

THE ECONOMICS OF PREDICTION MACHINES

ALEXANDER CS HENDORF



NETZWERK
SMART PRODUCTION

ABB

17.11.2020

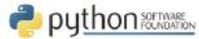
ABB Ability™ Customer Experience Center

K Ö N I G S W E G

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MANAGING PARTNER & PRINCIPAL CONSULTANT
DATA SCIENCE & AI AT KÖNIGSWEG.

PYTHON SOFTWARE FOUNDATION FELLOW, PYTHON SOFTWAREVERBAND CHAIR,
PYCONDE & PYDATA BERLIN CHAIR, LOCAL PYDATA COMMUNITY ORGANIZER



@HENDORF



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SMART PRODUCTION AH@KOENIGSWEG.COM



K Ö N I G S W E G

We do digital excellence.

STRATEGY & INNOVATION

DATA & ARTIFICIAL INTELLIGENCE

BUSINESS TRANSFORMATION &
OPERATIONS

Get in touch with our specialists.



PyConDE & PyData Berlin 2021

Oct 13–15 2021
bcc Berlin Congress Center

meetup

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



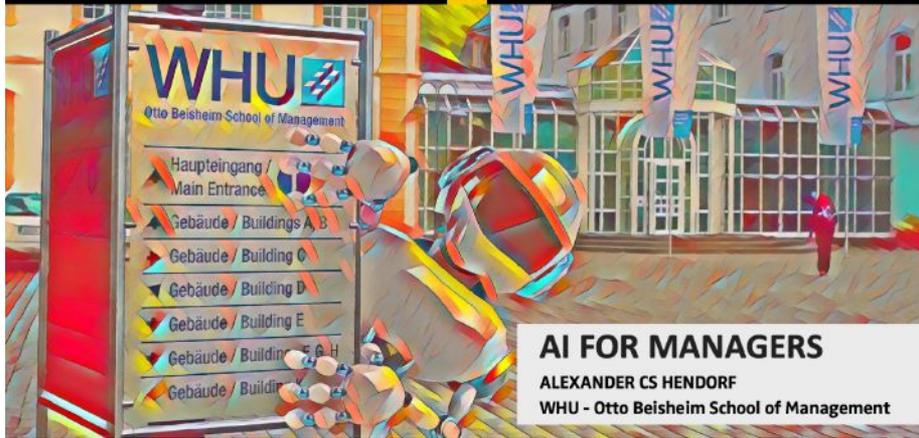
KÖNIGSWEG



TLDR;

too long - did not read

KÖNIGSWEG



AI for Managers

Otto-Beisheim-School for Management

- Bilderwelt zu KI führt in die Irre
- KI ist nicht IT – es ist R&D!
- Fehler beim Einkauf von der Stange
- Grenzen proprietärer Software

Gastvorlesung auf YouTube

<https://youtu.be/ltjEID4QqrY>

inteligencia hype education microsoft robots learning risks machine learning benefits business entrepreneur



Why We Need to Fine-Tune O...
singularityhub.com



Is Artificial Intelligence real or is it ...
towardsdatascience.com



Artificial Intelligence - Telenor Gr...
telenor.com



Why 'Fail Fast' is a Disaster Wh...
entrepreneur.com



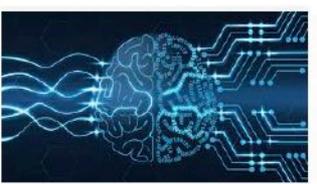
Benefits & Risks of Artifi...
futureoflife.org



How to Cut Through the Artificial Int...
emerj.com



Only one Canadian company ...
betakit.com



How artificial intelligence is chan...
surveycto.com



Understanding Artificial Intelli...
medium.com



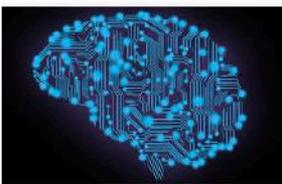
Digital Austria / Artificial Intelligence 201...
lsz-consulting.at



Artificial intelligence: 5 richtig...
deutsche-startups.de



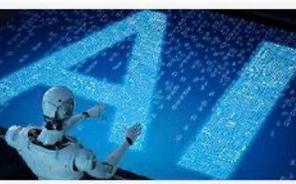
Security and Artificial Intellige...
threatpost.com



