

Gastautorin: Iris Proff

How artificial intelligence is making our world a better place

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Google, Facebook and others fill their pockets with billions using our data. But artificial intelligence can do much more – for example ending world hunger.

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»During my studies in artificial intelligence I didn't learn that much about how powerful computers are. Most of all, I learned that many things humans do are less complex than we think they are.« – Frederik Harder, graduate student in Amsterdam

Artificial Intelligence ^{#1} – even though the term triggers associations such as humanoid robots, ^{#2} world supremacy and apocalypse, very often it means »no more« than data analysis. This might sound less exciting, but it is a powerful tool indeed – not only to understand what we click and buy, but also to find answers to questions that might improve the lives of many people.

Filter bubbles, ^{#3} personalized ads and vote-rigging: Tech companies such as Facebook and consultancies such as Cambridge Analytica ^{#1} know how

to use artificial intelligence for their own gain. Their data analyses systematically interfere with social structures. However, the problem is not artificial intelligence itself but rather the question it is confronted with: »How can we grow faster?« , »How can we make more profit?«

But what would the results look like if instead we asked: »How can we get better at doing good?« #4

What marketing and saving the world have in common

Collecting data, finding patterns and making predictions. These are the 3 steps that allow Google, Facebook and Co. to detect links between how people behave and what they are interested in. These 3 steps can also help to understand other complex systems, such as social structures, supply chains or ecosystems. Let's start with some theory on each of these steps.

Step 1: Collect data

Data is the currency of the digital age. #5 From the way we act online, data dealers can infer where we go, whom we are friends with, what we (are going to) buy, and what we are interested in. That way, companies assemble a colorful mosaic of information about every single user. The picture gets even more detailed when companies share information with each other or track their customers *2 via different devices, such as laptop, smartphone and tablet.

Raw data alone does not lead to interesting insights – that's what the next step is about.

Step 2: Detect patterns

The term Big Data *3 captures the fact that the amount of raw data is simply too large and too complex to be interpreted manually. This is where artificial intelligence comes into play: computer programs can

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detect recurring patterns in these giant data sets. ^{*4}

Compared to humans they have a crucial advantage: We usually detect patterns by means of two factors and a couple of observations. When we observe Italians passionately discussing spaghetti and risotto during our summer holiday we are fast to conclude: »Italians like to talk about food.« When, despite pouring rain during our weekend trip to Rotterdam, we encounter a handful of cyclists, we deduce: »Dutch people cycle a lot.« The result of these everyday statistics is inevitably an oversimplified view of reality.

In contrast, an artificial intelligence can evaluate data sets with millions of observations, taking into account numerous factors. Logically, in doing so, it is able to detect patterns that humans could never recognize. The last step reveals why this can be very useful.

Step 3: Make predictions

Once patterns are detected, the artificial intelligence can answer precise questions. For example: Which users like Katy Perry? Who are potential customers for a new gay bar? Who can be convinced by the educational program of the green party? The program will spit out a prediction, such as: »Middle-aged men that have many Facebook friends and play World of Warcraft are interested in Katy Perry.«

Such statements can be mysteriously precise and yet they are grounded on mere statistics, not fortune telling. Likewise, our political stance and sexual orientation is not left to chance: What we are interested in, has an effect on which links we follow. Which videos we watch on Youtube can be predicted by the data track we leave behind.

Tech companies such as Facebook like this, as precise predictions about human behavior are how they earn their money. Their customers can choose precisely which audience they want to target with their ads. Facebook receives 97% of its income through advertisement. For Alphabet, the mother company of Google, ^{*5} 88% of the turnover is constituted by advertising revenues. ^{#6} Artificial intelligence has enabled

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companies to profit from the gold mine that is targeted advertising.

But just as our behaviour is predictable, other aspects of the world are predictable as well: An artificial intelligence can be fed other kinds of data about climate, capital distribution or streams of refugees, just as it is fed the data of your clicks online. Also in these data sets, it can detect patterns and predict how climate, ^{#7} poverty or migration might develop in the future. Instead of optimizing user profiles and maximizing marketing profits, artificial intelligence can thereby create a real added value to society. Many innovative organizations around the world have already proved that this is not just a nice thought experiment.

