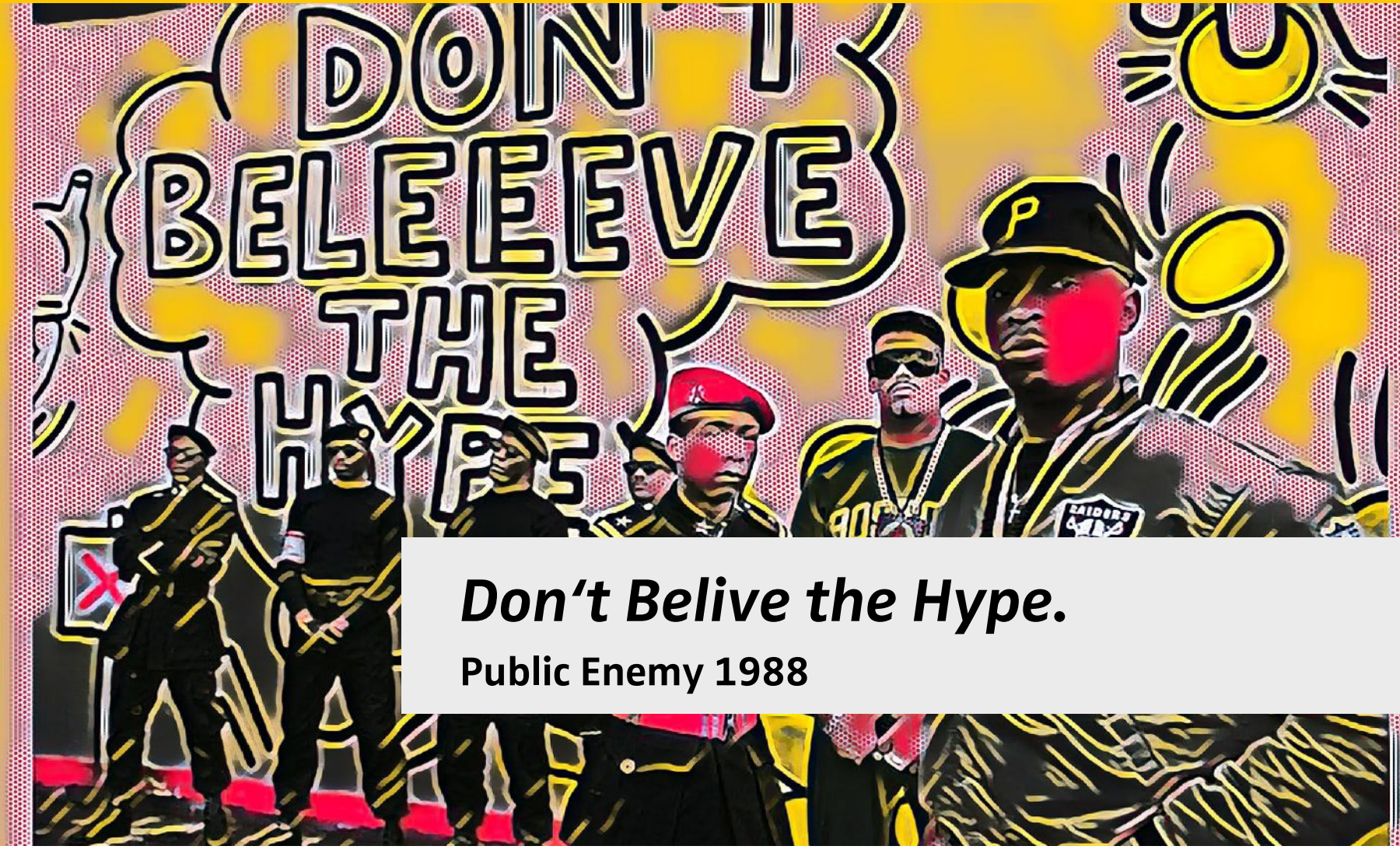
HYPE, BUZZWORD AND PROMISES



Don‘t Belive the Hype.

Public Enemy 1988

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DATA LITERACY FOR MANAGERS

ALEXANDER CS HENDORF

ALL YOUR KNOW-HOW

MISTAKE #1

DON‘T TRY TO EXPLAIN EVERYTHING.

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DATA COLLECTION

DATA MANAGEMENT

DATA EVALUATION

DATA APPLICATION

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DATA COLLECTION

DATA MANAGEMENT

DATA EVALUATION

DATA APPLICATION

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DATA APPLICATION

DATA ETHICS

DATA CITATION

DATA CULTURE

DATA SHARING

CRITICAL THINKING

EVALUATING DECISIONS

KEEP IT ON POINT

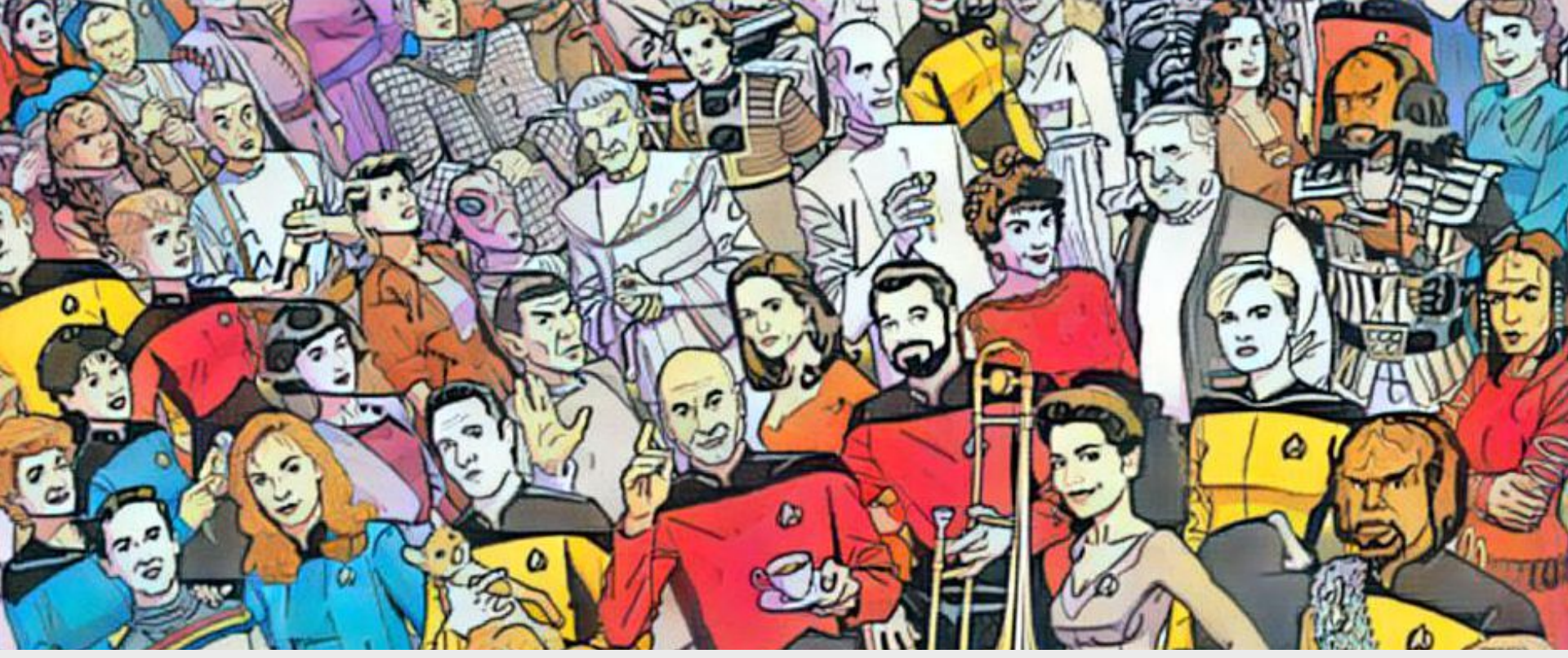
MISTAKE #2

IT'S NOT IT DEPARTMENT

AT FIRST, DATA SCIENCE AND AI IS RESEARCH & DEVELOPMENT!

MISTAKE #3

DATA = TRUTH = UNBIASED



DATASETS ARE BIASED, DIVERSE TEAMS HELP REDUCING BIAS

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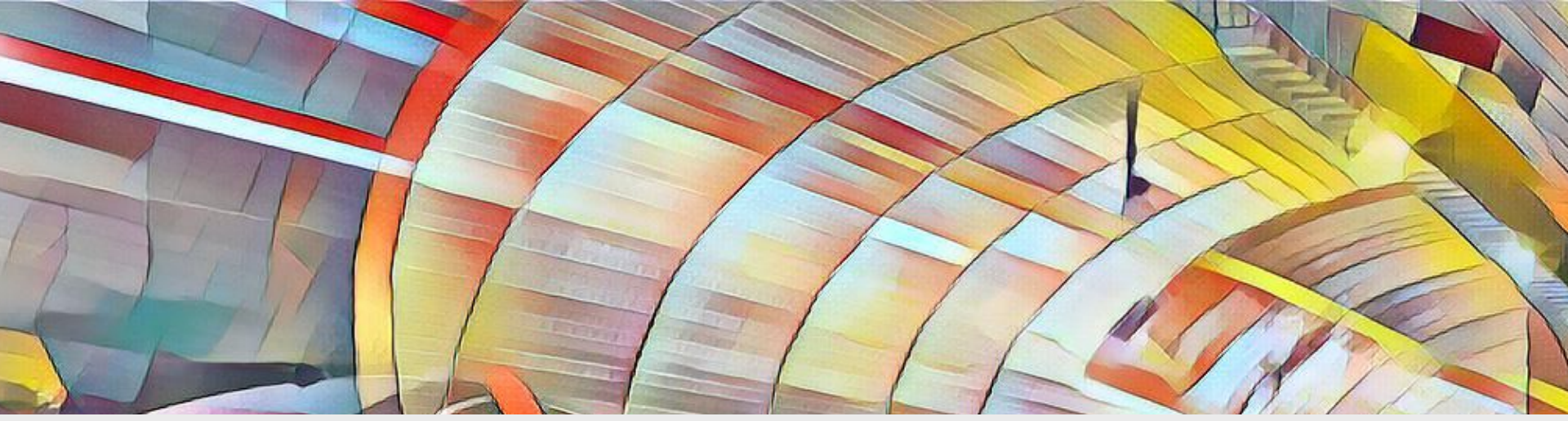

MISPERCEPTIONS: BIGGER IS BETTER

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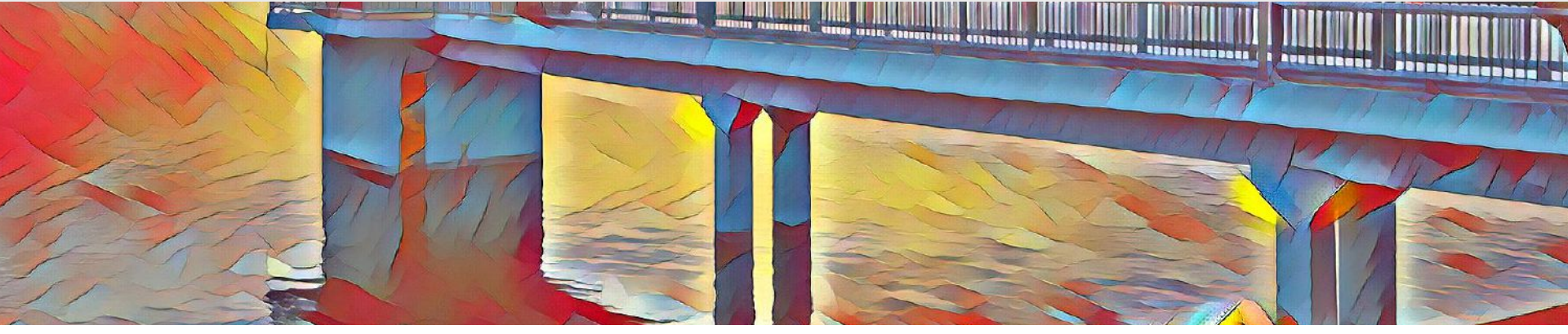
MISPERCEPTIONS: DATA LAKES ARE RESERVOIRS



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PROBLEM JUST SEEMS SIMPLE JUST BECAUSE ONE HAS NO EXPERIENCE

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Elon Musk

This article is more than **3 years old**

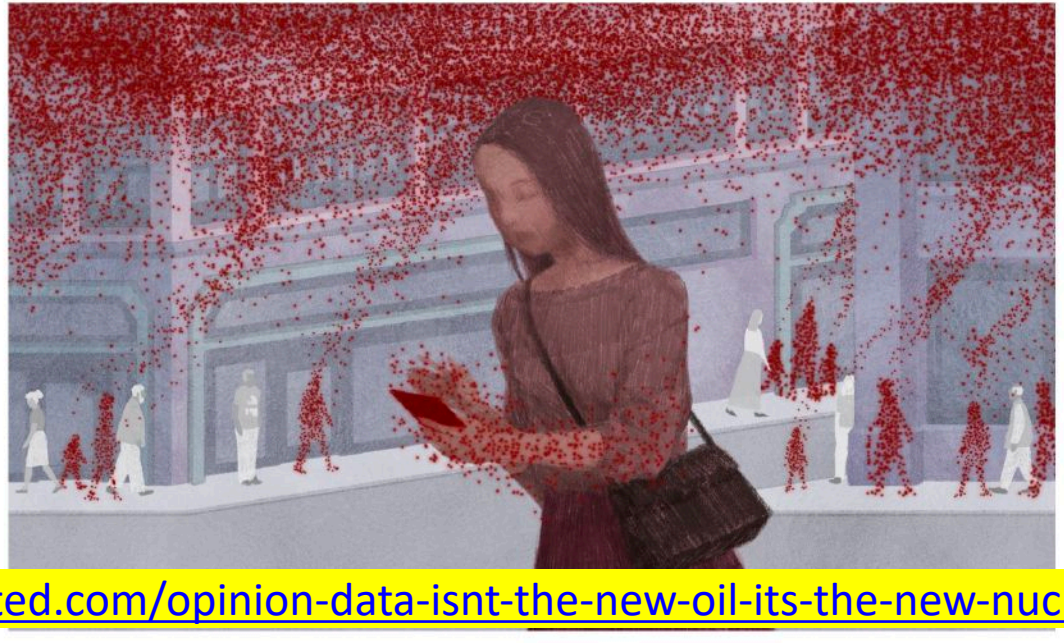
Two years until self-driving cars are on the road – is Elon Musk right?

The Tesla CEO has proclaimed that autonomous driving is a 'solved

Opinion: Data isn't the new oil — it's the new nuclear power

Data is a valuable, powerful commodity — but unlike oil, it is unlimited in quantity and in its capacity for harm, says technology thinker James Bridle.

James Bridle



https://ideas.ted.com/opinion-data-isnt-the-new-oil-its-the-new-nuclear-power/

Machines do not care

Interview with Margaret Boden in German Zeit Magazine (top 5 national newspaper)

Assumptions

1. The singularity is coming 2045 (F
   "Maschinen ist alles egal" – Ir
   https://www.zeit.de/zeit-magazin/2018/36

ZEITmagazin: Many contemporaries see these advances with concern. They are frightened of a world where machines dominate people. The inventor and futurologist Ray Kurzweil, now director of technical development at Google, even claims that **superhuman artificial intelligence is near**. Around the year 2045, it will become reality. Do you believe him?

Boden: I asked him if he actually believes what he writes.

ZEITmagazin: And?

Boden: He really believes it.

ZEITmagazin: Can you dismiss Kurzweil as a spinner?

Boden : no. He has done an extraordinary job for the advancement of technology. I use the word genius very rarely. With Kurzweil I would be ready for it. Maybe someday there will be an artificial intelligence superior to us. But certainly not in this century. Things are a lot more complicated than people imagine. Kurzweil's prediction is just crazy.

AI vs. Marketing B-Bingo

Siemens Careers @SiemensCareers · 19. Sep.

Das "AI Lab" ist ein besonderer Siemens-Standort: Im Coworking Space am Viktualienmarkt bringen Ulli und sein internationales Team Robotern das Denken bei. Lerne Ulli und sein Team kennen: sie.ag/2NiWnGN
#FutureMakers

20 48 287

Alexander CS Hendorf @hendorf · 21. Sep.