Artificial Intelligence: The Next...
blogs.cfainstitute.org



How does Artificial Intelligence ...
innopexus.com



How To Make Artificial Intelligen...
newyork.cbslocal.com



Artificial Intelligence in HR – The F...
emptrack.com



Will Artificial Intelligence be the ...
quarkmag.com



Why Will Artificial Intelligenc...
analyticstraining.com



The 7 stages of the future evoluti...
em360tech.com



Crowdsourcing in the age of ar...
venturebeat.com



Are We There Yet? Artificial Intel...
nmc.org



Artificial Intelligence Use Cases | C...
cookiegroup.com



Can Artificial Intelligence Hel...
verywellmind.com

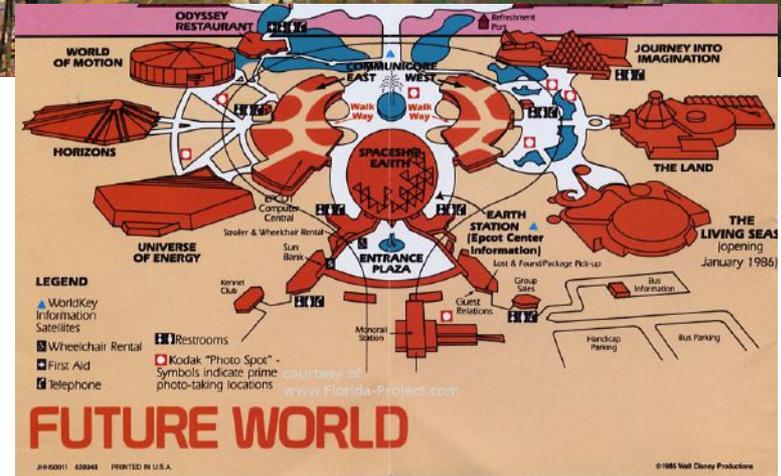


The Proliferation of Artificial In...
vlab.org

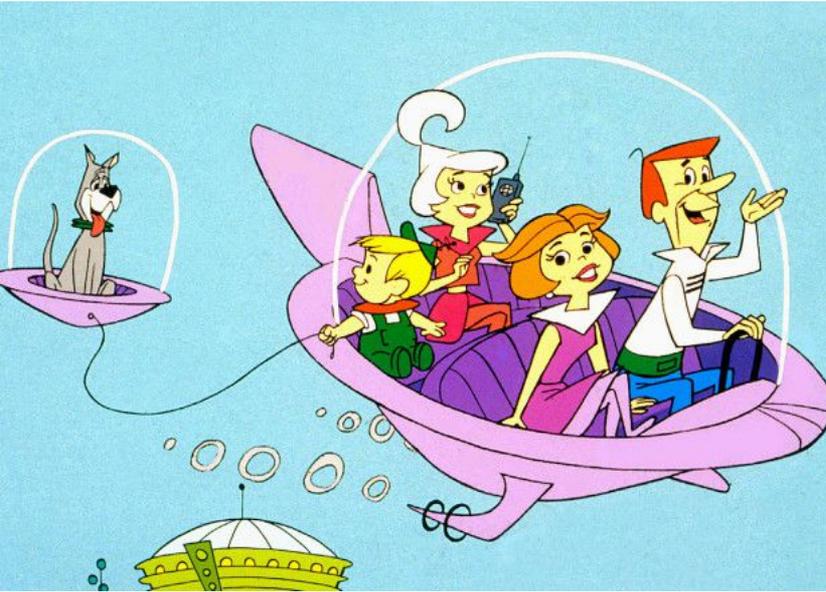


The Prologue and the Promise by Robert McCall @ Walt Disney World Horizons

Utopia, 1985



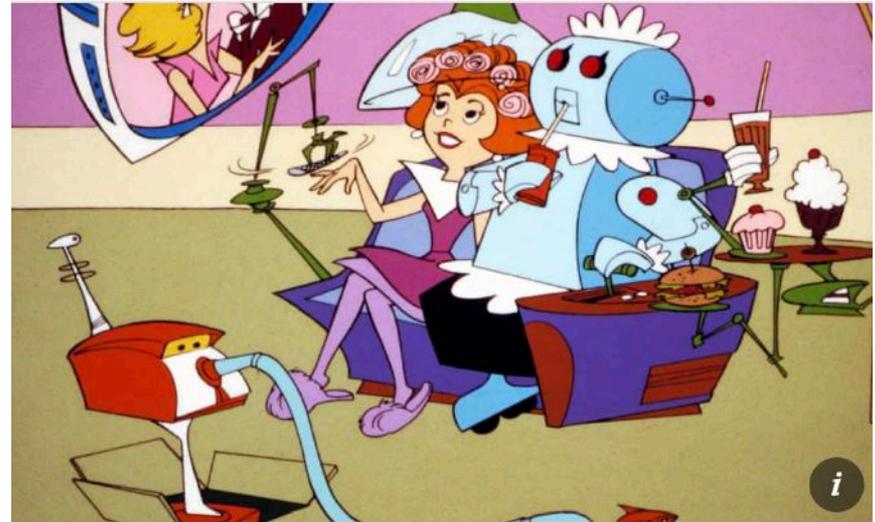
Future World im Epcot Center in Walt Disney World



The Jetsons, 1962



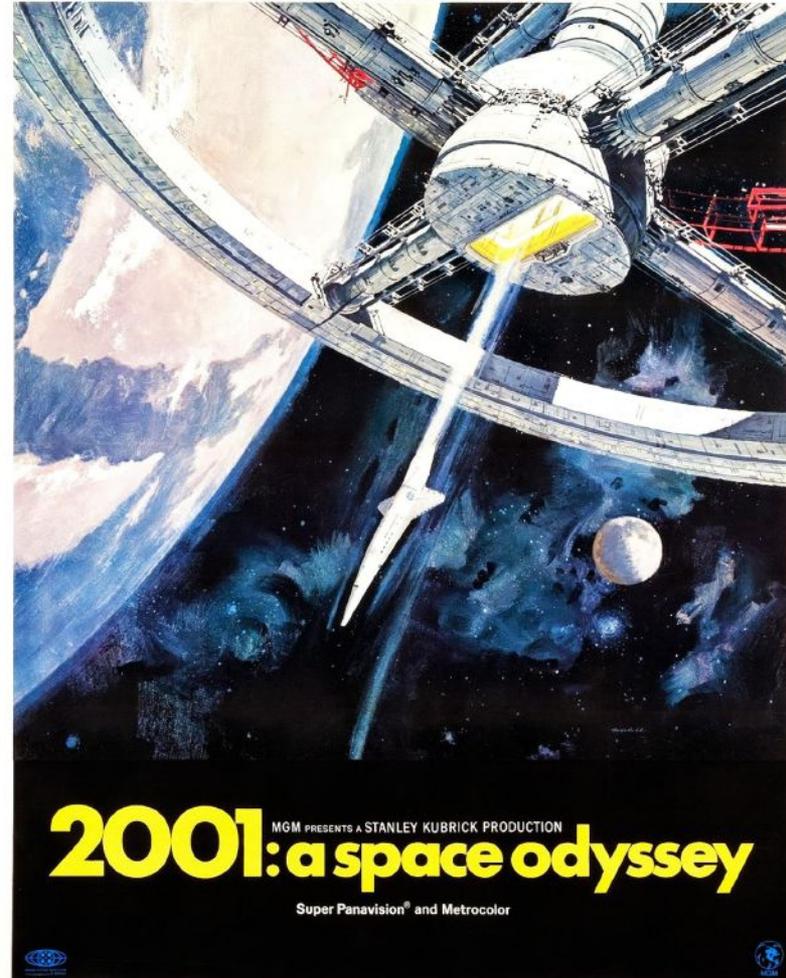
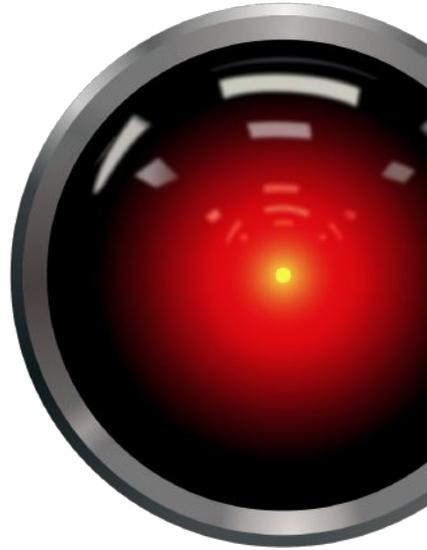
Business ▶ Economics Banking Money Markets More



Technology and Innovation
Fully automated luxury
communism

An epic drama of adventure and exploration

Space Station One: your first step in an Odyssey that will take you to the Moon, the planets and the distant stars.



MGM PRESENTS A STANLEY KUBRICK PRODUCTION
2001: a space odyssey

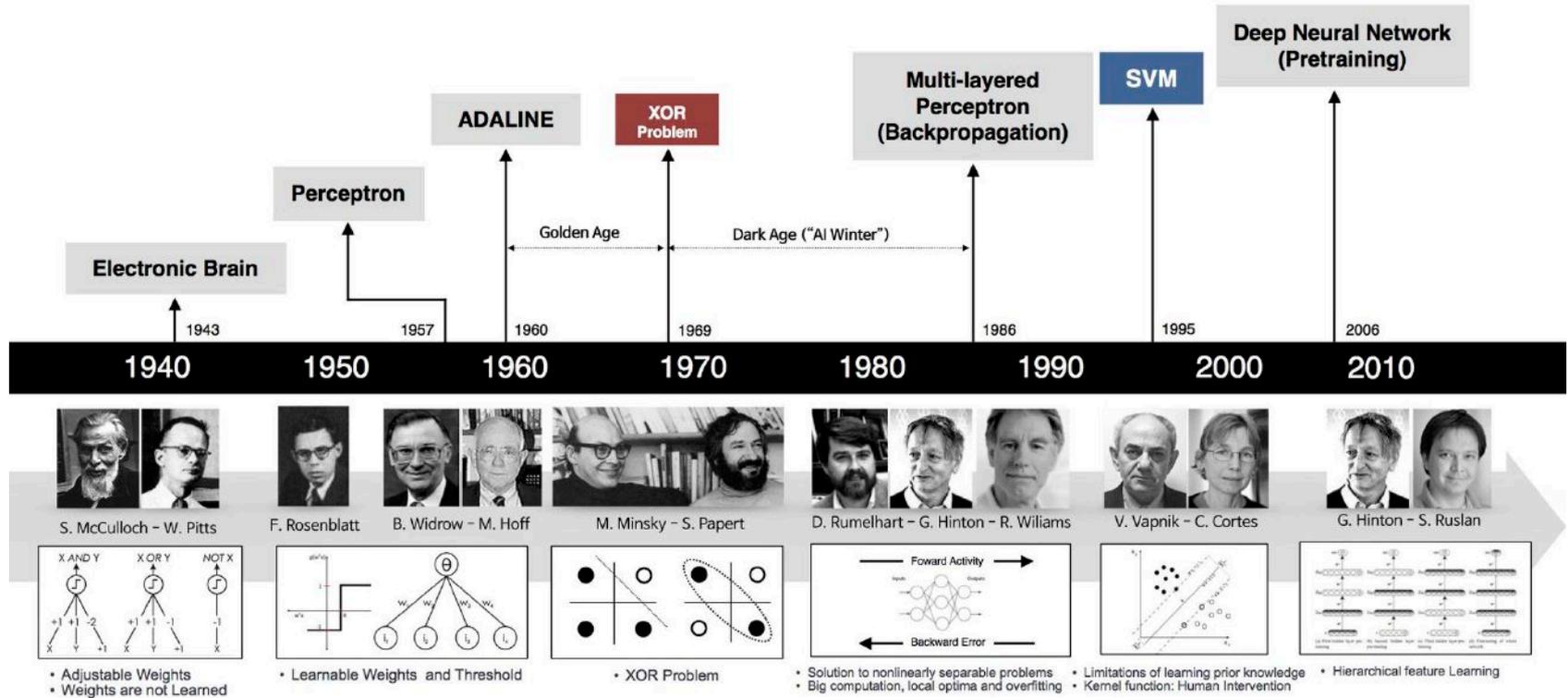
Super Panavision® and Metrocolor

1984





1987: Star Trek TNG



HOW TO BUY AI IN 2020



AUFSCHNITT ODER AM STÜCK?