Data analysis meets activism

Jake Porway is the founder of the US-American start-up *DataKind*. ^{#8} His mission is to connect people that usually don't come across each other. With *DataKind* he wants to get NGOs enthusiastic about the idea to learn from their data instead of insisting on habits ^{#9} and gut feelings. The starting point of this development are »Data Dives«, which the start-up organizes. During these events, activists and voluntary data scientists come together for 48 hours during a weekend to tackle one of the organization's problems. The goal is to visualize raw data in maps or graphs to obtain a clearer perspective on the problem and potential solutions.

Normally, many of the voluntary participants of the project work for renowned tech companies in which they deal with the typical applications of Big Data. In other words: advertisement. Their incentive to contribute to *DataKind* is the chance to use their abilities for a good cause instead of only generating clicks and profits.

Certainly, most problems cannot be solved on a weekend. However, the meetings are often the beginning of a larger process and encourage a rethink inside the NGOs. The organizations learn that they can take advantage of their data to improve their work.

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In Europe, there are a growing number of companies and initiatives combining social activism and data analysis. Among these are the following 3:

- > **Model DataKind:** In Berlin, the mathematician Daniel Kirsch founded the organization *Data Science for Social Good* (DSSG). ^{#10} Based on the American model, his team brings together voluntary data scientists and social organizations.

>>One of our biggest successes was the cooperation with the German Cancer Society. After working with us, they hired a data scientist to take care of their data. This is exactly the kind of change we want to bring about.<< – Daniel Kirsch, founder of DSSG

- > **Students solve problems:** In Amsterdam, entrepreneur Jim Stolze founded the platform *AI for Good* ^{#11} with a similar objective. He provides computer science students with the opportunity to apply their theoretical knowledge in practice. In cooperation with NGOs, they use data science to tackle real world problems.
- > **The UN faces the big issues:** The program *Global Pulse* ^{#12} has the modest objective to solve mankind's most pressing challenges – ranging from world hunger to global warming – with artificial intelligence. In projects throughout the world, the UN evaluates data sets such as Twitter posts to find out in real time where social conflicts are about to arise, ^{#13} where natural disasters are happening or how diseases are spreading. These analyses are meant to help developing countries and NGOs to provide humanitarian aid where it is most needed. ^{#14}

>>We see data as a natural resource. It is available almost everywhere and always renewable.<< – Robert Kirkpatrick, head of the UN-initiative Global Pulse

All of this sounds very promising, but how does it work in practice? How can we stop hunger ^{#15} and global warming using data science?

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Artificial intelligence for sustainable agriculture

Passionate environmental activist Tom shows us how the dream of a data driven activism can come true. In charity projects around the world he fights for sustainable agriculture. ^{#16} Even though he is utterly committed, he sometimes feels that his team doesn't have a clue where it should start to tackle the numerous sub-problems they have. Often, he and his colleagues can't assess the consequences of their actions beforehand. Luckily, on a »Data Dive« he meets Andrea, a data scientist in a tech business in Silicon Valley. Together, they combine Tom's questions and Andrea's expertise with »intelligent« data analysis to find possible solutions.

1. Stop deforestation

Tom: *»In Indonesia many palm-oil plantations are created by means of slash-and-burn farming.«^{*6}*

Collect data: Andrea und Tom collect satellite data from the last decades. Using this data, they find out in which areas palm-oil plantations were created in the last years.

Detect patterns: Andrea combines the data about palm-oil plantations with information by the Indonesian government that depict which forest areas are protected. She designs a program that learns how the surroundings change before an illegal plantation is build, for example new roads might emerge through the jungle.

Make predictions: Now the program can predict where plantations are likely to be built in the future. On this basis, Tom's organization can give precise advice to the Indonesian government: Which laws have to be adapted to prevent illegal deforestation and to protect the climate?