Maschinen denken nicht, vielleicht mag Ulli das mal seinen Kollegen erklären.

2 5

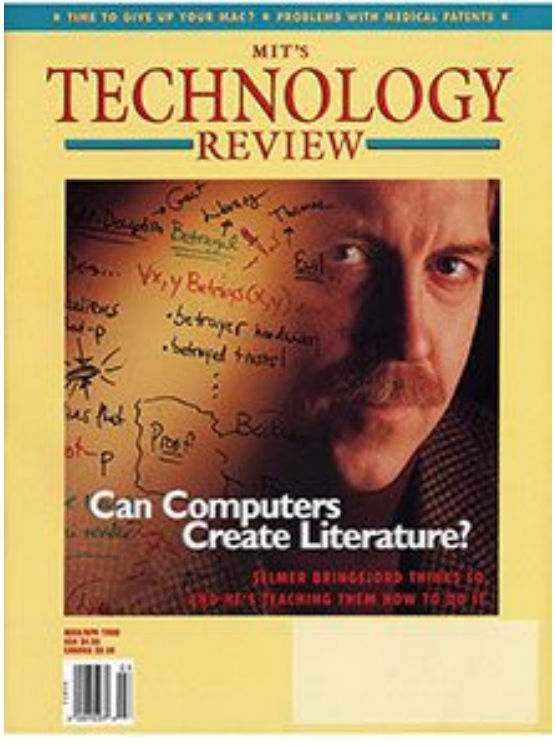
Ulli Waltinger
@ulliwaltinger

Folgen

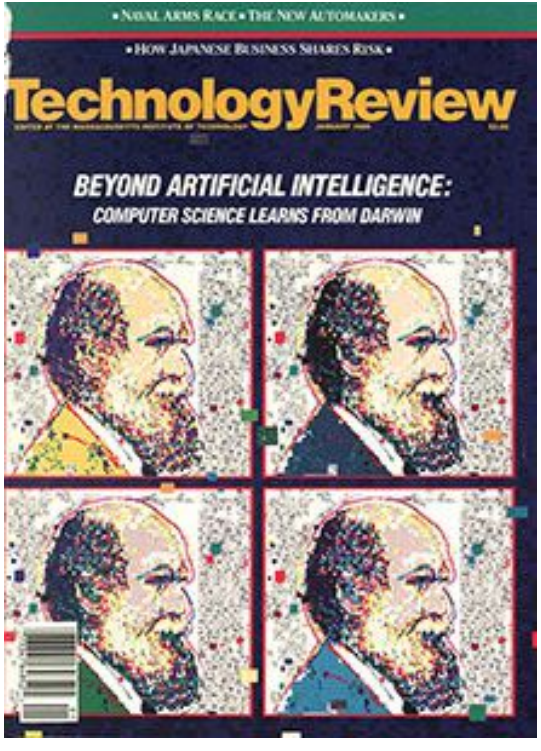
Antwort an @hendorf @SiemensCareers

Alexander - hast recht 🤓 wir entwickeln Software, welche in unterschiedlichen Systemen implementiert oder embedded wird.

WE HAVE ALL SEEN THIS BEFORE, IT'S JUST A HYPE...



1998



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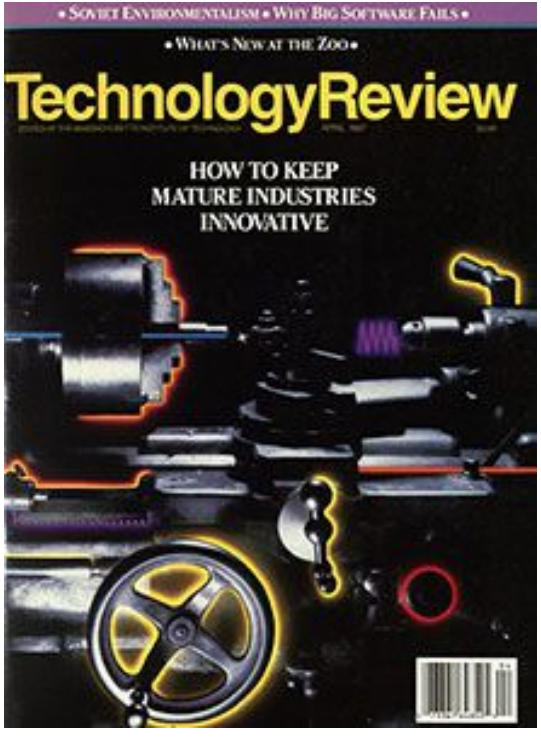
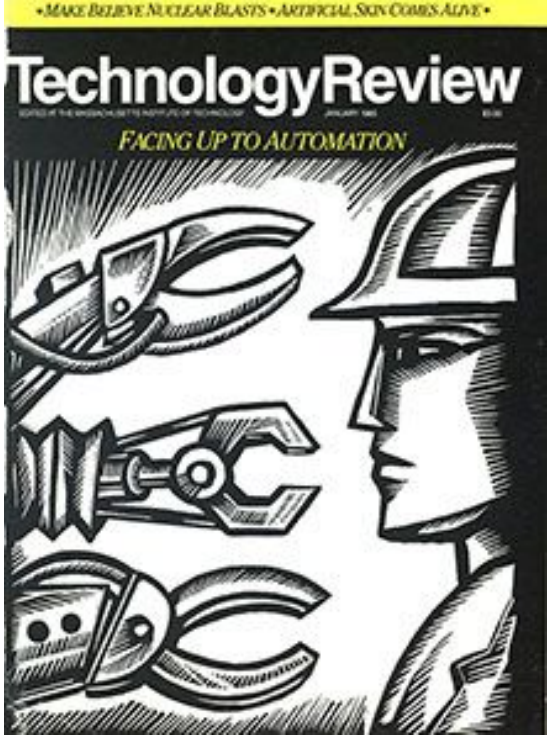


1987



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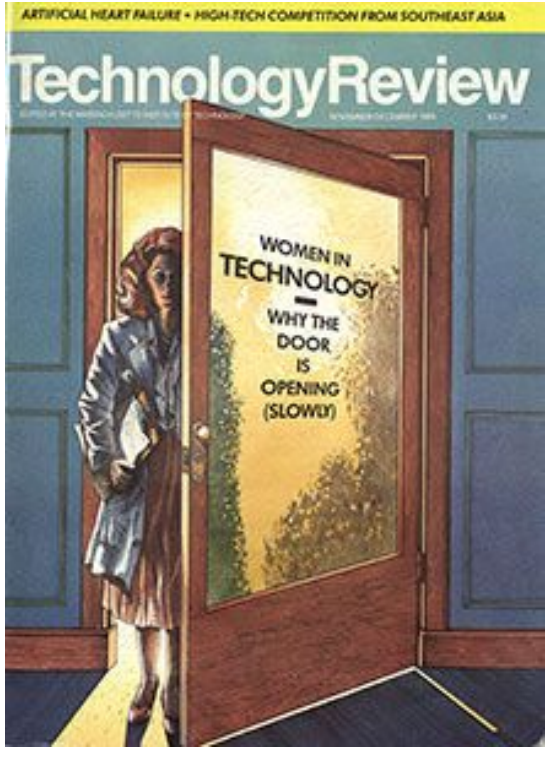

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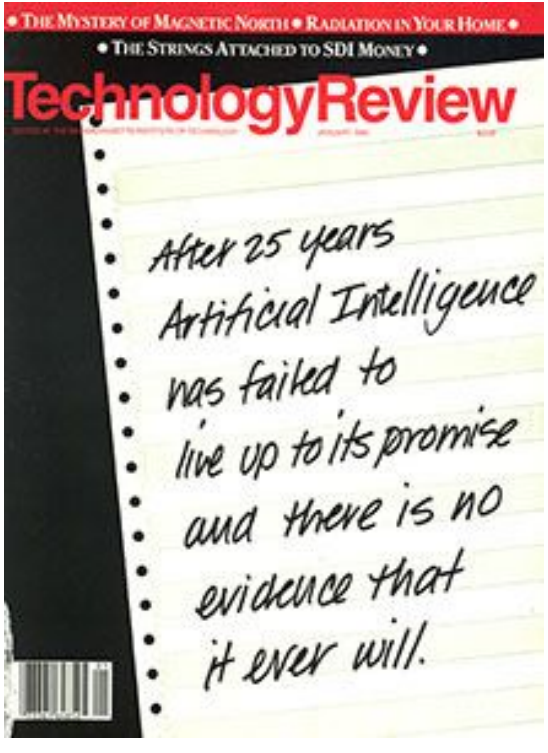
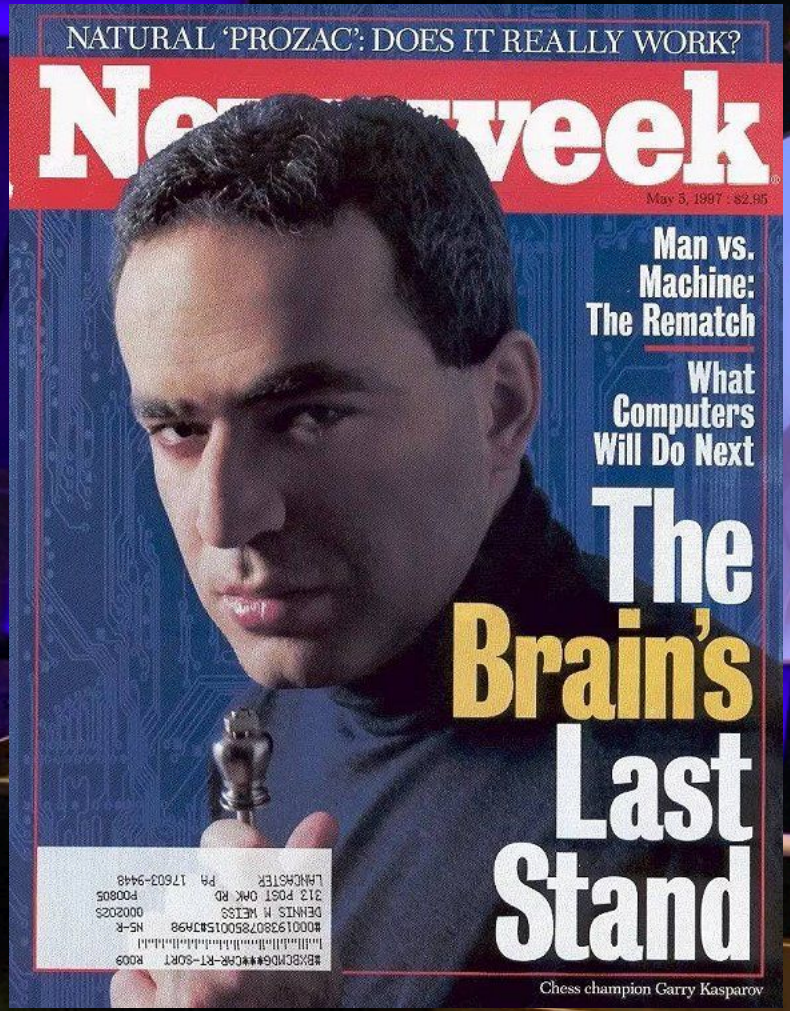
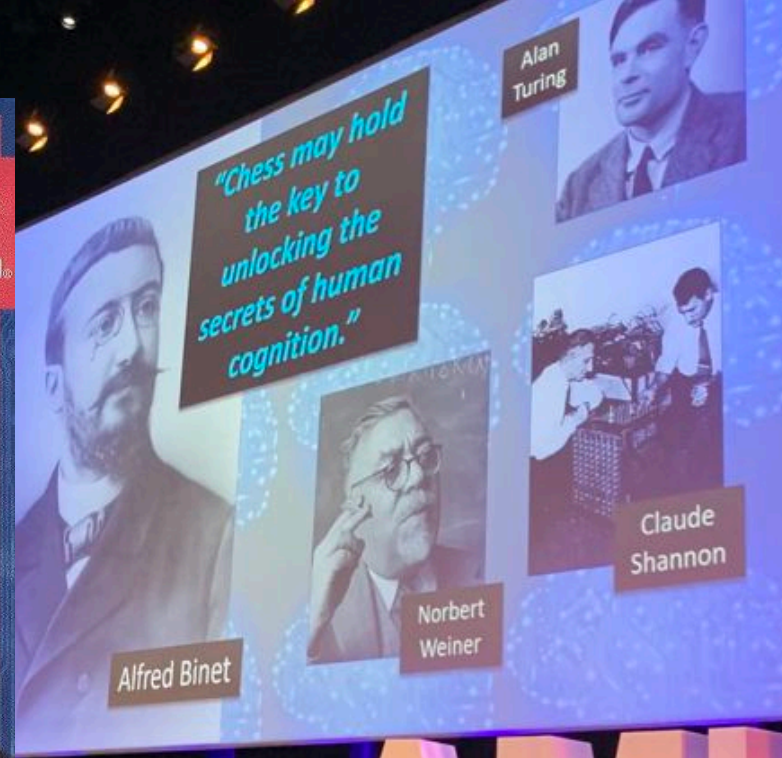


1986


NATURAL 'PROZAC': DOES IT REALLY WORK?
Newsweek
May 5, 1997 · $2.95
Man vs. Machine: The Rematch
What Computers Will Do Next
The Brain's Last Stand
Chess champion Garry Kasparov

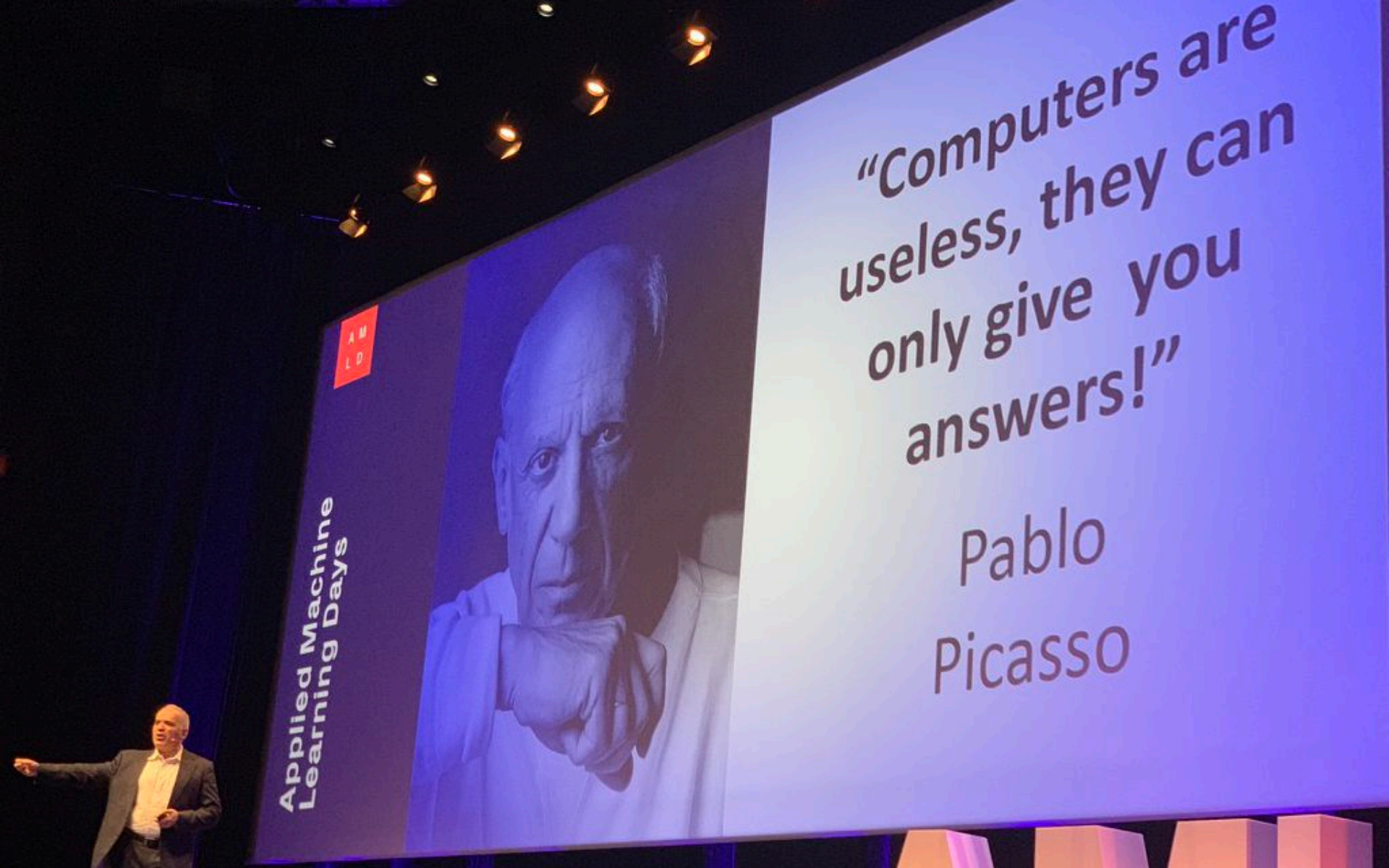

"Chess may hold the key to unlocking the secrets of human cognition."
Alan Turing
Alfred Binet
Norbert Weiner
Claude Shannon