CUT OR PIECE?



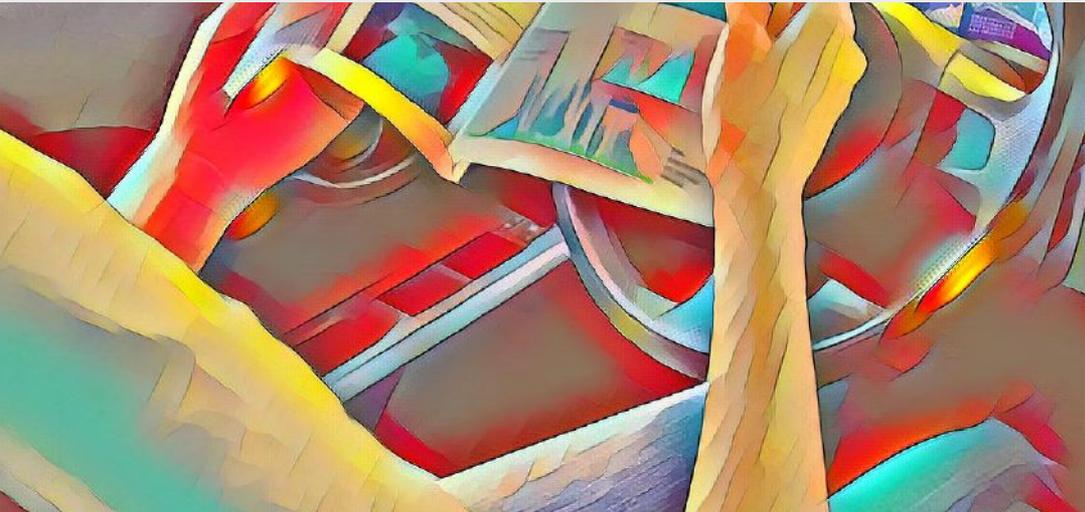
DATA SCIENCE UND AI IST FORSCHUNG & ENTWICKLUNG!



KÖNIGSWEG



2016: SOON WE'LL USE S



Elon Musk
This article is more than 4 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 'solve problem' but tech and executives in recent years have tempered their expectations

Danny Yadron in San Francisco
@dannyyadron
2016/02/02/PT



Don't Believe the Hype.

Public Enemy 1988



Deep Learning with PyTorch for Fun and Profit

EuroPython Edinburgh 2018

- Deep Learning
- Style Transfer
- AI Comic

Talk auf YouTube

[https://youtu.be/ uNgNhdIB7U](https://youtu.be/uNgNhdIB7U)

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

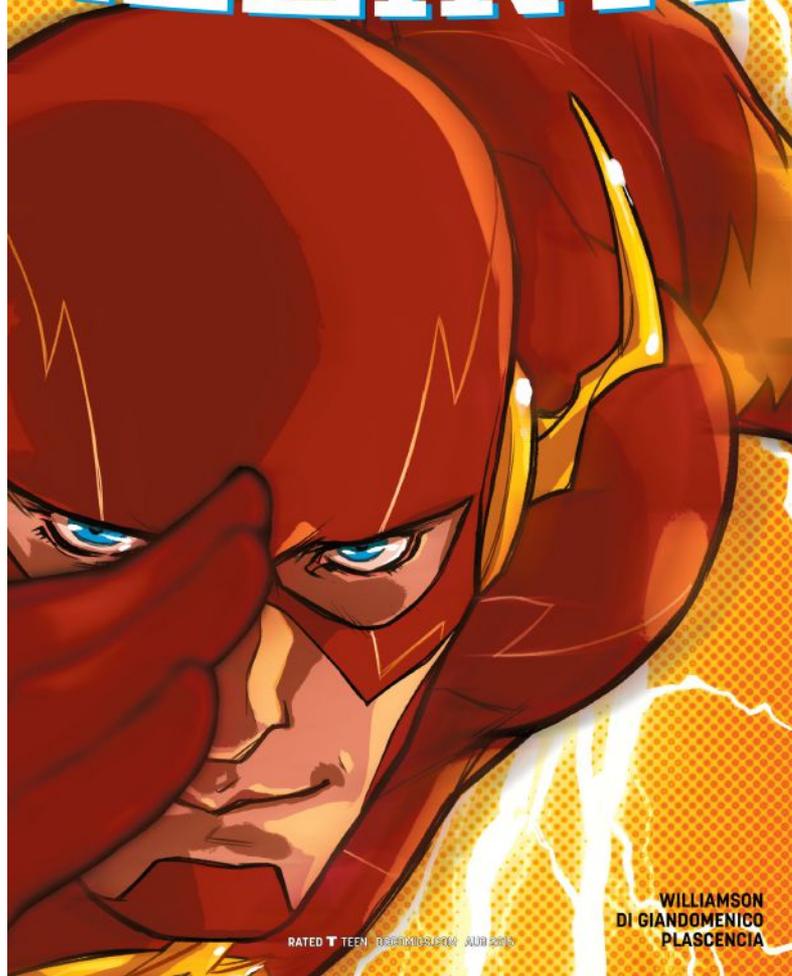
comicArt



The FLASH

1

REBIRTH



RATED T TEEN REBIRTH #1 \$3.99 JULIO 2016

WILLIAMSON
DI GIANDOMENICO
PLASCENCIA



ZUSAMMEN MIT ANDEREN REISENDEN FAHREN VALERIAN UND VERDIGNIQUE UNGEHINDERT ZUR HAUPTSTADT.



BISHER KLAPPT ALLES

KEINE ÜBER- RASCHUNG, DIE MEISTEN RASSEN SIND MENSCHLICHEN URSPRUNGE. WIR FALLEN ÜBERHAUPT NICHT AUF.



ZUM GLÜCK SIEHT MAN HIER ALLE ARTEN VON KLEIDERN. WIR FALLEN NICHT AUF.

EIN PRÄCHTIGER MARKT! DORT IST DIE GASSE DER GOLD- SCHMIEDE. LASS UNS MAL SCHAUEN...



ICH HABE GOLD DABEI. DAS WIRD ALS ZAHLUNGSMITTEL ANGENOMMEN.

DU WIRST DOCH NICHT EINEN HAUFEN ZEUGS ZUSAMMEN- KAUFEN?!



DIE STEINE, DIE SICH AUF DER HAUT FEST- SAUGEN, SIND ZAUBER- HAFT. ABER HERUM- LAUFEN NICHTS ICH MIT SOLCHEN VIEHERN NICHT.



SIEH MAL, VALERIAN!



EINE UHR MIT SCHÖNEN ORNAMENTEN. SIE SCHEINT SEHR ALT ZU SEIN.

SELTSAM... IM PRAÄTOMAREN MUSEUM VON GALAXITY GIBT ES GANZ ÄHN- LICHE. GEFÄLLT SIE DIR?



WAS IST DAS?

WAS IST DAS? DAS IST DAS...