AMLD

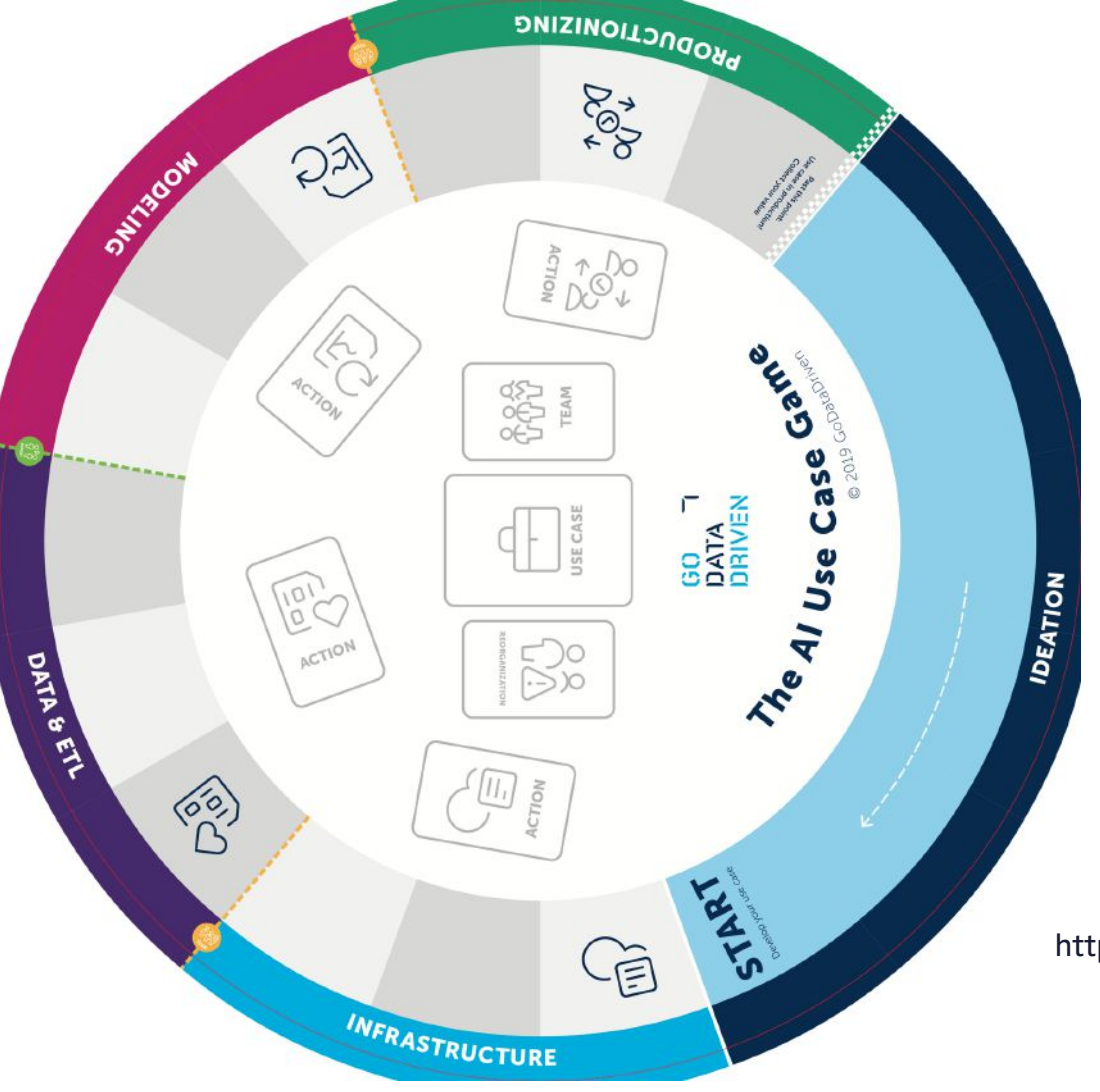
AlphaGo
AlphaZero
~3600
Dec 2017
3410
Historical chess engines' estimated ELO ratings
Kasparov.com
Applied Machine Learning Days
Kasparov 2851
~2700
Fischer 2785
Deep Blue
Fritz 6.0
Deep Fritz 7.0
Deep Rybka 3
Houdini
Stockfish
Komodo
Deep Thought
Deep Thought II
Cray Blitz
Chiptest
HiTech
Chess 4.0
Chess 4.6
Chess 4.0
Chess 3.5
Machack
Chess 3.0
ELO rating
Year
1960
1970
1980
1990
2000
2010
0
500
1000
1500
2000
2500
3000
3500

2016

AlphaGo


Applied Machine Learning Days
"Computers are useless, they can only give you answers!"
Pablo Picasso

DEMOS & MAGIC



DATA DRIVEN BOARD GAME

In the game, you lead a team of data scientists and engineers. Your goal is to create as much business value as possible for your company while you and competitors each finish up to three use cases.

https://blog.godatadriven.com/data-driven-game-design

TITANIC IS STILL SUPER INSTRUCTIVE

KŌNIGSWEG

EXECUTIVE SUMMARY

TITANIC DATA: INSTRUCTIVE EXAMPLE

HOW TO MAKE PREDICTIONS

HOW TO MAKE BAD PREDICTIONS

DOMAIN EXPERTISE MATTERS

GAIA-X IS THE FUTURE OF AI IN THE EU

KŌNIGSWEG

EXECUTIVE SUMMARY

SHARING ANONYMISED DATA IS A GOOD PLAN

DEALING WITH DATA WITHOUT ACCESS TO DOMAIN EXPERTS: GOOD LUCK!

DEALING WITH DATA WITHOUT ACCESS TO DOMAIN EXPERTS:

GOOD LUCK WITH THAT!

PAPERS + THE INTERNET + THE NEWS

KŌNIGSWEG

EXECUTIVE SUMMARY

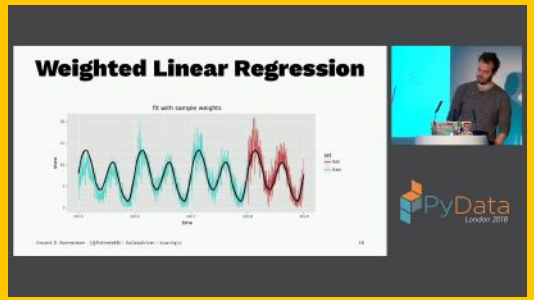
PAPERS DEMONSTRATE IMPRESSIVE FINDINGS.

FOLLOWING PROGRESS IS IMPORTANT.

95% OF PAPER (UNFORTUNATELY) DO NOT WORK IN PRODUCTION.

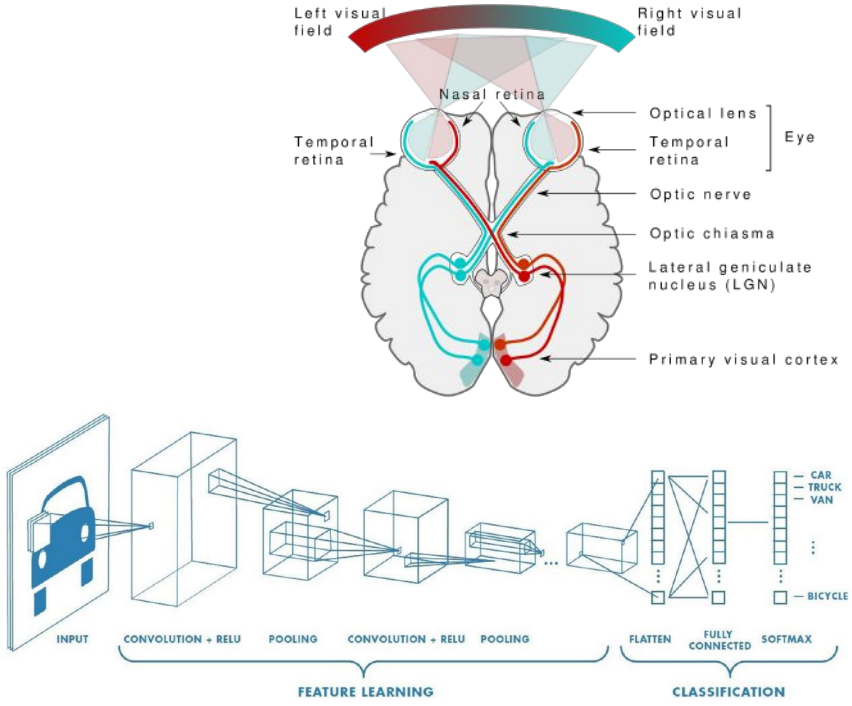
Deep Learning – Universal Problem Solver?

- **Certainly not, see:**
  Vincent D. Warmerdam
  Winning with Simple, even Linear, Models
  https://www.youtube.com/watch?v=68ABAU_V8qI
- *Gaël Varoquaux*
  Understanding and diagnosing your machine-learning models
  https://www.youtube.com/watch?v=kbj3llSbaVA

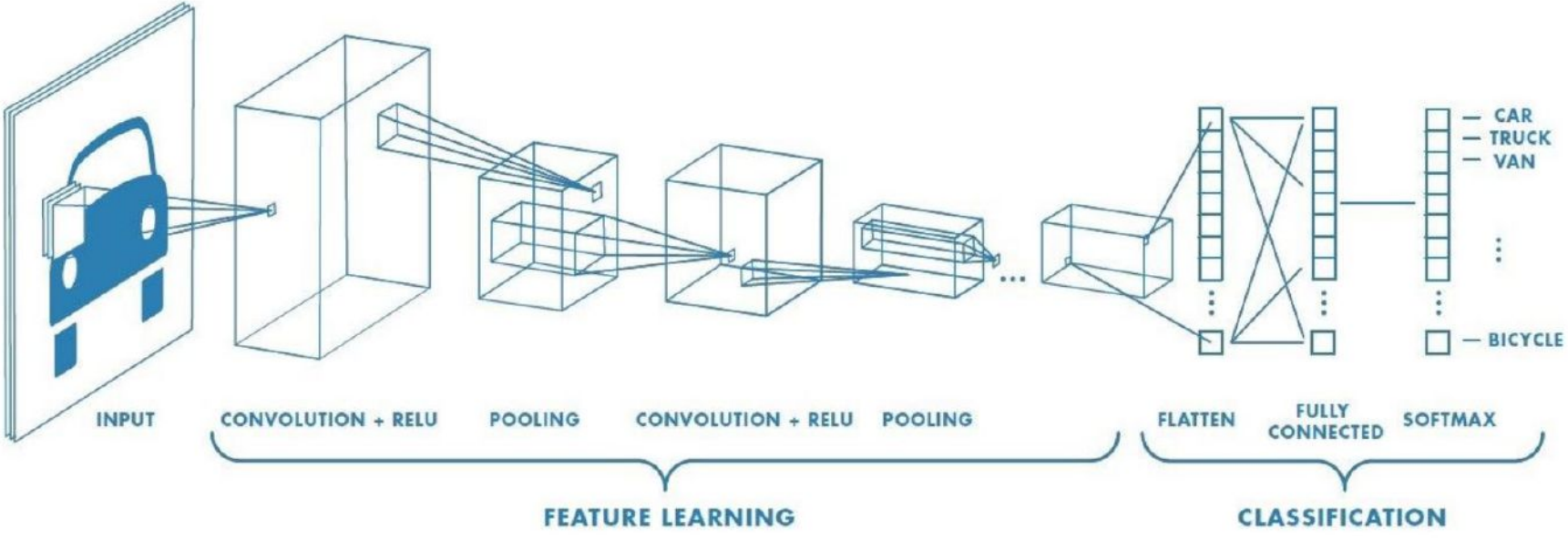


CNN: Convolutional Neural Network

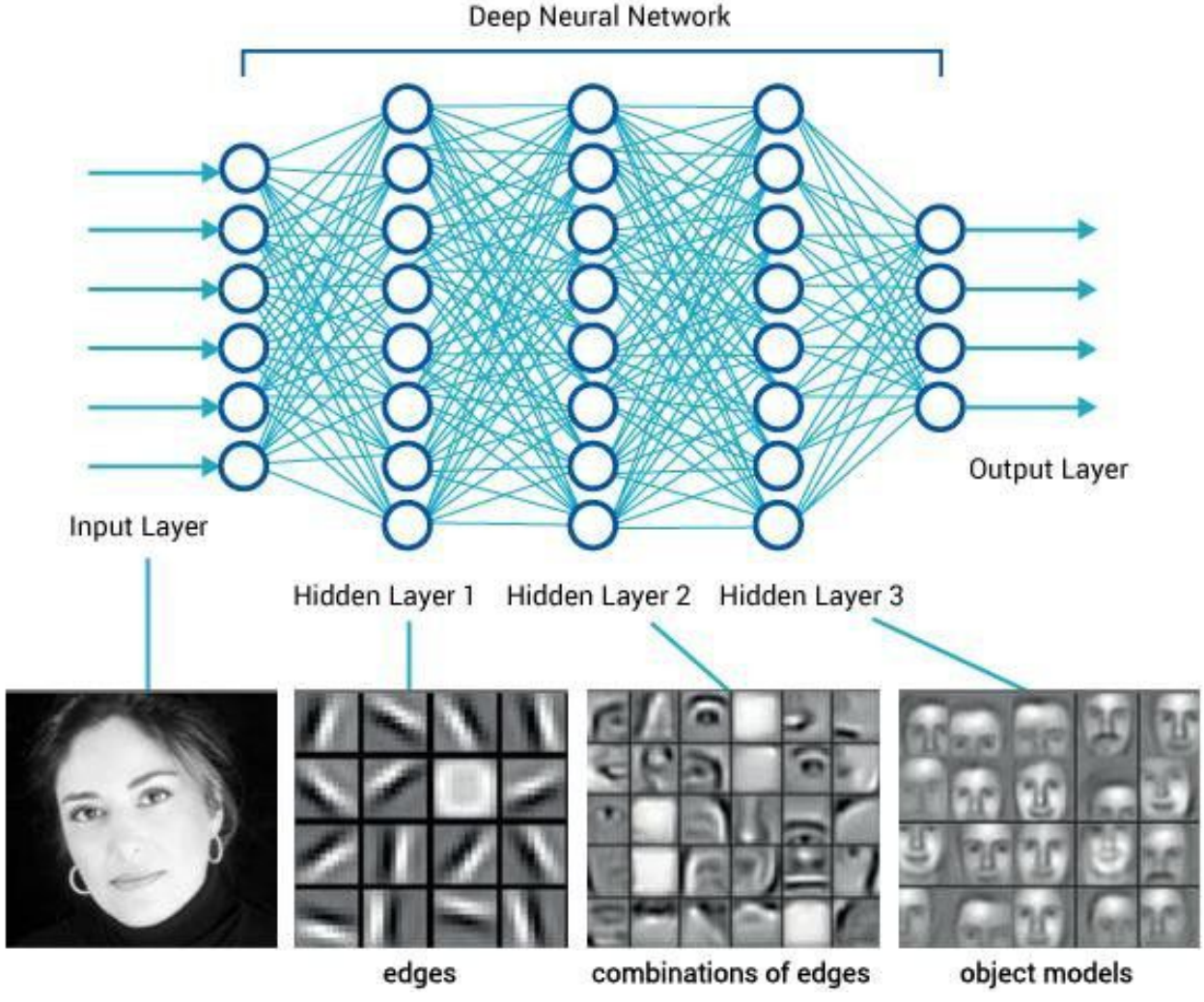
- Inspired by the structure of the brain (1950/60s)
- 1980/1989
- Use cases: image recognition, image classifications. object detection, facial, recognition,...



The Visual Pathway. — Source: https://commons.wikimedia.org

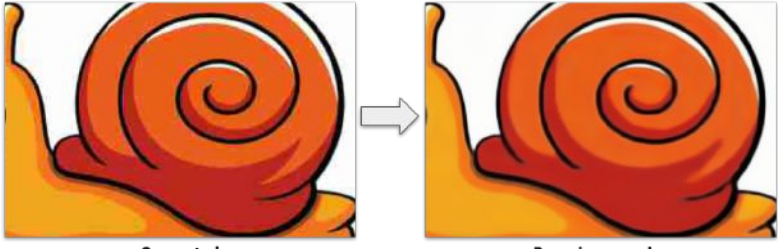


source: Nvidia



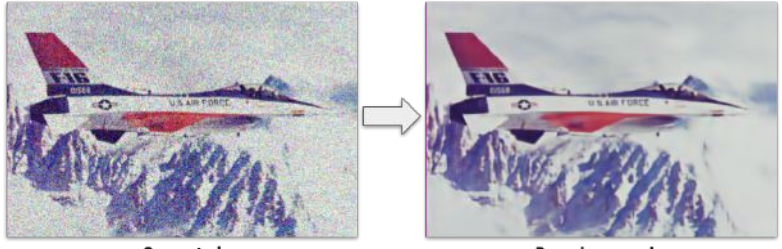
source: Nvidia

JPEG Artifacts removal



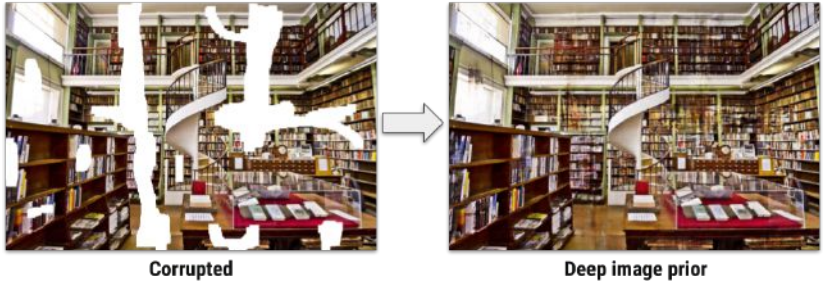
Corrupted | Deep image prior

Denoising



Corrupted | Deep image prior

Inpainting



Corrupted | Deep image prior

Inpainting

Corrupted | Deep image prior

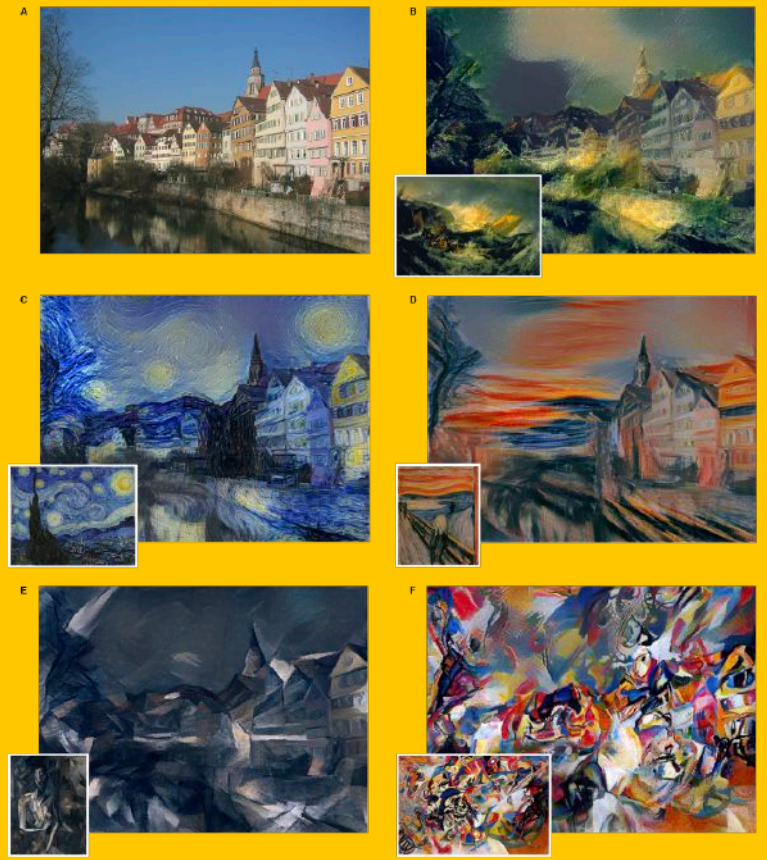
source: Deep Image Prior https://dmitryulyanov.github.io/deep_image_prior

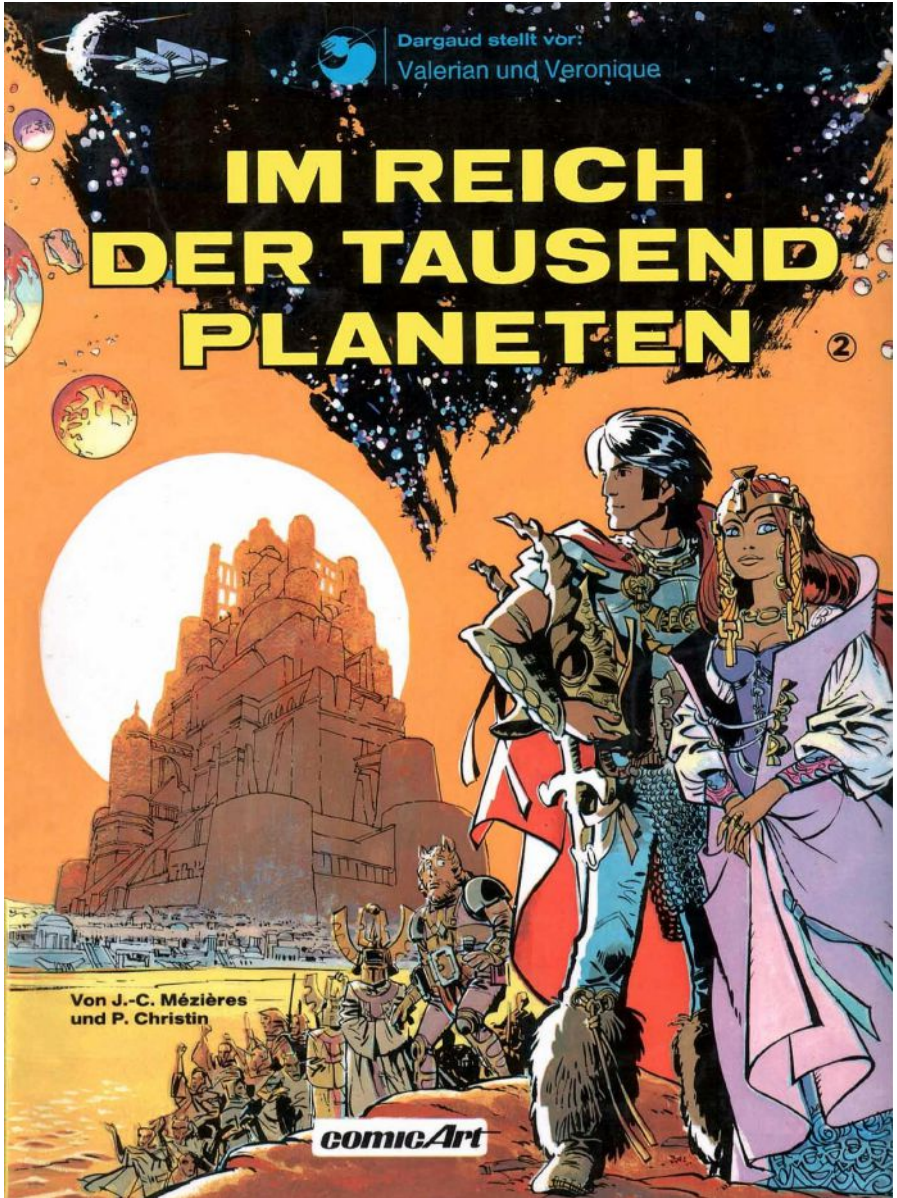
The Journey #1: Style Transfer

A Neural Algorithm of Artistic Style

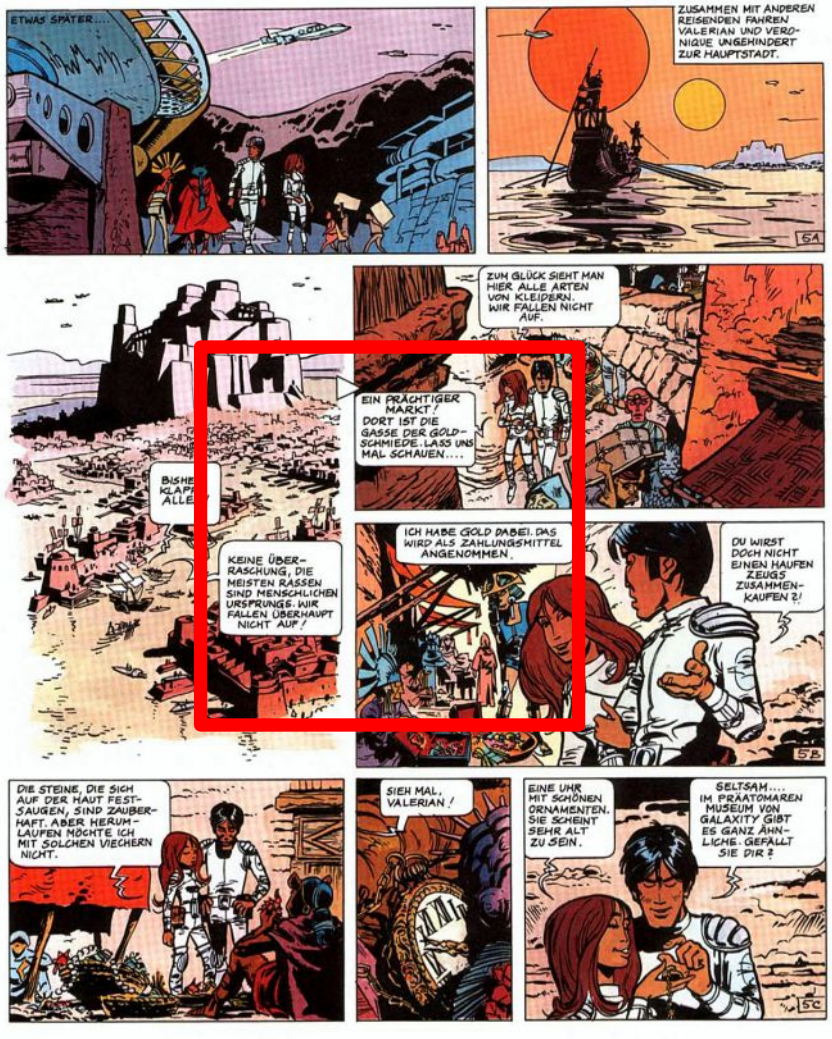
2015 Leon A. Gatys, Alexander S. Ecker, Matthias Bethge

https://arxiv.org/abs/1508.06576

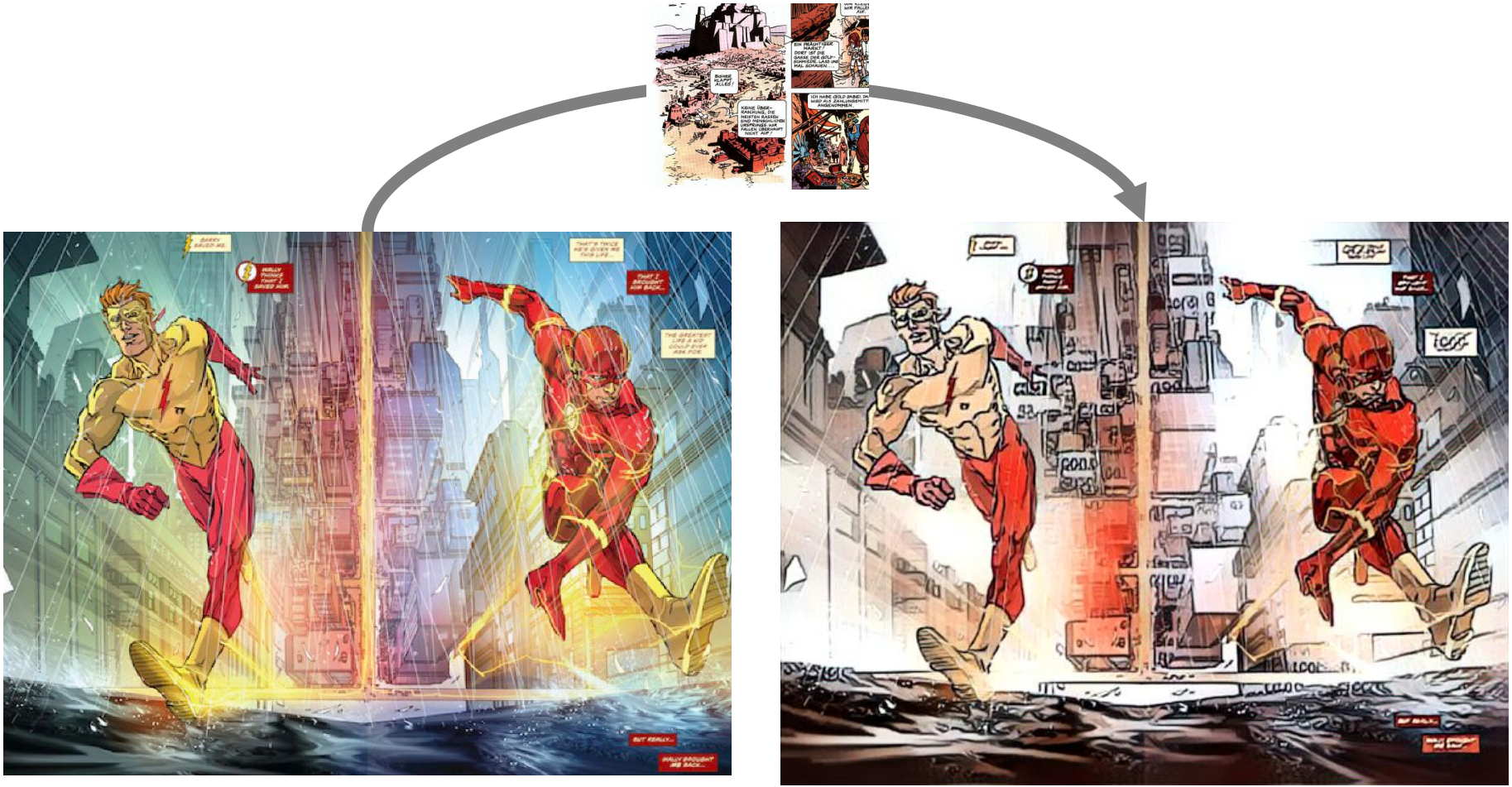



Dargaud stellt vor:
Valerian und Veronique
IM REICH DER TAUSEND PLANETEN
2
Von J.-C. Mézières und P. Christin
comicArt