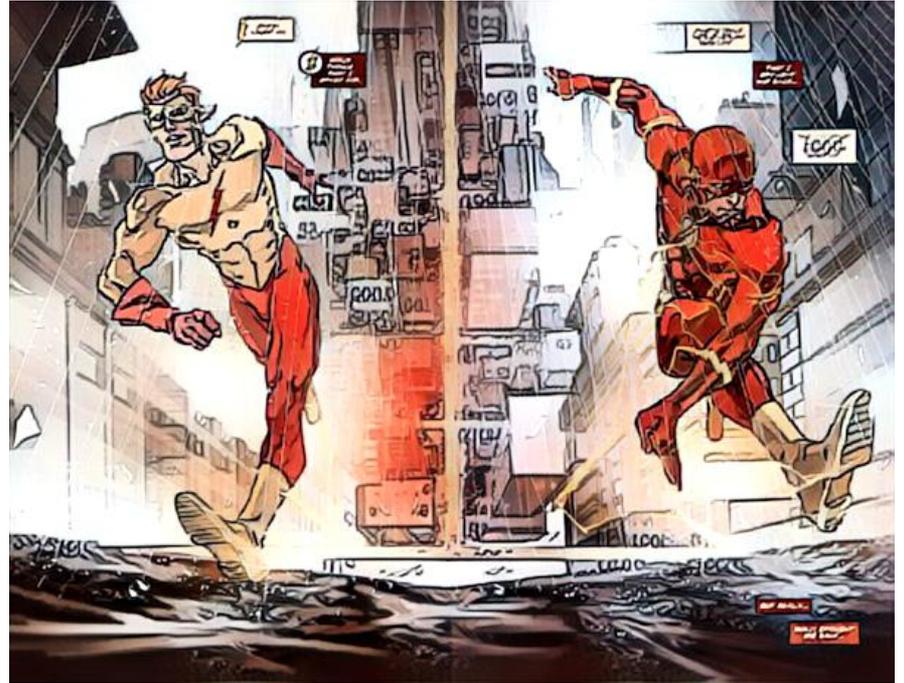
THEY'RE TRYING TO GET AWAY FROM US...

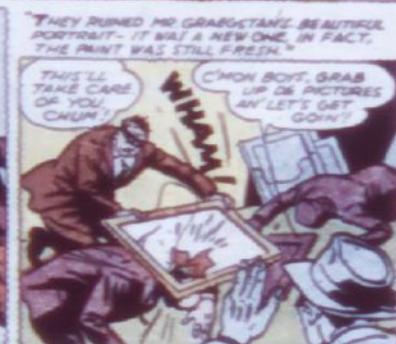
THEY'RE TRYING TO GET AWAY FROM US...

THEY'RE TRYING TO GET AWAY FROM US...

BUT REALLY...

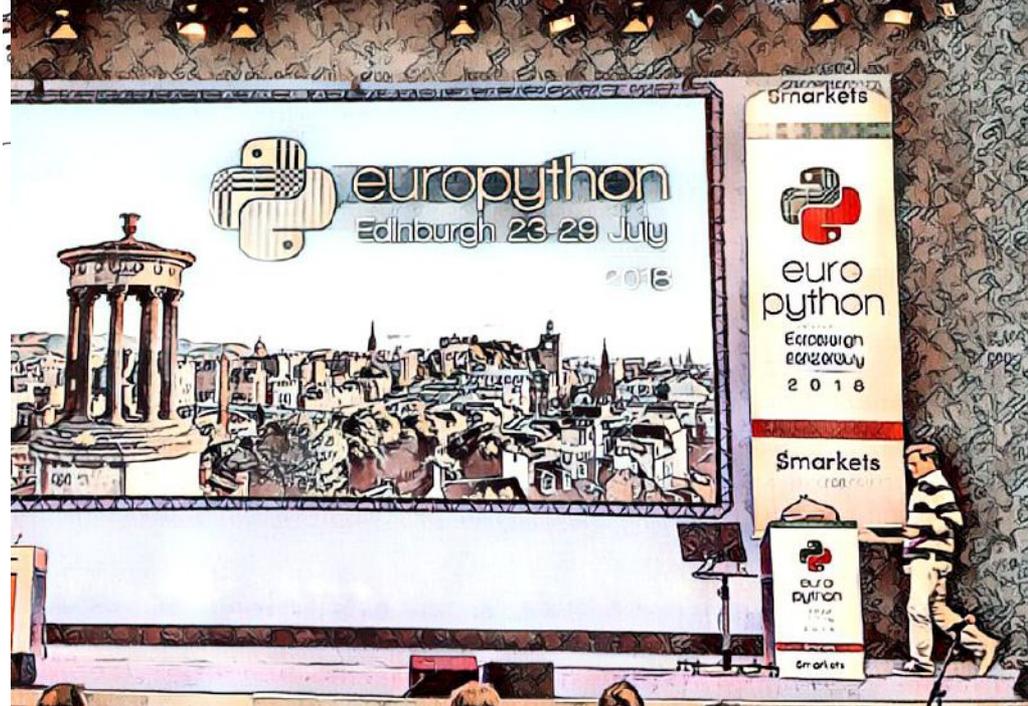
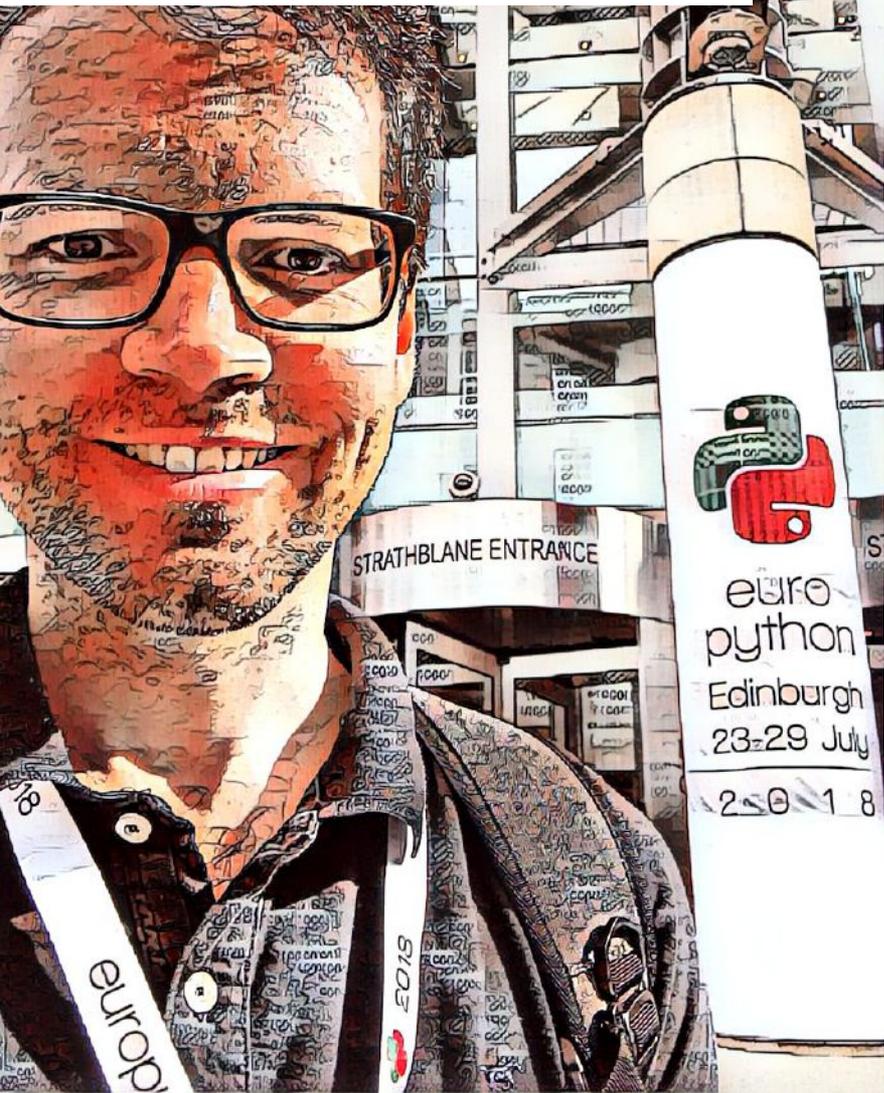
BUT REALLY... THEY'RE TRYING TO GET AWAY FROM US...