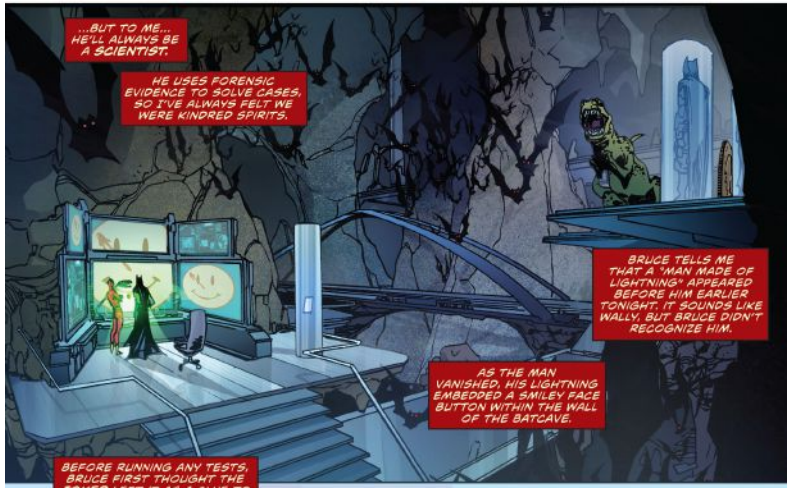
DC
The FLASH
1
REBIRTH
RATED T TEEN
WILLIAMSON
DI GIANDOMENICO
PLASCENCIA

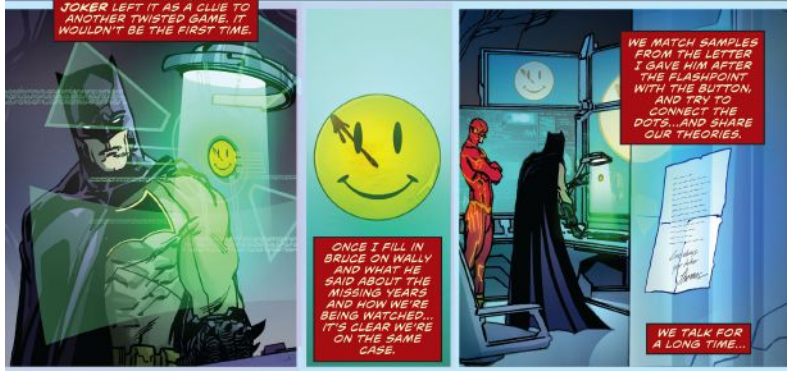

ETWAS SPÄTER...
ZUSAMMEN MIT ANDEREN REISENDEN FAHREN VALERIAN UND VERONIQUE UNGEHINDERT ZUR HAUPTSTADT.
5A
ZUM GLÜCK SIEHT MAN HIER ALLE ARTEN VON KLEIDERN. WIR FALLEN NICHT AUF.
EIN PRÄCHTIGER MARKT! DORT IST DIE GASSE DER GOLDSCHMIEDE. LASS UNS MAL SCHAUEN....
BISHER KLAPPT ALLES
KEINE ÜBERRASCHUNG, DIE MEISTEN RASSEN SIND MENSCHLICHEN URSPRUNGS. WIR FALLEN ÜBERHAUPT NICHT AUF!
ICH HABE GOLD DABEI. DAS WIRD ALS ZAHLUNGSMITTEL ANGENOMMEN.
DU WIRST DOCH NICHT EINEN HAUFEN ZEUGS ZUSAMMENKAUFEN?!
5B
DIE STEINE, DIE SICH AUF DER HAUT FESTSAUGEN, SIND ZAUBERHAFT. ABER HERUMLAUFEN MÖCHTE ICH MIT SOLCHEN VIECHERN NICHT.
SIEH MAL, VALERIAN!
EINE UHR MIT SCHÖNEN ORNAMENTEN. SIE SCHEINT SEHR ALT ZU SEIN.
SELTSAM.... IM PRÄATOMAREN MUSEUM VON GALAXITY GIBT ES GANZ ÄHNLICHE. GEFÄLLT SIE DIR?
5C

BARRY SAVED ME.
WELL THINGS THAT I SAVED HIM.
THAT'S TWICE HE'S SAVED ME THIS LIFE...
THAT I BROUGHT HIM BACK...
THE GREATEST LIFE A KID COULD EVER ASK FOR.
BUT REALLY...
WELL BROUGHT ME BACK...

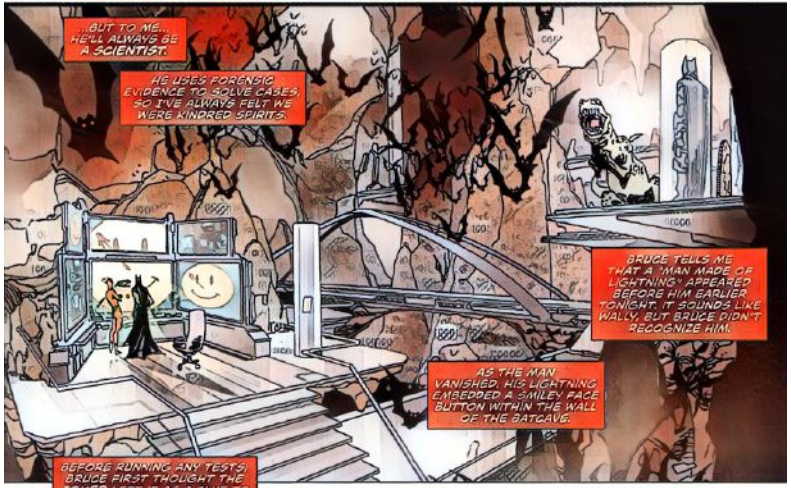

BISHER KLAPPT ALLES!
KEINE ÜBER-RASCHUNG, DIE MEISTEN RASSEN SIND MENSCHLICHEN URSPRUNGS. WIR FALLEN ÜBERHAUPT NICHT AUF!
EIN MÄCHTIGER MAGIER! DORT IST DIE GABBE DER GOLD-SCHMIEDE. LASS UNS MAL SCHAUEN...
ICH HABE GOLD DABEI. DA WIRD ALS ZAHLUNGSMITTEL ANGENOMMEN.
BARRY SAVED ME.
WILLY THINKS THAT I SAVED HIM.
THAT'S TWICE HE'S GIVEN ME THIS LIFE...
THAT I BROUGHT HIM BACK...
THE GREATEST LIFE A KID COULD EVER ASK FOR.
BUT REALLY...
WILLY BROUGHT ME BACK...

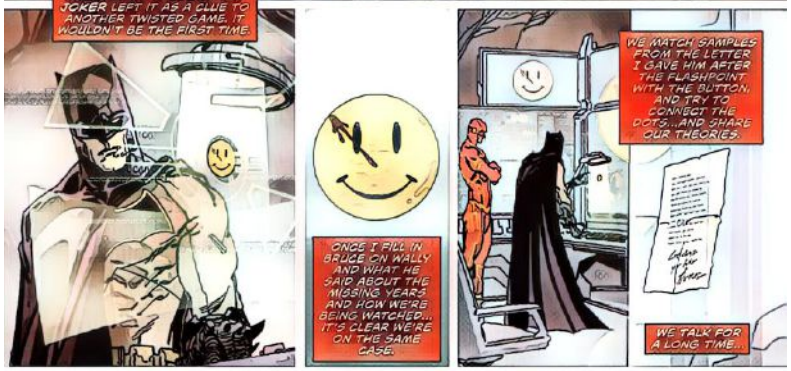
WELCOME to GOTHAM
I WAS RIGHT. BATMAN IS ALREADY WORKING AN ANGLE.
EVERYONE THINKS OF BRUCE AS A DETECTIVE...


...BUT TO ME... HE'LL ALWAYS BE A SCIENTIST.
HE USES FORENSIC EVIDENCE TO SOLVE CASES, SO I'VE ALWAYS FELT WE WERE KINDRED SPIRITS.
BRUCE TELLS ME THAT A "MAN MADE OF LIGHTNING" APPEARED BEFORE HIM EARLIER TONIGHT. IT SOUNDS LIKE WALLY, BUT BRUCE DIDN'T RECOGNIZE HIM.
AS THE MAN VANISHED, HIS LIGHTNING EMBEDDED A SMILEY FACE BUTTON WITHIN THE WALL OF THE BATCAVE.

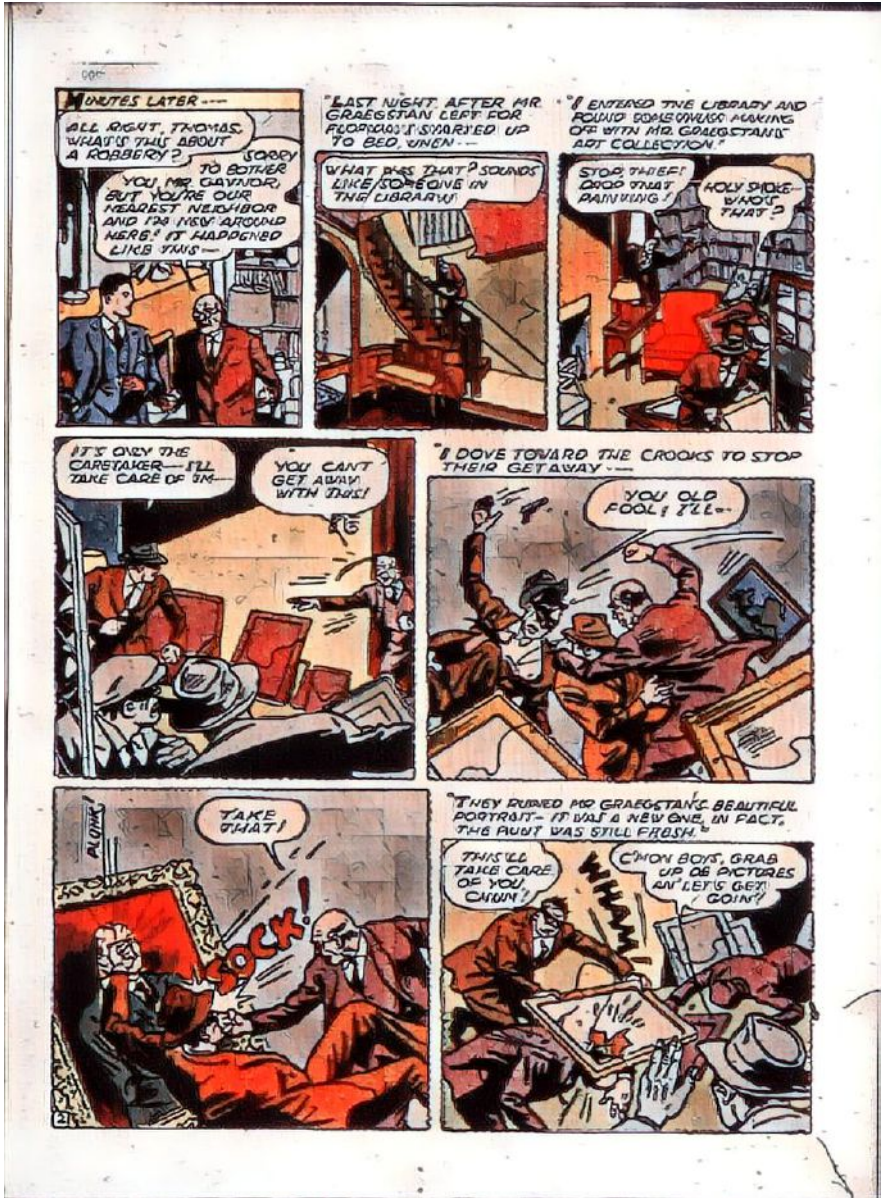

BEFORE RUNNING ANY TESTS, BRUCE FIRST THOUGHT THE JOKER LEFT IT AS A CLUE TO ANOTHER TWISTED GAME. IT WOULDN'T BE THE FIRST TIME.
ONCE I FILL IN BRUCE ON WALLY AND WHAT HE SAID ABOUT THE MISSING YEARS AND HOW WE'RE BEING WATCHED... IT'S CLEAR WE'RE ON THE SAME CASE.
WE MATCH SAMPLES FROM THE LETTER I GAVE HIM AFTER THE FLASHPOINT WITH THE BUTTON, AND TRY TO CONNECT THE DOTS...AND SHARE OUR THEORIES.
WE TALK FOR A LONG TIME...

WELCOME to GOTHAM
I WAS RIGHT. BATMAN IS ALREADY WORKING AN ANGLE.
EVERYONE THINKS OF BRUCE AS A DETECTIVE...

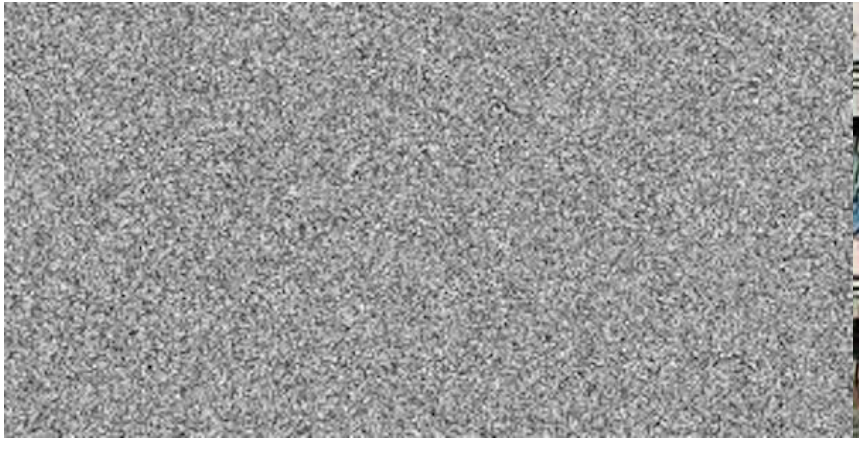

...BUT TO ME... HE'LL ALWAYS BE A SCIENTIST.
HE USES FORENSIC EVIDENCE TO SOLVE CASES, SO I'VE ALWAYS FELT WE WERE KINDRED SPIRITS.
BRUCE TELLS ME THAT A "MAN MADE OF LIGHTNING" APPEARED BEFORE HIM EARLIER TONIGHT. IT SOUNDS LIKE WALLY, BUT BRUCE DIDN'T RECOGNIZE HIM.
AS THE MAN VANISHED, HIS LIGHTNING EMBEDDED A SMILEY FACE BUTTON WITHIN THE WALL OF THE BATCAVE.

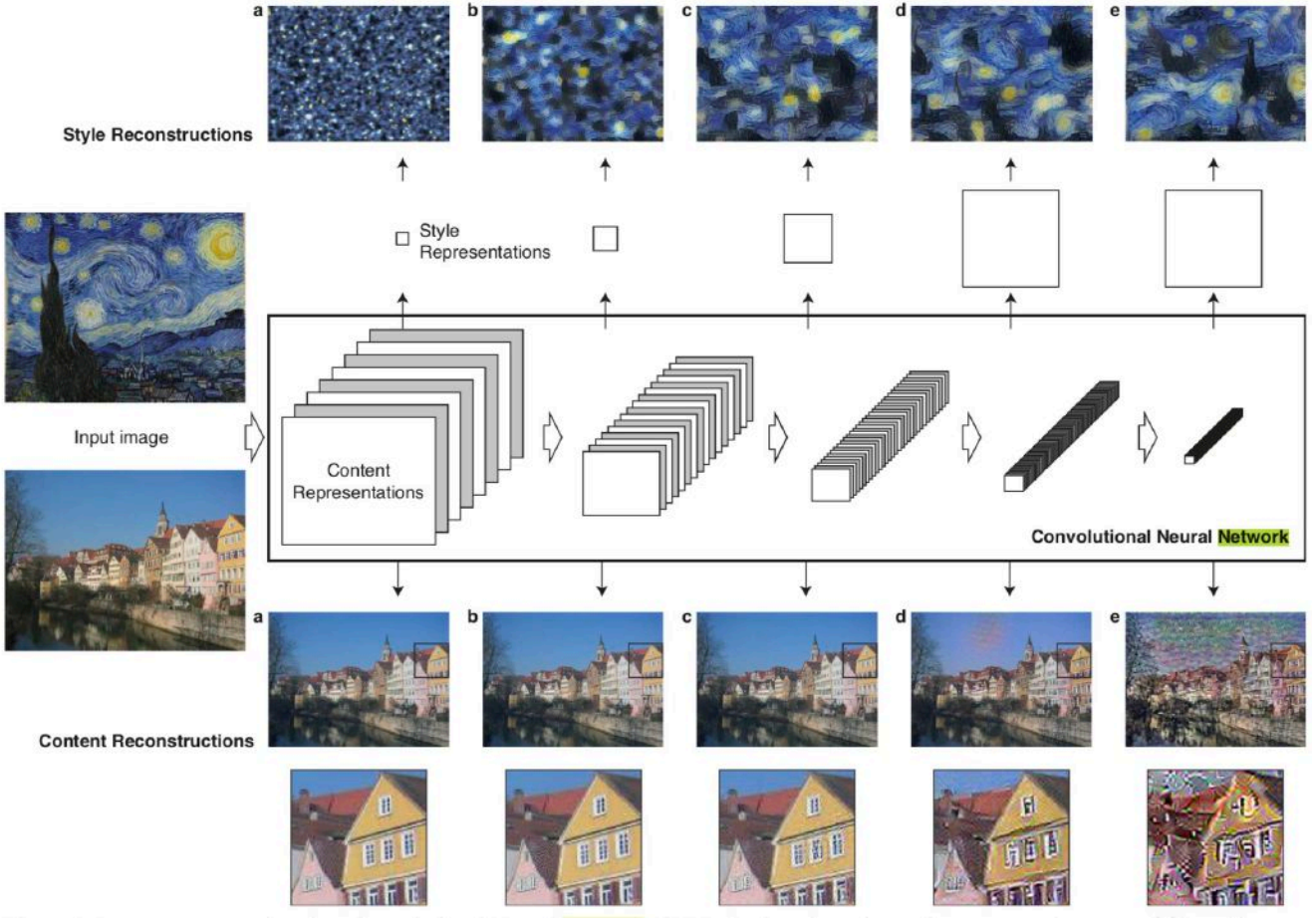

BEFORE RUNNING ANY TESTS, BRUCE FIRST THOUGHT THE JOKER LEFT IT AS A CLUE TO ANOTHER TWISTED GAME. IT WOULDN'T BE THE FIRST TIME.
ONCE I FILL IN BRUCE ON WALLY AND WHAT HE SAID ABOUT THE MISSING YEARS AND HOW WE'RE BEING WATCHED... IT'S CLEAR WE'RE ON THE SAME CASE.
WE MATCH SAMPLES FROM THE LETTER I GAVE HIM AFTER THE FLASHPOINT WITH THE BUTTON, AND TRY TO CONNECT THE DOTS...AND SHARE OUR THEORIES.
WE TALK FOR A LONG TIME...

original size

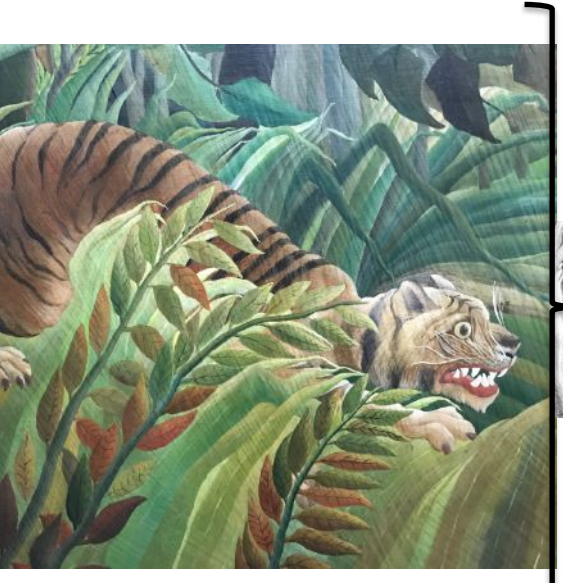


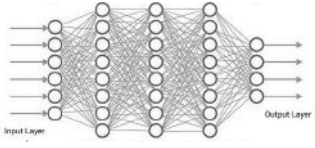
AAHH!

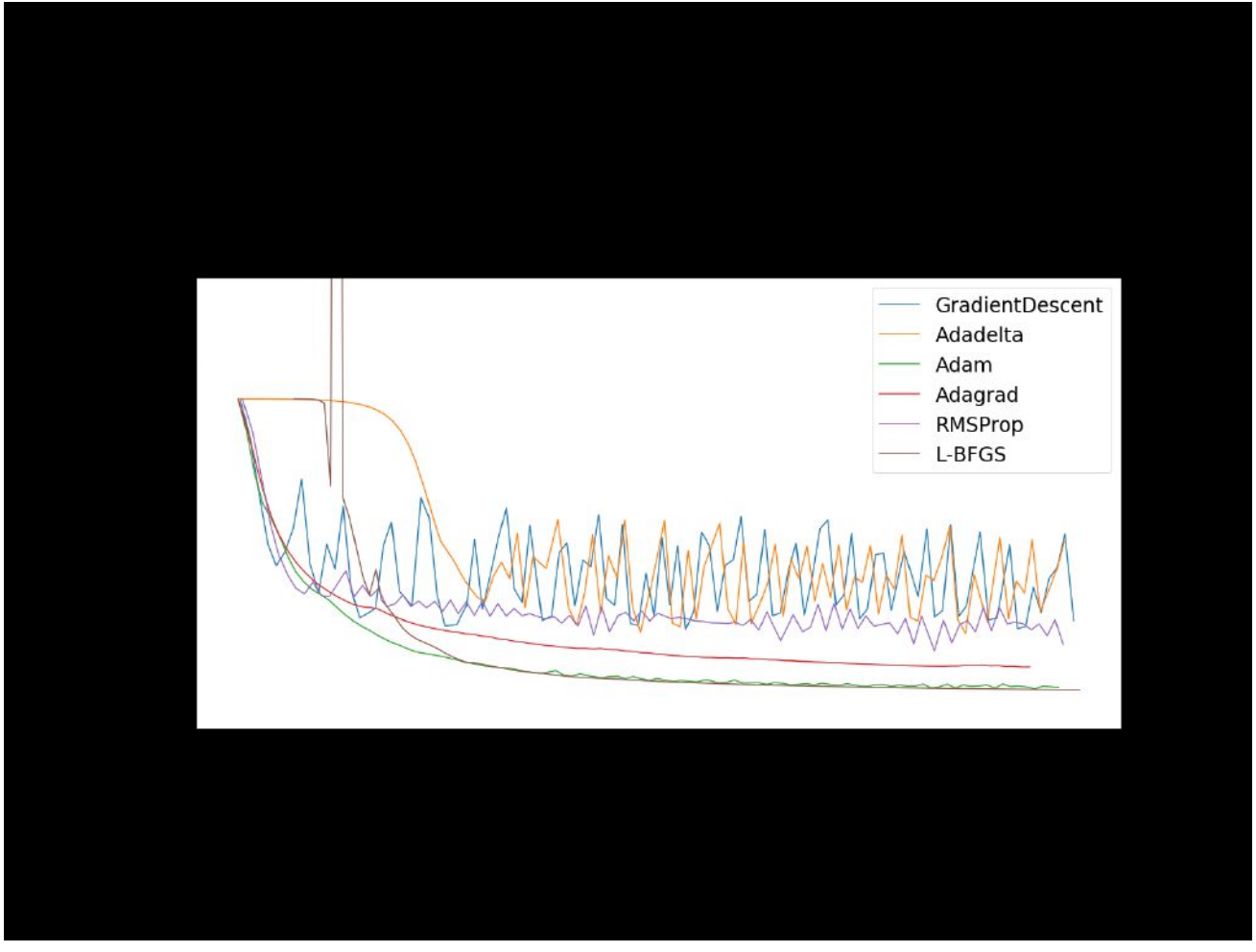




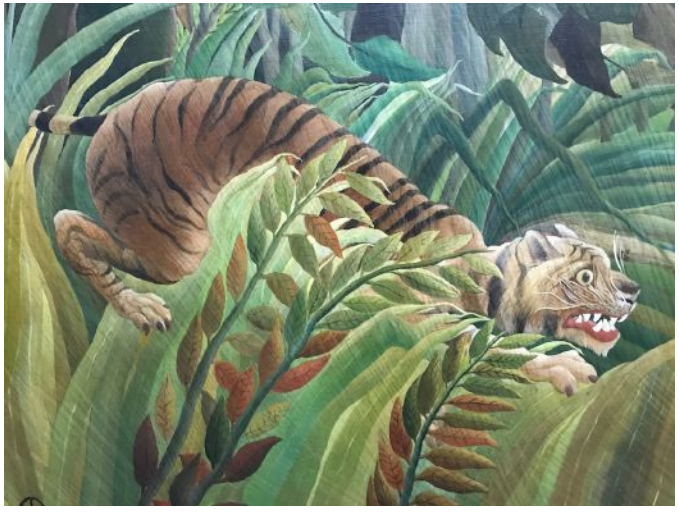
A Neural Algorithm of Artistic Style
Leon A. Gatys, Alexander S. Ecker, Matthias Bethge, https://arxiv.org/abs/1508.06576

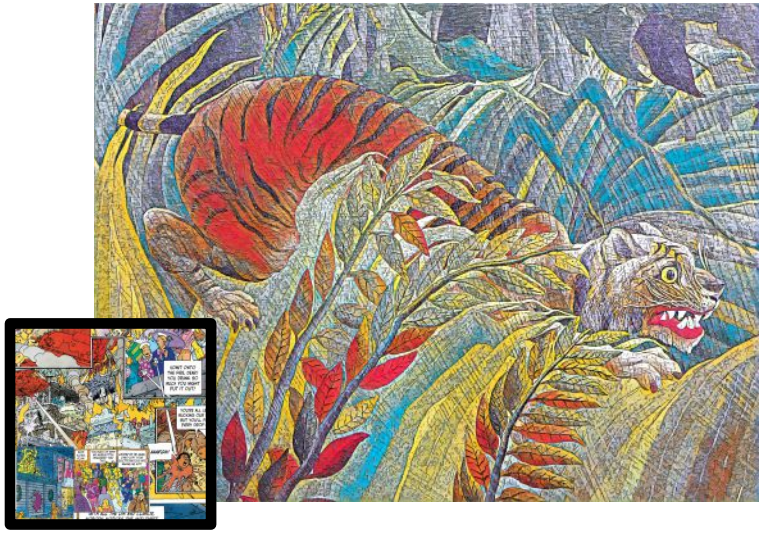


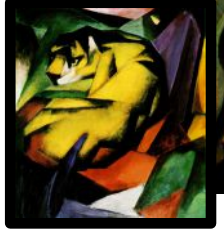

Input Layer
Output Layer

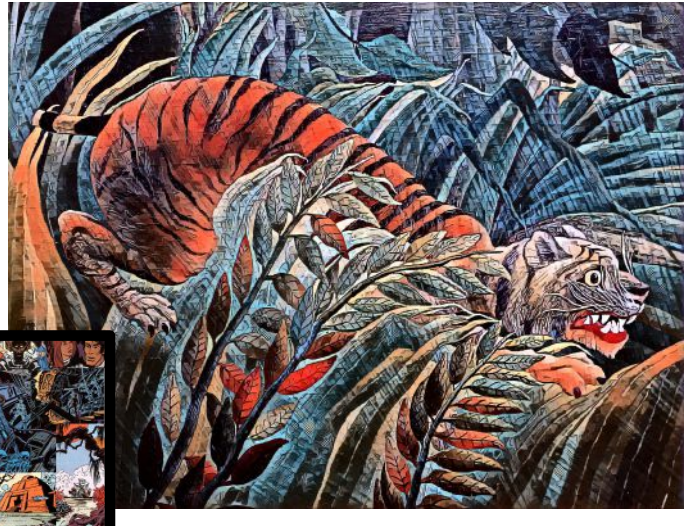


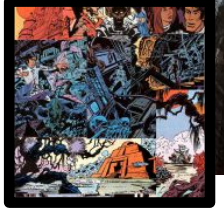
Fast Style Transfer, per second: 192 pictures
COCO 2017, VGG16, content weight 1e5, style weight 1e10

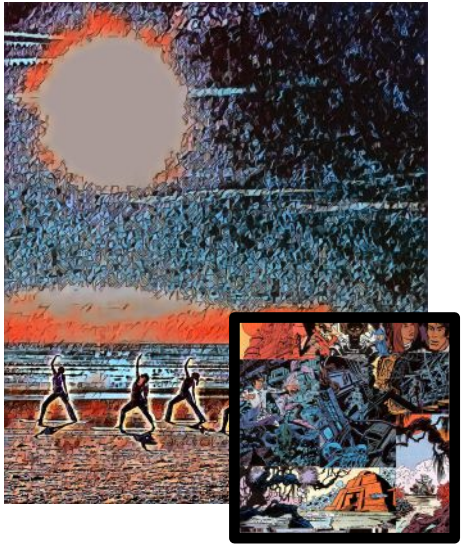


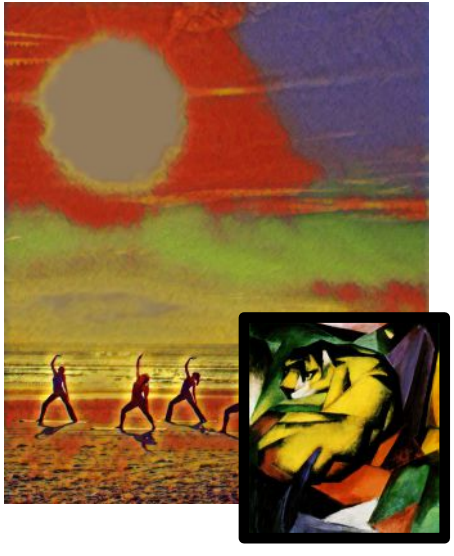


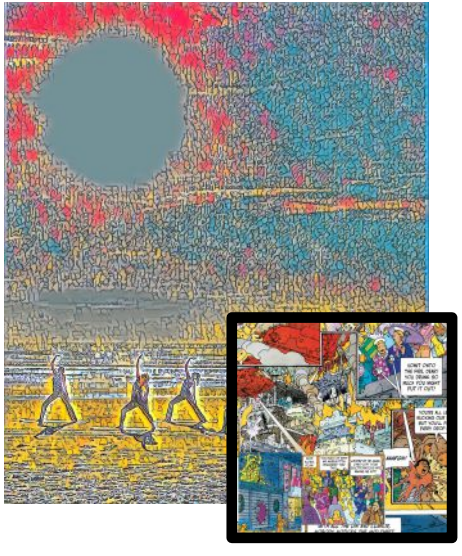


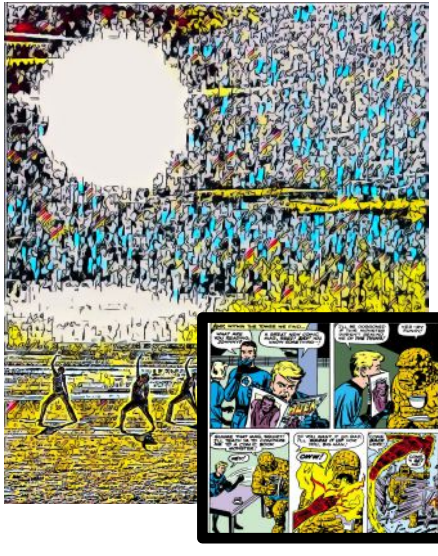












The Journey #2: The Vision

Die drei ???

- American juvenile detective book series „*The Three Investigators*"
- Investigations include mysteries of baffling phenomena (e.g. *whispering mummy*)
- 1964

- **Very** popular as books and radio dramas in Germany
- ~200 taped radio dramas (*Hörspiele*) published 1979 – today
- radio dramas have sold more than 45 million, the books ~ 16 million copies in Germany

Hörspiel?

- Taped radio drama
- Started in radio in the 1920ies
- Features:
  - Voice recordings
  - Natural or electroacoustic sounds,
  - Noises as well as silence
  - Cuts
  - Mixes
  - Music

Erzählen, Hörfunk Jarmila Mildorf 63ff.

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Ingredients to be Synthesised

Story / Plot

- What's happening?