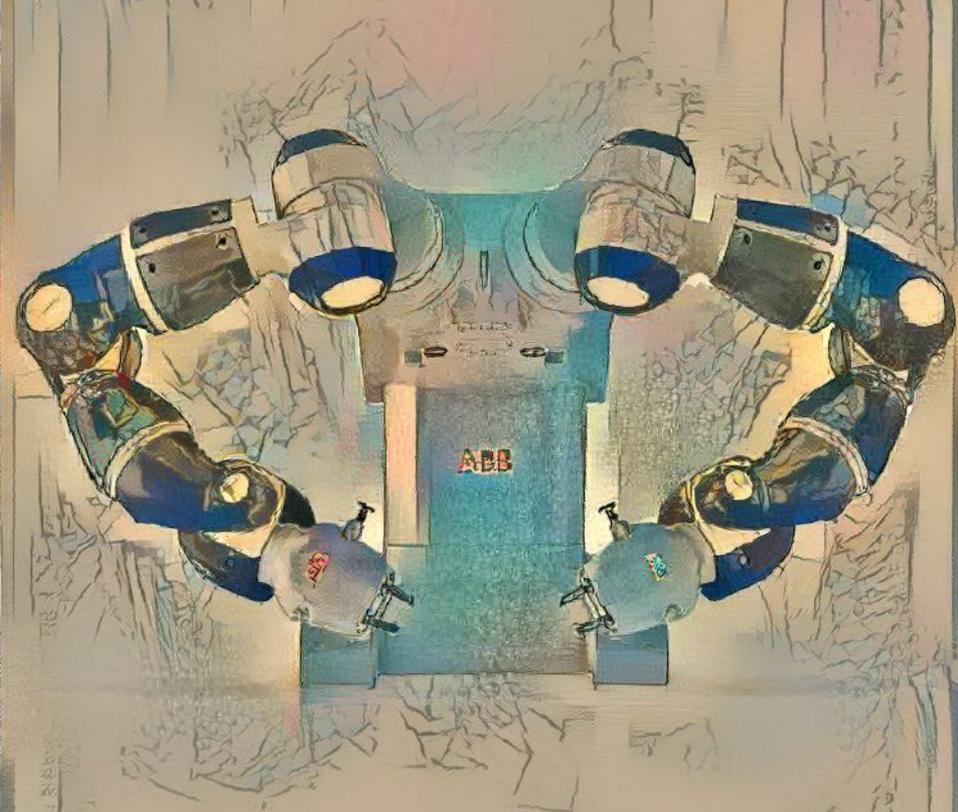




original size

EuroPython Comic





KÖNIGSWEG



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Die Vision



200+ Bücher

200+ Hörspiele

Exzellente Domainexpertise in-house



Das Verfahren



- *Datenerfassung*
- *Bereinigung von Daten*
- *Blogpost / Paper, eine funktionierende Lösung*
- *Verifizieren, dass es wie dargestellt funktioniert*
- *Die Lösung für unseren Anwendungsfall anpassen*
- *Qualität maximieren*

Die drei ??? und der Super-Papagei

1



EUROPA

Die drei ??? und die flüsternden Puppen

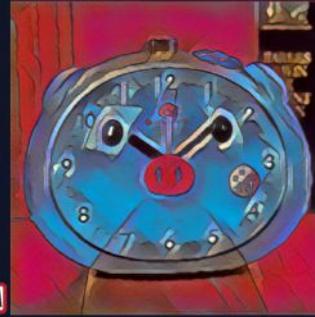
180



EUROPA

Die drei ??? und der seltsame Wecker

12



EUROPA

Die drei ??? und die flüsternde Mumie

10



EUROPA

Die drei ??? Das Grab der Inka-Mumie

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

KÖNIGSWEG

How I Made My Computer
Write its First Short Story.
Part One
Alexander CS Hendorf



How I Made My Computer Write its First Short Story

PyData Berlin 2018

- Natural Language Processing
- Text Generierung
- KI Training: sind 200 drei Fragezeichen Bücher genug Trainingsmaterial?

Talk auf YouTube:

<https://youtu.be/jCII02teu1k>

KÖNIGSWEG



The Unreasonable Effectiveness of Recurrent Neural Networks

May 21, 2015

There's something magical about Recurrent Neural Networks (RNNs). I trained a recurrent network for Image Captioning with arbitrarily-chosen hyperparameters, and the edge of making sense. Sometimes it blows past your expectations. One time was that the common wisdom I've in fact reached the opposite conclusion. I've witnessed their power and robustness. This post is about sharing some of the

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:

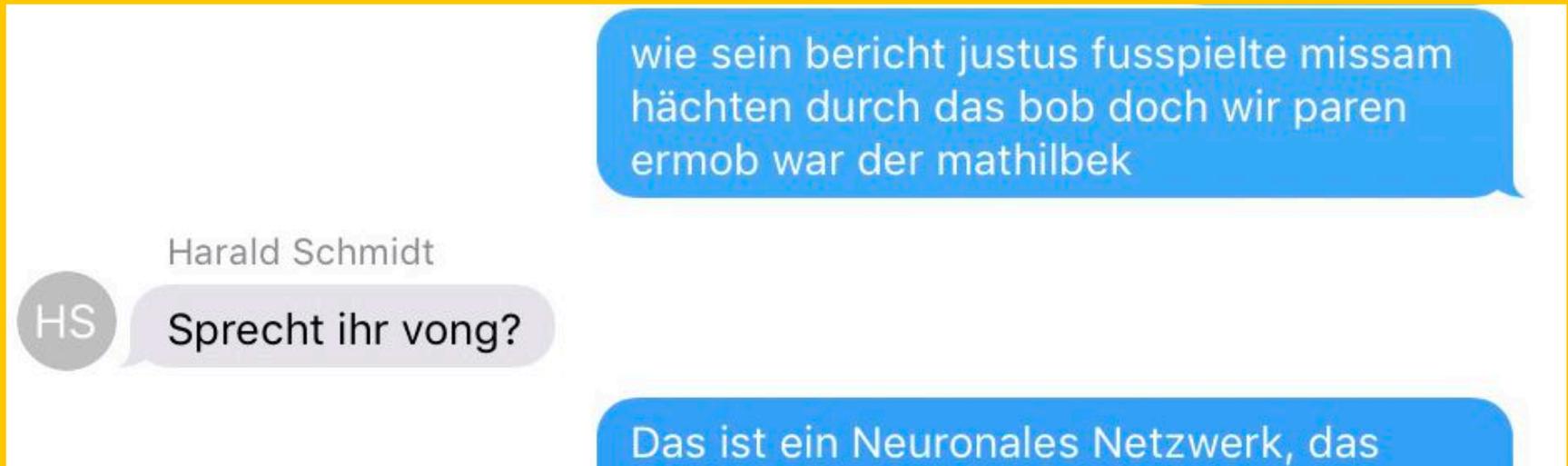
```
Alas, I think he shall be come approached and the day  
When little strain would be attain'd into being never fed,  
And who is but a chain and subjects of his death,  
I should not sleep.
```