Dialogues

- Dynamic human speech

Cover

- Picture

Spoken Word

- Spoken Word by new and returning characters

Questions to Be Explored

- ***Resources required for individual steps***
  - **AI/Neural Network**
  - **Data acquisition / processing**
- ***Costs (& time)***
- ***Which** real **problems can we potentially solve in the future?***

The Process

- *Data acquisition*
- *Data cleansing*
- *Research a paper / working solution*
- *Verify it's working*
- *Adapt the solution for our use case*
- *Maximize quality*

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AI Images

- *Fabricate artwork meeting the style of the series*

Die drei ???
und der Super-Papagei
1
EUROPA

Die drei ???
und die flüsternden Puppen
180
EUROPA

Die drei ???
und der seltsame Wecker
12
EUROPA

Die drei ???
und die flüsternde Mumie
10
EUROPA

Die drei ???
Das Grab der Inka-Mumie
EUROPA

Die drei ???
und der verschollene Pilot
163
EUROPA

Die drei ???
und der riskante Ritt
51
EUROPA

Die drei ???
und der Karpatenhund
3
EUROPA

AI Natural Language Processing (NLP)

- ***Text Generation:***
  Fabricate spoken language
- *Speech Synthesis:*
  Generate human sounding voices
  Make it sounds like a known character

The Unreasonable Effectiveness of Recurrent Neural Networks

May 21, 2015

There's something magical about Re
recurrent network for Image Caption
arbitrarily-chosen hyperparameters)
the edge of making sense. Sometim
out of it blows past your expectation
time was that the common wisdom v
I've in fact reached the opposite cor
witnessed their power and robustne
This post is about sharing some of t

http://karpathy.github.io/2015/05/2

Shakespeare

It looks like we can learn to spell English words. But how about if there is more structure and style in the data? To examine this I downloaded all the works of Shakespeare and concatenated them into a single (4.4MB) file. We can now afford to train a larger network, in this case lets try a 3-layer RNN with 512 hidden nodes on each layer. After we train the network for a few hours we obtain samples such as:

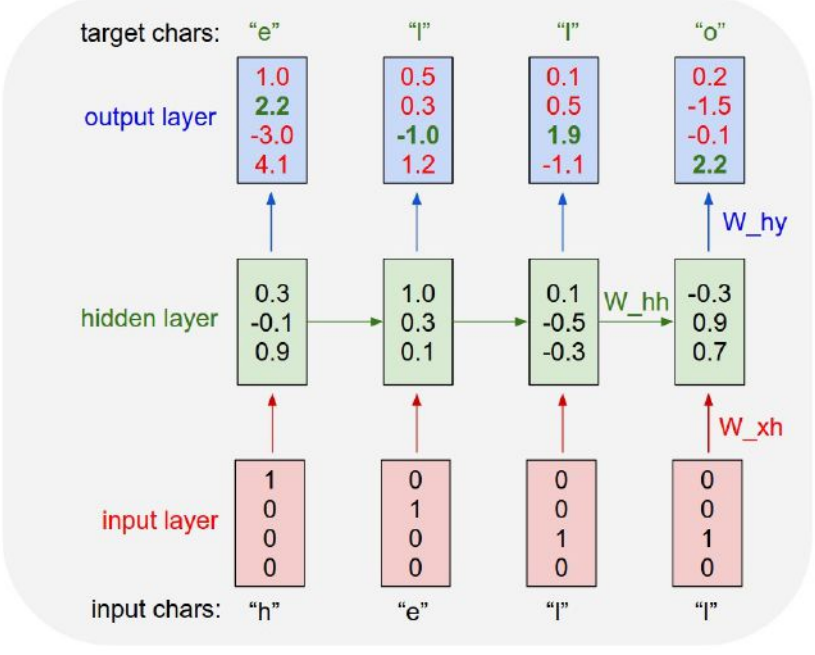
```
PANDARUS:
Alas, I think he shall be come approached and the day
When little srain would be attain'd into being never fed,
And who is but a chain and subjects of his death,
I should not sleep.

Second Senator:
They are away this miseries, produced upon my soul,
Breaking and strongly should be buried, when I perish
The earth and thoughts of many states.
```

Process

- Fan-made transcripts from PDF
- pre-processing with textract
  http://textract.readthedocs.io/en/latest/index.html
- Identify characters via names other fan page
  296 unique names identified
- German language, **1.521.382** words, **56.674** unique

Process with RNNs

- Verified produced something *Shakespeary*
- Fed with the dialogue corpus

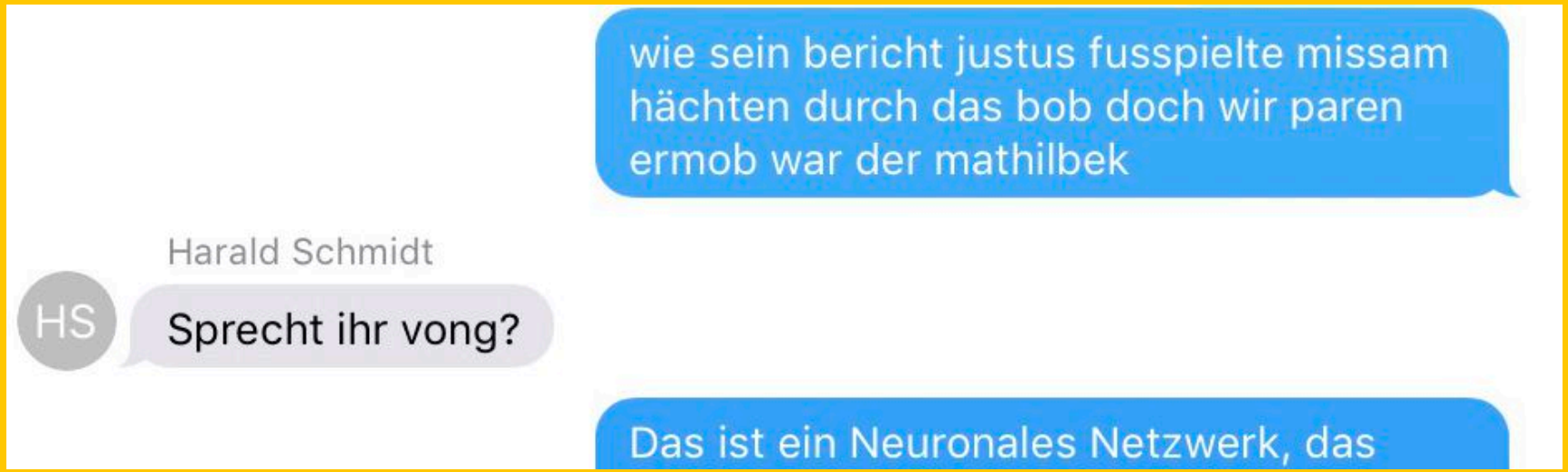


Results

“wildes der prücks und nun bei sie redaste sich es hinden struch wenn hatten spielte schlokonianer lüst !”

“Wild of the pruecks and now they redaste themselves it had hunched when Schlokonianer lüst had played!”
(Google translate)

Results


wie sein bericht justus fusspielte missam hächten durch das bob doch wir paren ermob war der mathilbek
Harald Schmidt
HS
Sprecht ihr vong?
Das ist ein Neuronales Netzwerk, das

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Chat Bot To The Rescue?

-

https://arxiv.org/abs/1708.00818

AI Natural Language Processing (NLP)

- *Text Generation:*
  Fabricate spoken language
- ***Speech Synthesis:***
  Generate human sounding voices
  Make it sounds like a known character

Tacotron2

- LJ Speech Dataset (English)
  https://keithito.com/LJ-Speech-Dataset
- Natural TTS Synthesis by Conditioning WaveNet on Mel Spectrogram Predictions, Jonathan Shen, Yuxuan Wang and Zongheng Yang et al.
- Tacotron2 implementation used:
  NVIDIA/tacotron2

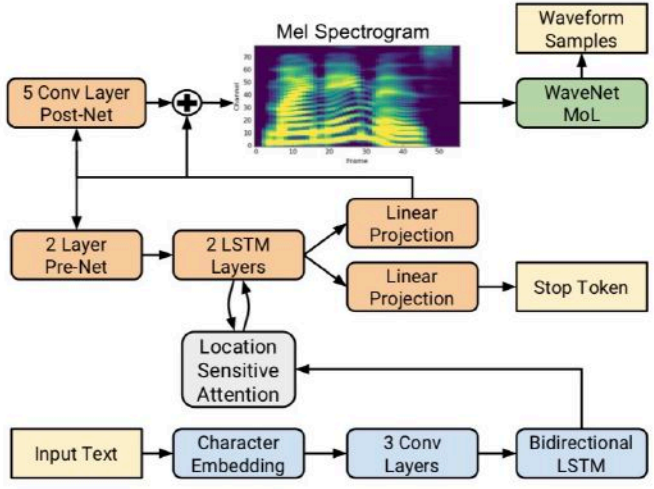
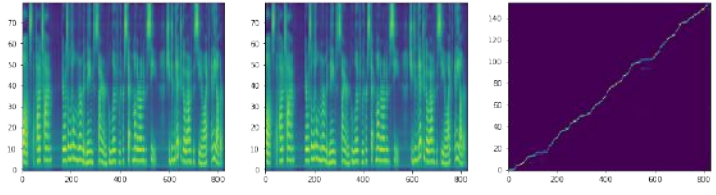


Fig. 1. Block diagram of the Tacotron 2 system architecture.



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Once upon a time there was a little mermaid named Siren, who lived with her step mother under the sea, She didn't get to go out of the Sea like any other."

— 9 days

9 DAYS OF TRAINING

NN CAN READ ENGLISH TEXT - WITHOUT CLOUDSERVICE.

SCALABLE INSTANT APPLICATION

🤑

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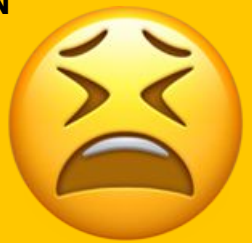
EXECUTIVE SUMMARY

HIGH QUALITY DATA +
A CLEVERLY DESIGNED NEURO NET
CAN PRODUCE IMPRESSIVE RESULTS

Let’s Do This in German!

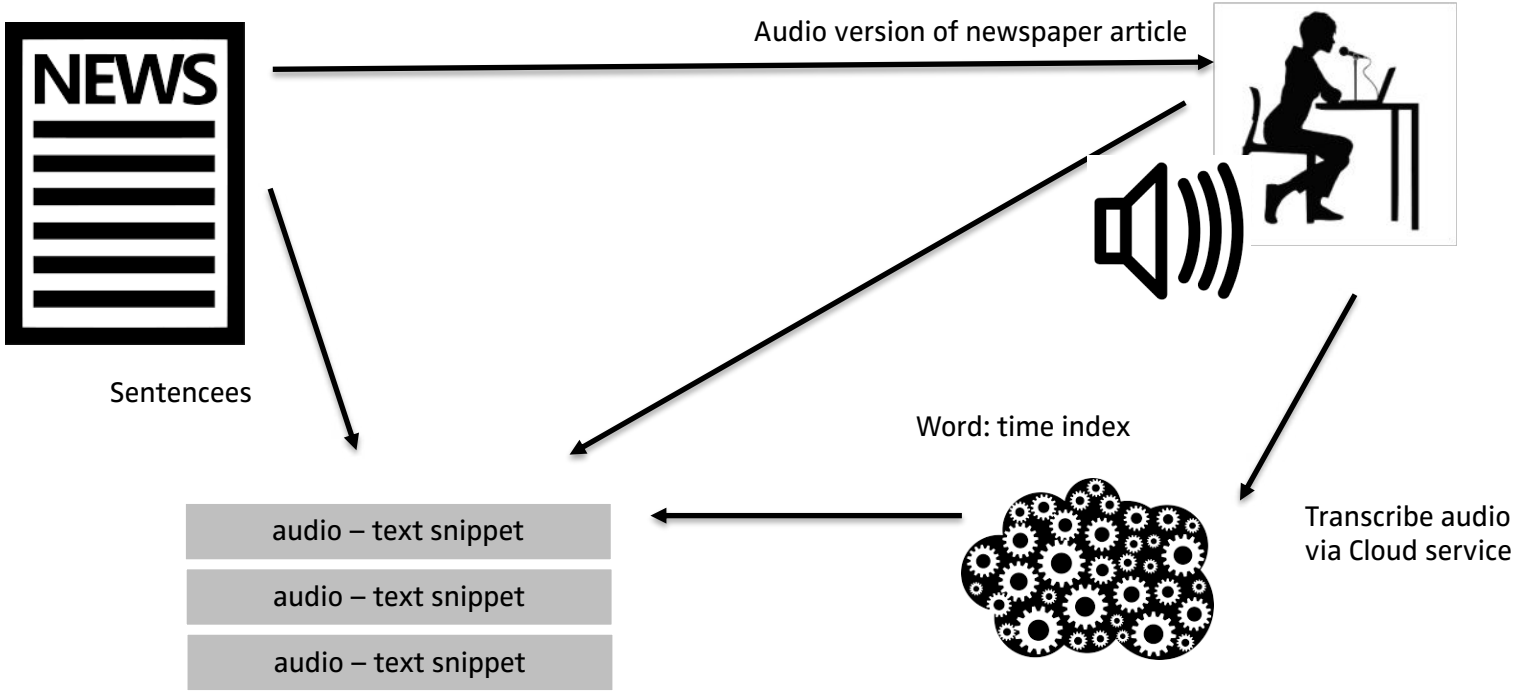
- *Requires:*
  - audio snippets and
  - text of the audio snippet
  - In GERMAN



We Can Do This in German!

- Task: building a German corpus to learn with
  - audio snippets
  - text of the audio snippet
- Options
  - audiobooks
  - newspapers with audio
  - ...
- Requirements
  - humans to prepare the dataset

Semi-automation of Dataset Generation



KÖNIGSWEG

Deutschland darf kein Talent vergeuden, so heißt es immer wieder. Wo aber bleiben in unseren Schulen die Angebote für die besonders Talentierten?

Germany must not waste any talent, it is said again and again. But where are the offers for the most talented in our schools?

— ‘original’

— 10 days

— 14 hrs

— 14 days

Assumptions

1. Transcription service will deliver a very good quality
2. Transcription service a generally available at all providers and very cheap
3. It should be easy to generate a new corpus

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Assumptions

Findings German

1. Transscription service will deliver a very good quality

   Quality is ok, but transcription is not accurate, many artefacts

2. Transscription service a generally available at all providers and very cheap

   (+) Google (N/A) Azure (N/A) IBM (N/A) AWS Offline libs (-) Apple (-), Wit.ai (+)

3. It should be easy to generate a new corpus

   Not so simple...

EXECUTIVE SUMMARY

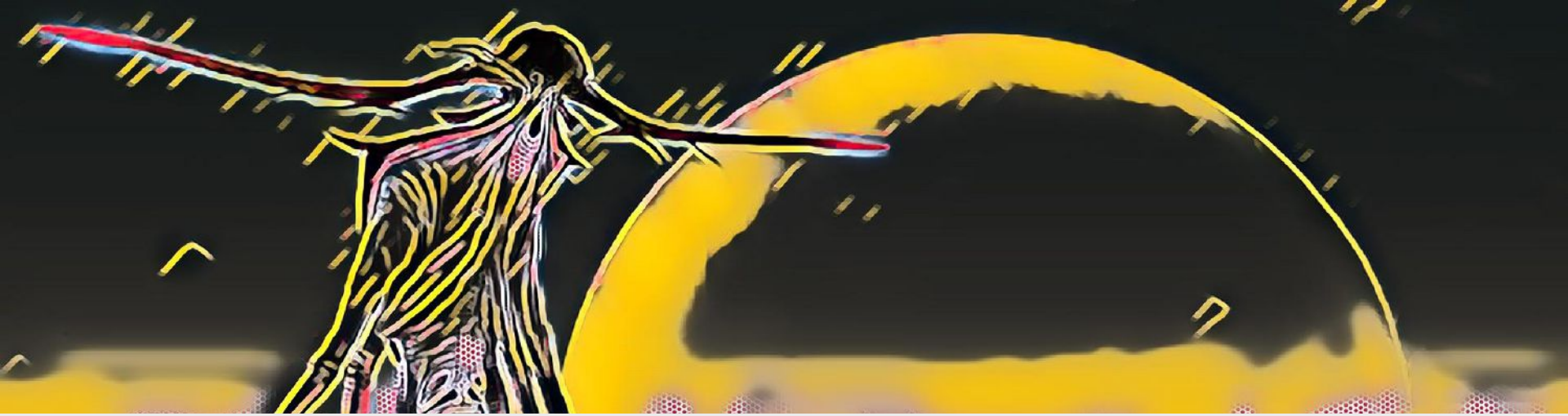
NLP RESEARCH IS DOMINATED BY ENGLISH AND CHINESE

NOT ALL TECHNIQUES WORK IN ALL LANGAUGES

AS WELL AS IN ENGLISH, YET

Meanwhile…

- BERT (Oct 2018)
  Bidirectional **E**ncoder **R**epresentations from **T**ransformers.
- Transformer-X (Jan 19)
- GPT-2 (open AI)
- wav2letter++ (Dec 18)
- Open.AI claims system has writes solid articles (Feb 19)



ADVERSARIAL ATTACKS

Fooling automated surveillance cameras: adversarial patches to attack person detection

Simen Thys, Wiebe Van Ranst, Toon Goedemé

https://arxiv.org/abs/1904.08653

April 2019

https://www.youtube.com/watch?v=MIbFvK2S9g8

NoT sO YoLo

EXECUTIVE SUMMARY

NEURO NETWORKS DO NOT PERCEIVE REALITY AS WE HUMANS DO.