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.
```

<http://karpathy.github.io/2015/05/21/>

Ergebnis



KÖNIGSWEG



SPEECH SYNTHESIS WITH TACOTRON2 AND PYTORCH

ALEXANDER CS HENDORF



Speech Synthesis with Tacotron2 and PyTorch

PyData Amsterdam 2019 @ booking.com

- Sprachsynthese
- Geringe Erfolgserwartung
- Transkription auf Deutsch über Cloudservices unter Erwartung
- Datenbeschaffung auf deutsch schwierig
- Ergebnis überraschend gut

Talk auf Youtube:

<https://youtu.be/ijhZR43TOwc>

KÖNIGSWEG

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."

— 10 hrs



— 9 days



— 14 hrs



Technologie-Lab

- MacBookPro 2016, eGPU NVIDIA GTX1080
- Dokumentation & Reproduzierbarkeit der Experimente
- Plattformunabhängige Entwicklung
- 100% Open Source Software





**THE ECONOMICS
OF
PREDICTION
MACHINES**

ALEXANDER CS HENDORF



**NETZWERK
SMART PRODUCTION**

ABB

17.11.2020

ABB Ability™ Customer Experience Center

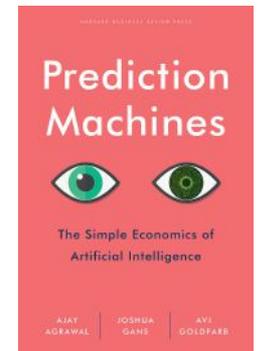
K Ö N I G S W E G





Prediction Machines

- Zutreffenderer Begriff
- Lösen das Problem menschlicher Voreingenommenheit
- Lösen das Problem menschlicher Aufnahmefähigkeit (mehr Parameter)
- Fallende Vorhersagepreise





Treiber

- Leistungssteigerung = fallende Kosten
Computation (CPU, GPU, et al.)
- Kapazitätssteigerung = fallende Kosten
Datenspeicherung & -transport
- Flexible Infrastruktur = Cloud
- Open Source Software
- Offener Zugang zu Information

KÖNIGSWEG



15 THINGS YOU
SHOULD KNOW ABOUT
SPACY

ALEXANDER CS HENDORF @
EUROPYTHON 2020

Natural Language Processing for Managers / 15 Things You Should Know About Spacy

PyData Bonn-Cologne / EuroPython 2020

- Natural Language Processing
- Personas im Projekt
- Projektumsetzung
- Use Case aus Industrie

Spacy Talk auf YouTube:

<https://youtu.be/-hJcklCooHU>

KÖNIGSWEG



*Use Case:
Natural
Language
Processing*

Hercule Prototype

Create a new clustering

2



15

10



Number of clusters

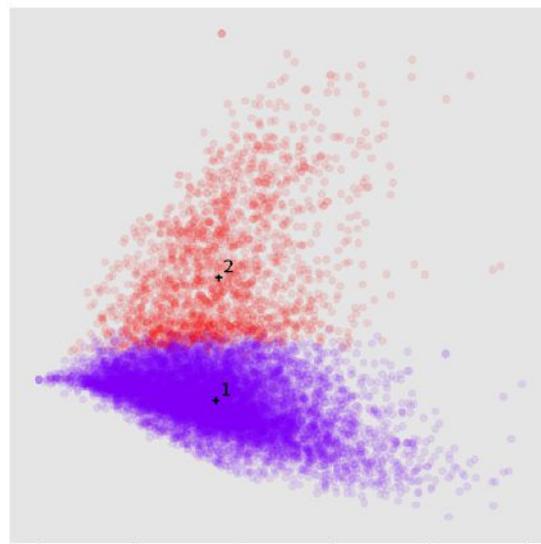
Number of keywords

Documents in cluster
Min.
[Get Clusters](#)

Current clustering

1. BIODIVERSITY (8984)

2. RECYCLING (1878)



BIODIVERSITY

This cluster contains 8984 documents.

[biodiversity](#)
[degradation](#)
[soil](#)
[natural](#)
[resource management](#)
[forest](#)
[conservation](#)
[student](#)
[resources](#)
[sustainable](#)
[specie](#)

1. [PDF](#) [Go to 072ee09815a87ffb1297652b4bca5be7](#)

[strategy](#)
[strategy](#)
[concept](#)
[concept](#)
[concern](#)
[concern](#)
[generation](#)
[generation](#)
[agency](#)
[agency](#)

Examples of the application of sustainable strategies to local, national and regional issues, sustainable resource use is basically dependent on the outcome of the cost-increasing effects application of sustainable strategies in a local, national and regional context. environmental concerns about increasing resource use, as well as a review of the contrasting application of sustainable strategies to local, national and regional issues, as well as the role of early development, resources are exploited, the environment is degraded, and income and environmental sustainable development. environmental sustainability and the Southern states demanding development, ensured that The sustainable development strategy also includes areas of economic Conservation Strategy (NCS) and the National Environmental Action Plan (NEAP). Sustainable Development Strategy. Thematic Community Strategy on the Sustainable Use of Resources.

2. [DOCX](#) [Go to 1be1c96458fa99a319cb2e73b63b1a68](#)



Hercule Prototype

Create a new clustering

Number of clusters

Number of keywords

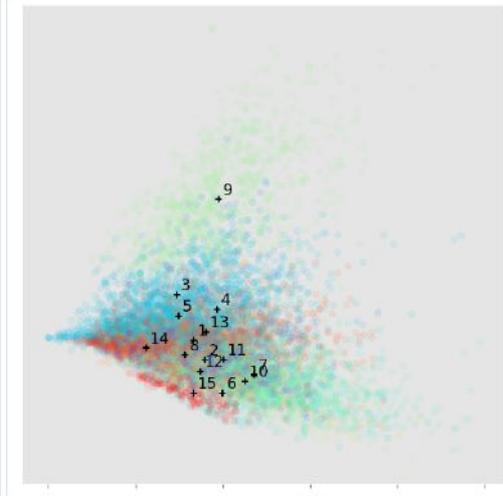
Documents in cluster

Min.

Get Clusters

Current clustering

1. ESG (8)
2. NATURAL (824)
3. PAPER (55)
4. COUNCIL (240)
5. ECO (2464)
6. SOIL (217)
7. DEGRADATION (1723)
8. JOURNAL ARTICLE (475)
9. RECYCLING (900)
10. BIODIVERSITY (579)
11. STUDENT (596)
12. RESOURCE MANAGEMENT (433)
13. COMPANY (1349)
14. MODEL (825)
15. JOURNAL SOIL (174)



This cluster contains 8984 documents.

[biodiversity](#)
[degradation](#)
[soil](#)

[natural](#)
[resource management](#)

[forest](#)
[conservation](#)
[student](#)

[resources](#)
[sustainable](#)
[specie](#)

[country](#)
[university](#)
[journal](#)

[plant](#)

explore this cluster

1. [PDF](#) [Go to 072ee09815a87ffb1297652b4eca5be7](#)

[strategy](#) [strategy](#) [concept](#) [concept](#) [concern](#) [concern](#) [generation](#) [generation](#) [agency](#) [agency](#)

Examples of the application of sustainable strategies to local, national and regional issues, sustainable resource use is basically dependent on the outcome of the cost-increasing effects application of sustainable strategies in a local, national and regional context. environmental concerns about increasing resource use, as well as a review of the contrasting application of sustainable strategies to local, national and regional issues, as well as the role of early development, resources are exploited, the environment is degraded, and income and environmental sustainable development. environmental sustainability and the Southern states demanding development, ensured that The sustainable development strategy also includes areas of economic Conservation Strategy (NCS) and the National Environmental Action Plan (NEAP). Sustainable Development Strategy. Thematic Community Strategy. The Sustainable Use of Resources.

2. [DOCX](#) [Go to 1be1c96458fa98a319cb2a73b63b1a68](#)

[impact](#) [impact](#) [emission](#) [emission](#) [human](#) [human](#) [may](#) [may](#) [greenhouse](#) [greenhouse](#)

Human impact on the environment or anthropogenic impact on the environment includes changes to biophysical environments[1] and ecosystems, biodiversity, and natural resources[2][3] caused directly or indirectly by humans, including global warming,[1][4] environmental degradation[1] (such as ocean acidification[1][5]), mass extinction and biodiversity loss,[6][7][8][9] ecological crisis, and ecological collapse. Environmental impacts associated with meat production include use of fossil energy, water and land resources, greenhouse gas emissions, and in some instances, rainforest clearing, water pollution and species endangerment, among other adverse effects.[57][58] Steinfeld et al.

3. [PDF](#) [Go to 5bb18f8b77d2b0797060056cca1a5a](#)

[measure](#) [measure](#) [transport](#) [transport](#) [principle](#) [principle](#) [awareness](#) [awareness](#) [sector](#) [sector](#)

development, while maintaining the essential freedom of the people Sri Lanka to protect nature and conserve its riches . natural resources, the land, water, atmosphere and living resources, the direction according to which steps will be taken to conserve and 2. Reclassify the natural forests of the country on a national system dry zone (outside the protected areas) to productive use, management of land, water and other natural resources on and with value addition within the country, as far as Promote water resources development techniques with environmentally safe limits and is restricted to designated sites. Adopt regulatory measures to ensure that all mining (development activities in the coastal zone such as aquaculture, sustainably through regulation of fishing effort and the use of conserving the marine and coastal environment.

4. [PDF](#) [Go to 61dd29b8fb6608637c1f684c6f36c1a9](#)

[greenhouse](#) [greenhouse](#) [oil](#) [oil](#) [carbon](#) [carbon](#) [sea](#) [sea](#) [ocean](#) [ocean](#)

Since its March 2015 take off, the Swiss-engineered Solar Impulse 2 has made 16 stops across the world without using a drop of fuel to demonstrate that using the plane's clean technologies on the ground can halve the world's energy consumption, save natural resources and improve quality of life..... The hard-fought deal at a global climate conference in Durban, South Africa keeps talks alive but doesn't address the core problem: The world's biggest carbon polluters aren't willing to cut emissions of greenhouse gases enough to stave off dangerous levels of global warming. For example, some geo-engineering techniques are based on carbon sequestration, for reduction of greenhouse gases in the atmosphere directly, an effort, to check climate change by controlling global warming.

5. [PDF](#) [Go to 6a13ff9af682802eb89512a8d46e9e7e](#)

[habitat](#) [habitat](#) [fish](#) [fish](#) [animal](#) [animal](#) [deforestation](#) [deforestation](#) [biodiversity](#) [biodiversity](#)

Biodiversity land management waste management maintaining ecosystems conservation projects deforestation recycling air water land pollution lgcse/O level/lcse 9-1 biology revision notes examinations Biodiversity and managing resources. habitat destruction, the wild animals and plants that live in their natural habitats environment - land and water pollution and the production of methane gases and chemical waste to minimise the harmful polluting impact on try to minimise pollution of the atmosphere, water and land, all local ecosystems and the habitats and populations of specific plants use up oxygen affecting many species in food chains - this But plant/animal species population numbers aquatic species for food, reducing biodiversity. biodiversity and allows plants and animals to continue to live in species helps biodiversity.

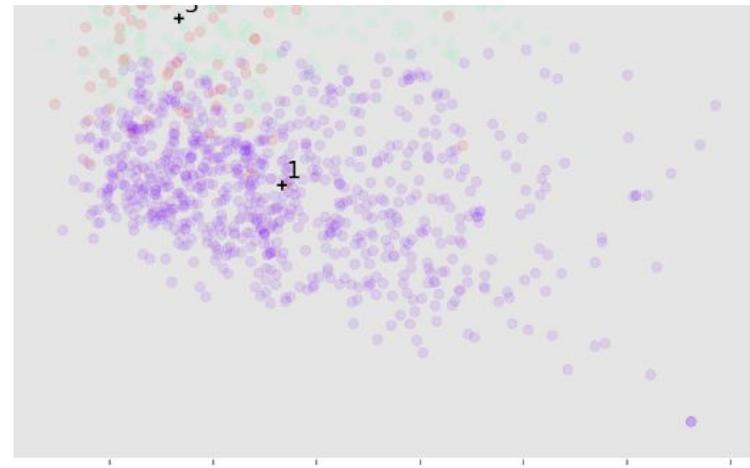
6. [PDF](#) [Go to 6a2b0f68b0f62df8b755174378e521c7](#)

Current clustering

1. RECYCLING (798)

2. PLASTIC (249)

3. UPCYCLING (91)



RECYCLING

This cluster contains 798 documents.

recycling recycle scrap metal
collection paper services
trash landfill city equipment
county company program bin

explore this cluster



1. **PDF** [Go to 032ab17b6fa507c086f19d19db3f830d](#)

car car garden garden facebook facebook thing thing green green

Biodiversity | RESET.org Login with Facebook Login/Register But the huge numbers of people around the world buying water in bottles rather than taking it straight from the tap is a trend that has huge negative consequences for the environment. Most of the conventional cleaning products we all grew up with are petroleum-based and have dubious health and environmental implications. Tips for Sustainable Travel We are often equally unaware of the implications our travel has on global environmental issues, especially climate change. 12 Things You Can Do Right Now on Climate Change Below is a list of 12 easy things you can do right now to help fight climate change. These use four times less energy and they last eight times longer. Green New Deal RESET News

2. **TXT** [Go to 089adbc7e7511a209d49bef523eab43f](#)

comment comment test test question question measure measure course course

Measures to Control of Environmental Degradation - Manufacturing Industries - Everonn - CBSE Class 10th Course and NCERT Solutions 6. Manufacturing Industries Contribution of industry to National Economy Agro Based Industries Mineral Based Industries Industrial Pollution and Environmental Degradation Air pollution can be reduced by selection of proper fuel and fitting smoke stacks to factories with electrostatic precipitators, fabric filters,



KI im produzierenden Mittelstand

Zu maschinenzentriert, oft reicht Analytics

Mehr Augenmerk auf:

- Supply-Chain
- Informationsmanagement
- Informationsgewinnung
- Finance
- Risk
- Compliance

Jenseits Neuronaler Netze:

- statistische Verfahren
- Bayessche Statistik



Vorraussetzungen

- Ordentliche Daten
- Offene Wissenskultur
- Mut zum Experiment
- Allokiertes Budget
- Zugang



Hindernisse

- Halbwissen
- Hype
- Legacy
- Lahmheit



Beispiel-Prozess

Mehrwertgenerierung für eine Domäne

- Erste Stufe: MVP
- Kleines Team
- Einfache, stabile Ansätze zuerst
- Agil: zweiwöchentliche Entwicklung, Evaluation, ggf. Nachjustierung
- Projektdauer 3-6 Monate max.

- Überwachter Einsatz
- Re-evaluation

- Produktion

+

> notebooks > transit-zurich

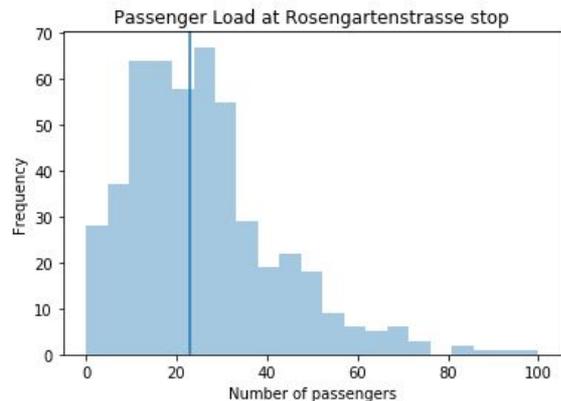
Name	Last Modified
transit.ipynb	2 minutes ago
passenger.csv	2 hours ago
routes.json	2 hours ago
stops.json	2 hours ago

transit.ipynb x

Code Python 3

We plot the number of passengers at the Rosengartenstrasse stop.