NEURO NETWORKS MAY BE FOOLED.

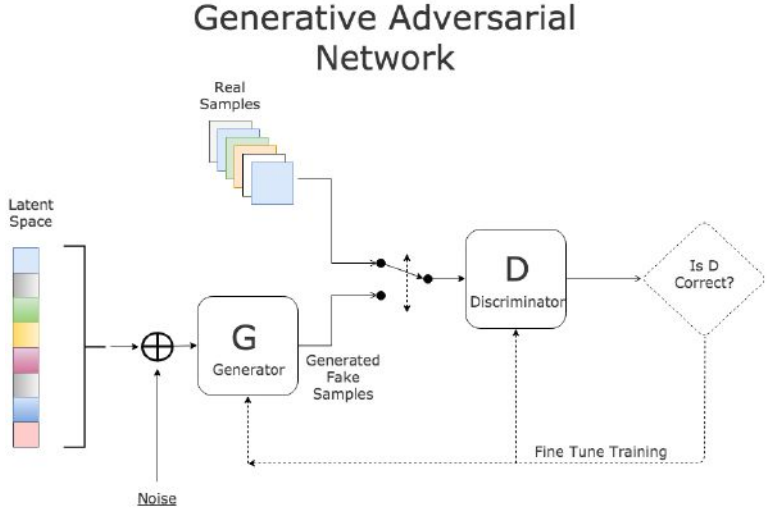
NEURO NETWORKS ARE BETTER + FASTER AT MANY THINGS.

NEURO NETWORKS CANNOT TRANSFER KNOWLKEDGE.

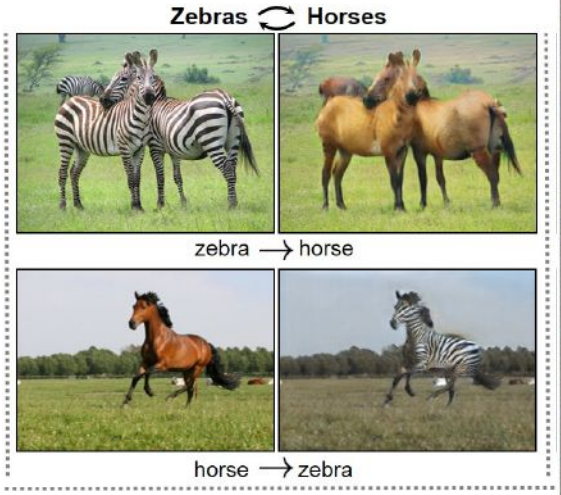
GAN: Generative Adversarial Networks

Generative gegnerische Netze

- 2014
- Creation of photorealistic images for the visualization of various objects, for the modeling of movement patterns



More usecases



[Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks]

Jun-Yan Zhu* Taesung Park* Phillip Isola Alexei A. Efros

Figure 5: 1024×1024 images generated using the CELEBA-HQ dataset. See Appendix F for a larger set of results, and the accompanying video for latent space interpolations.

PROGRESSIVE GROWING OF GANS FOR IMPROVED QUALITY, STABILITY, AND VARIATION
https://research.nvidia.com/sites/default/files/pubs/2017-10_Progressive-Growing-of/karras2018iclr-paper.pdf

Google Übersetzer

Englisch | Deutsch | Somali | Sprache erkennen

ag ag ag ag ag ag ag ag ag ag ag ag ag ag ag ag ag ag

Ausgangssprache: Irisch

https://translate.google.com/#so/en/ag%20%20ag%20%20ag%20%20

Emilien Dupont

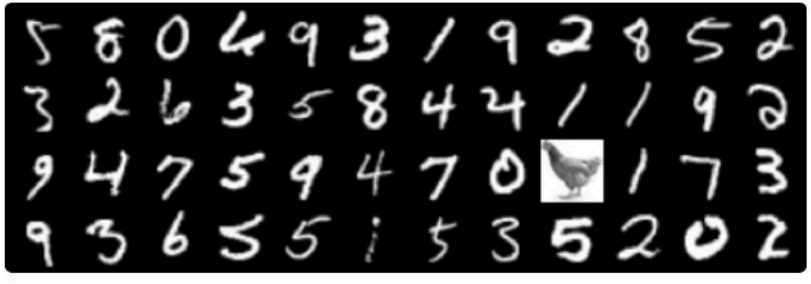
Machine Learning

Passing a Chicken through an MNIST Model

14 Mar 2018

When you put a picture of a chicken through a model trained on MNIST, the model is 99.9% confident that the chicken is a 5. That's not good.

This problem does not just relate to chickens and digits but the fact that a neural net makes very confident predictions on data that does not come from the same distribution as the training data. While this example is artificial, it is common in practice for a machine learning model to be used on data that is very different from the data it was trained on. A self-driving car, for example, may encounter an unusual environment that was never seen during training. In such cases, the system should not be overly confident but instead let the driver know that it is not able to make a meaningful prediction.[1]



Images from MNIST and a chicken.

https://emiliendupont.github.io/2018/03/14/mnist-chicken/

Breaking Linear Classifiers on ImageNet

Mar 30, 2015

You've probably heard that Convolutional Networks work very well in practice and across a wide range of visual recognition problems. You may have also read articles and papers that claim to reach a near *"human-level performance"*. There are all kinds of caveats to that (e.g. see my G+ post on Human Accuracy is not a point, it lives on a tradeoff curve), but that is not the point of this post. I do think that these systems now work extremely well across many visual recognition tasks, especially ones that can be posed as simple classification.

Yet, a second group of seemingly baffling results has emerged that brings up an apparent contradiction. I'm referring to several people who have noticed that it is possible to take an image that a state-of-the-art Convolutional Network thinks is one class (e.g. "panda"), and it is possible to change it almost imperceptibly to the human eye in such a way that the Convolutional Network suddenly classifies the image as any other class of choice (e.g. "gibbon"). We say that we *break*, or *fool* ConvNets. See the image below for an illustration:

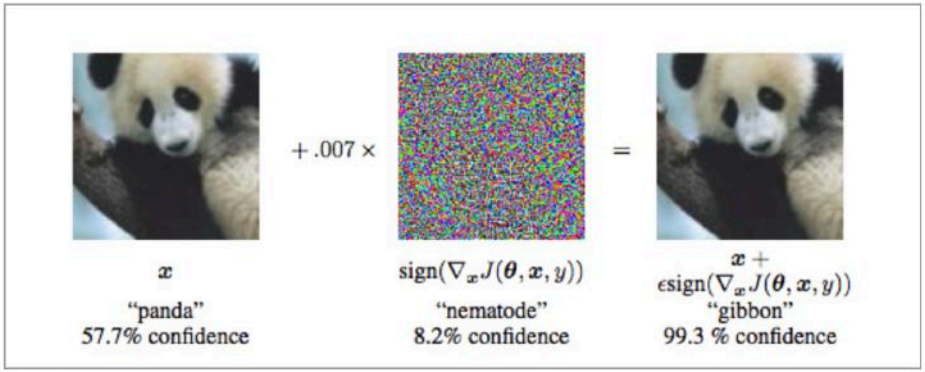


Figure from Explaining and Harnessing Adversarial Examples by Goodfellow et al.

Th**http://karpathy.github.io/2015/03/30/breaking-convnets/** et al. last year. They had a very similar set of images:

Making AI Happen

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TEAM UP: OPEN, HONEST & RESPECTFUL COMMUNICATION CULTURE

Meetup

PyData
51 Länder • 137 Gruppen • 116991 Mitglieder

Events in meiner Umgebung **Gruppen in meiner Nähe**

YouTube

Youtube Videos	Youtube Subscribers	Youtube Views
1250+	70,000	4,5+ Mio

PYDATA FRANKFURT

PyData Frankfurt

TUESDAY, NOVEMBER 26 18:00

TECH QUARTIER, PLATZ DER EINHEIT 2

— 10 Years of Automated Category Classification for Product Data at billiger.de

Johannes Knopp
solute

KPMG

— Sharing Jupyter notebooks with Binder

Tim Head
Binderproject

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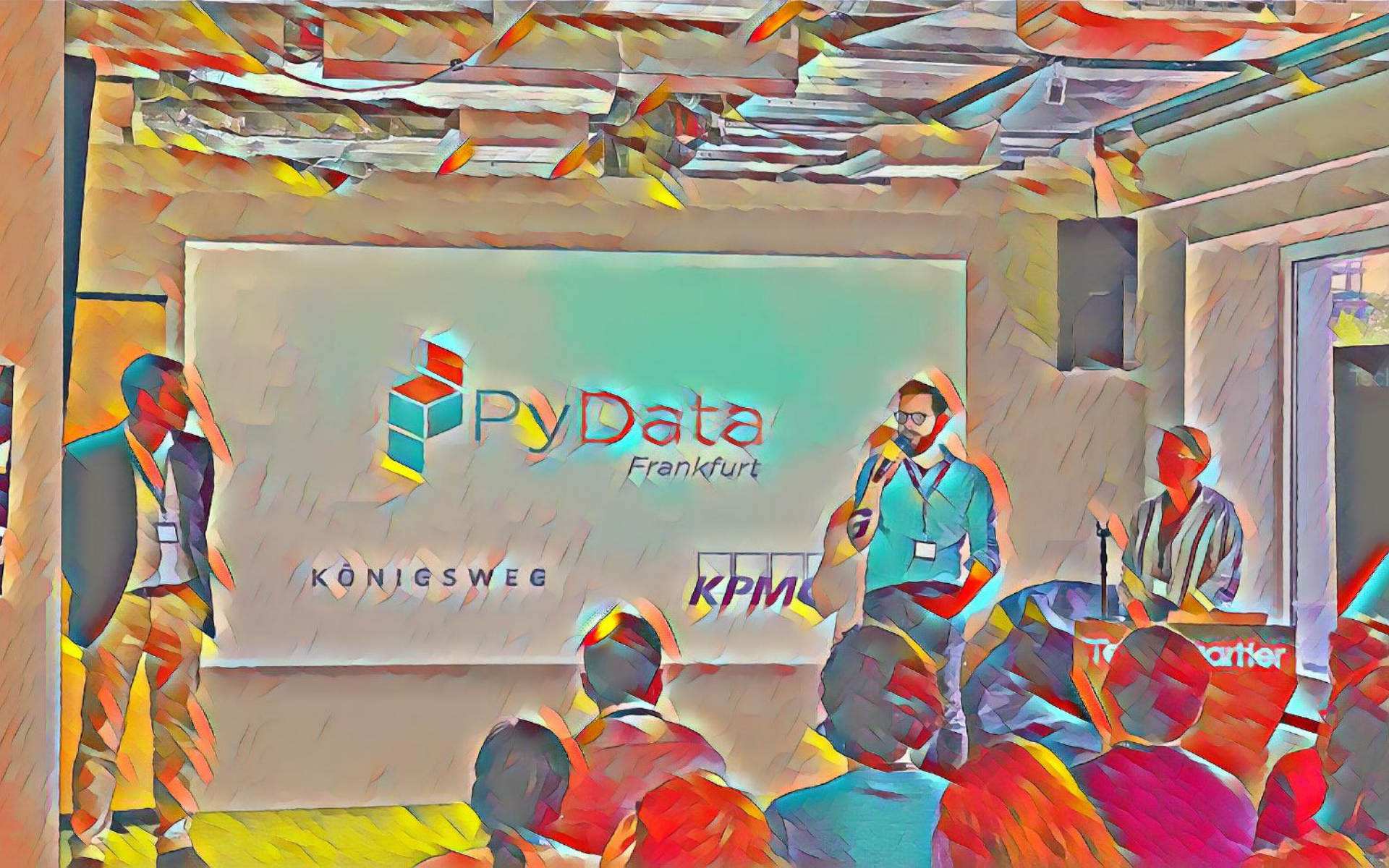
PyData
Frankfurt
KÖNIGSWEG
KPM

PYDATA SÜDWEST

PyData Südwest

THU, NOV 21 18:00 - 21:30

X-HOUSE, HEIDELBERG (@MAIN STATION)

— A.I. Caramba: How to Maintain Sanity

Vincent D. Warmerdam
GoDataDriven

HEIDELBERGCEMENT

— 2119: A Data Science Escape Room

Konrad Heimpel
Getsafe

KŌNIGSWEG

NUMFOCUS
Algo Rules
pandas
PyMC3
julia
JUMP
将軍
open Journals
sunpy
yt
KOSMOS
PyCon.DE
PyData
Berlin

Q: How long does it take?

- Training a model depends on:
  - complexity
  - data-volume
  - data-density / task (text, image)
  - hardware

Q: How long does it take? No. 2

- **Training:**
  time and resource intensive (minutes to months)
- **Application, model serving:**
  fast, almost instantly

Q: Why Does it Sometimes Not Work?

- Non sufficient data quality
- Heterogeneous data
- Biased datasets

Q: What is a Model?

- Python, a pickle file – object saved to disk
- ONNX - open ecosystem for interchangeable AI models
  https://onnx.ai

Q: Pro Tips?

–

- Document properly
- Code properly, esp. code that works also outside of Jupyter notebooks
- Data versioning
- Think
- Domain expertise
- Challenge yourself, is DL the right approach and why
- DevOps skills to access computing power

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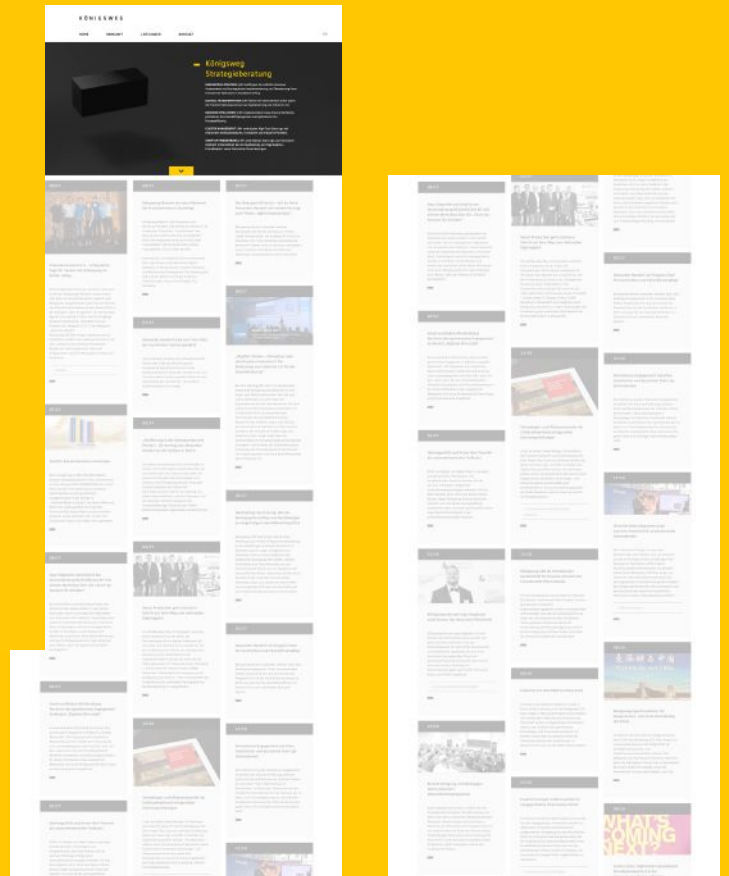
Thank you!



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