```
In [93]: load = df[df.stopNameShort=='ROSE'].passengerLoadStop
sns.distplot(load, kde=False)
plt.axvline(load.median())
plt.title('Passenger Load at Rosengartenstrasse stop')
plt.xlabel('Number of passengers');plt.ylabel('Frequency');
```



Compare the median load at this stop with the medians of all stops.

```
In [94]: sns.distplot(df.groupby('stopNameShort')
                    .passengerLoadStop.median(), kde=False)
plt.axvline(load.median())
plt.title('Passenger load medians across all stops');
plt.xlabel('Median passenger load');
plt.ylabel('Frequency');
```



routes.json x



stops.json routes.json x

```

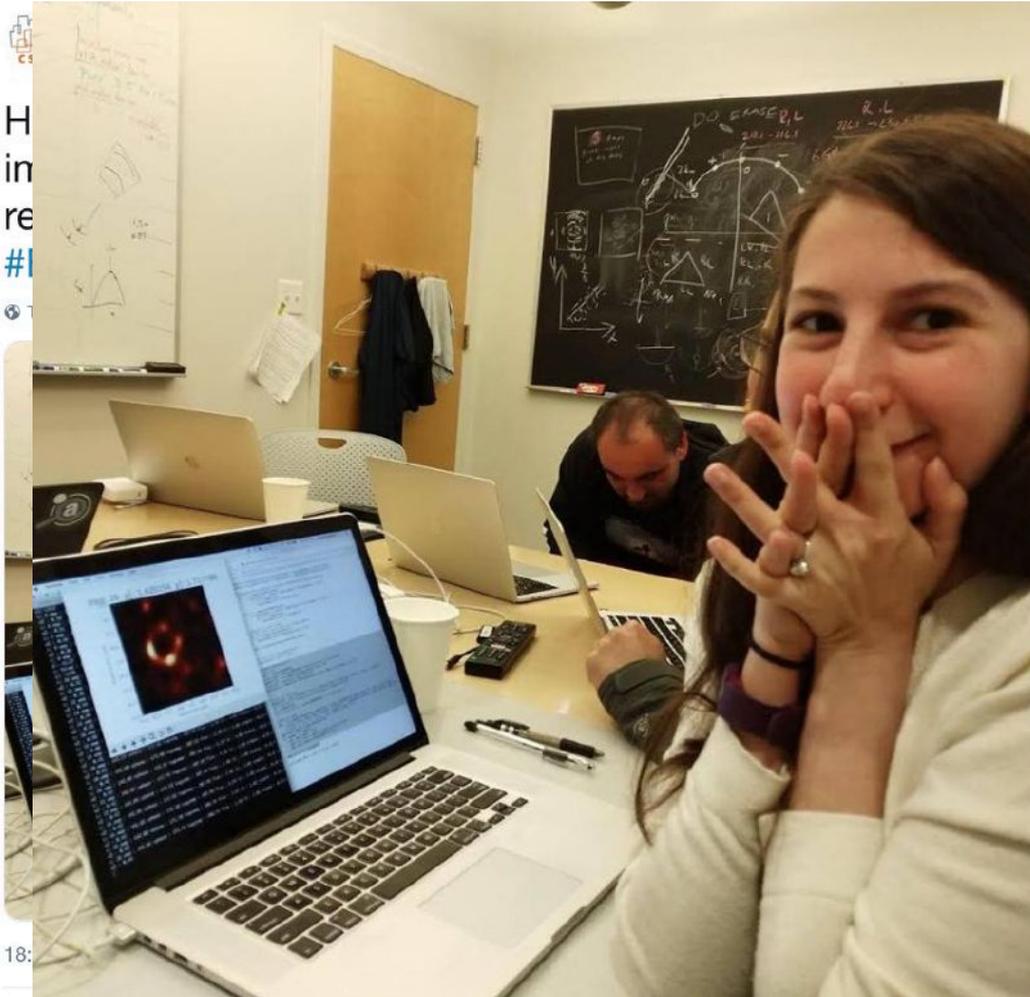
564: {} 3 keys
  type: "Feature"
  properties: {} 4 keys
    stopId: 2749
    stopNumber: 2104
    stopNameShort: "ROSE"
    stopName: "Zürich, Rosengartenstrasse"
  geometry: {} 2 keys

```

passenger.csv x

Delimiter:

stopSequenc	stopId	stopNameShort	stopName
5	2104	ROSE	Zürich, Rosengartenstrasse
6	564	BUCH	Zürich, Bucheggplatz
7	2017	RADI	Zürich, Radiostudio
8	498	BIRD	Zürich, Birchdörfli
9	1705	NEUA	Zürich, Neuaffoltern
10	1000	GLAU	Zürich, Glaubtenstrasse
11	767	EINF	Zürich, Einfangstrasse

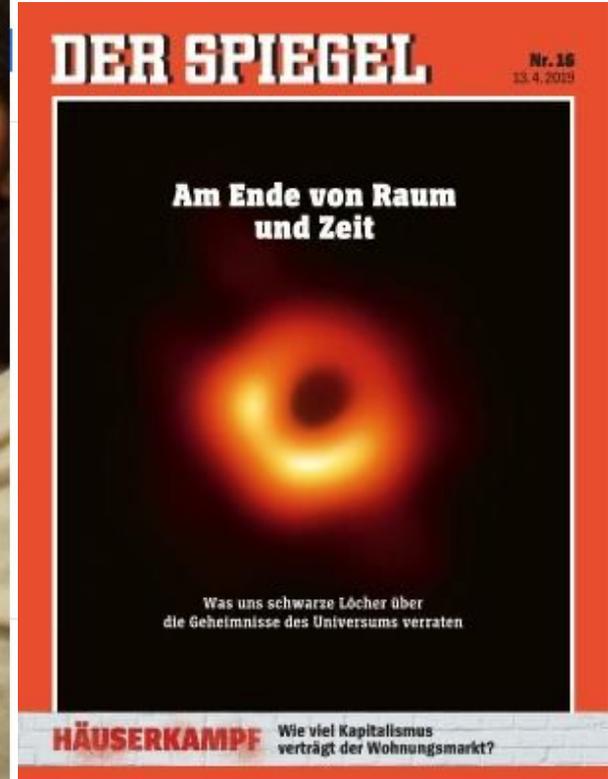


Katie Bouman

1 hr · 🌐

Watching in disbelief as the first image I ever made of a black hole was in the process of being reconstructed.

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re
#l



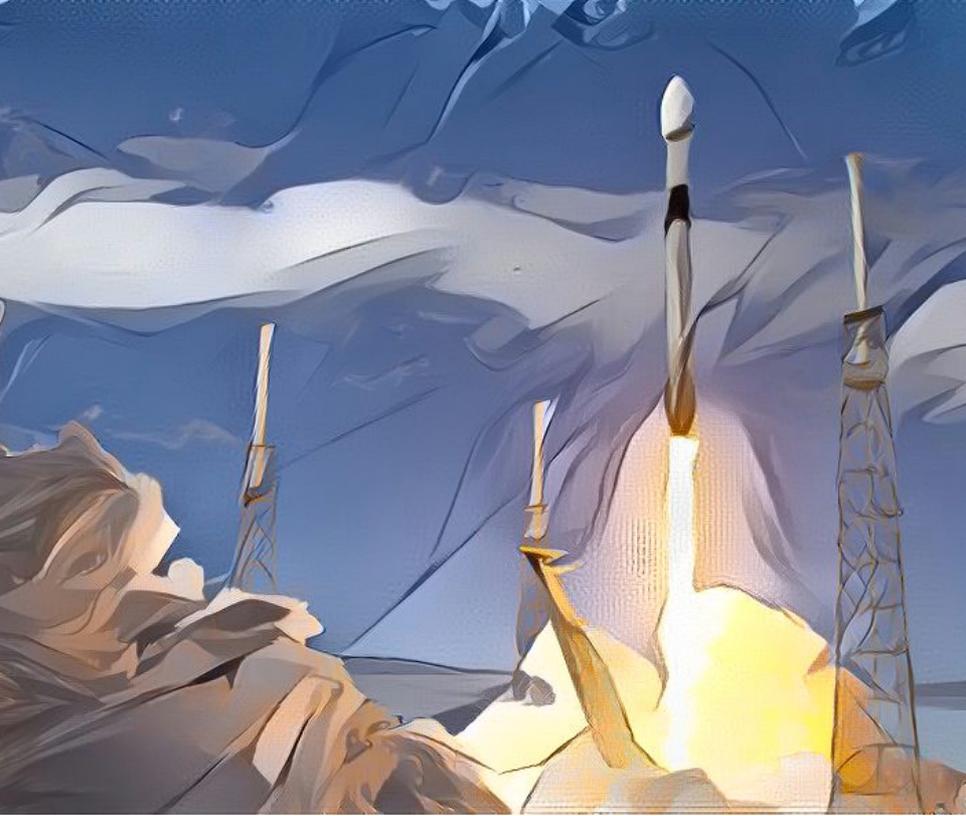
18:

17.496 Retweets 57.656 „Gefällt mir“-Angaben



Best Practices

- **Aufrichtige Kommunikationskultur**
- **Kurze Wege zu Experten, Mentoren
Community**
- **Fokus: wenige Themen und Ideen auf
einmal**
- **Neue Ideen ins Backlog**



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Danke & 🙌 bleiben Sie gesund!

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Vielen Dank für Ihre
Aufmerksamkeit.
Fragen & Antworten



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