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Who makes it possible? The platform *Global Forest Watch* ^{#17} provides the necessary data for such an analysis. On interactive maps anyone can track worldwide deforestation over the course of the last 16 years and examine the locations of palm-oil plantations and mines. The initiative evaluates data about illegal deforestation and puts pressure on governments to publish relevant information.

2. Less pesticides

Tom: »Many farmers use pesticides excessively without considering the consequences.^{#18} They often don't think about where pesticides are actually needed.«^{#19}

Collect data: Tom collects data from farmers throughout the world about the composition of their fields, soil conditions and crop diseases.

Detect patterns: Next, Andrea implements a program that detects patterns in these data. Which diseases are likely to develop under which conditions?

Make predictions: By means of this program, Andrea designs a tailored plan for every single farmer containing suggestions about how much of which pesticides and fertilizers he should use to optimize his harvest. With this tool, Andrea and Tom can achieve 2 effects: First, the farmers will harm the environment less, through reduced use of excessive or improper chemicals. Second, they will lose less of their harvest through diseases and weeds.^{#20}

Who makes it possible? The founders of the Swiss company *Gamaya* ^{#21} build their business on precisely this idea. They deploy drones that fly over the fields of their customers and take photos. *Gamaya* uses this data to create individual plans for the optimal use of chemicals on-site.

3. Reduce food waste

Tom: »One third ^{#22} of our food is wasted. Can artificial intelligence help us to reduce that amount?«

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Collect data: Tom convinces one branch of a supermarket to participate in an experiment. He promises to reduce the amount of food wasted daily. In return, he obtains the supermarket's sales statistics of the last 3 years.

Detect patterns: Using that data, Andrea designs a program that learns which products are bought every day. She doesn't only input information about past sales, but also about other factors such as weather, season and offers from competitors into the program.

Make predictions: The program generates weekly predictions on the consumption of every single product the supermarket has on offer. The store manager starts to adjust his purchases to these forecasts. Soon, he recognizes the advantage of this procedure and other branches start adopting the same strategy to plan more efficiently. The program continues to learn and keeps improving its predictions. Thus over time, less and less products are wasted.

Who makes it possible? The start-up *FoodTracks* ^{#23} in Münster fights the waste of food in bakeries. Using artificial intelligence, the team of data scientists optimize the purchases of bread and cakes, resulting in less leftovers at the end of the day.

From field to store shelf – data can help in all stages to optimize processes and make them more sustainable. ^{#7} That does not only hold for agriculture and food industry, but also for the fight against poverty or humanitarian aid after natural disasters – in short: in all sectors where humans have to base decisions on a complex state of affairs. However, to make this work on a large scale, the users – which means *us* – have to learn to trust in statistics and data analyses more than in our habits and intuitions. ^{#24}

Does that imply that machines should make decisions for us? By no means! The potential lies in combining human ideas and values on one side, and the precision of data on the other. Artificial intelligence cannot take over responsibility, ^{#25} but it can put us in a position to make sound and better decisions.

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Zusätzliche Informationen

- *1 »Data drives all we do« – that's the slogan of the consultancy [Cambridge Analytica](#). The company offers advice for election campaigns and targeted marketing. Therefore, they evaluate Big Data. The influence of their analyses on the results of the US-election 2016 was a [highly controversial issue \(German\)](#).
- *2 [Facebook's advertisement customers can detect](#), if a user read an ad on his smartphone and subsequently bought the promoted product from another device.
- *3 Big Data refers to data sets that are too large (data volume), too complex (bandwidth) or too dynamic (data generation rate) to be handled by conventional databases or statistics programs. For instance, Big Data is collected during surveillance recordings or in social media. New analysis methods relying on cutting-edge computer technology are required to harness these huge data sets.
- *4 In tech jargon, the program is »trained« on the data and »learns« patterns in it.

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- *5 Larry Page and Sergey Brin developed the search engine Google at Stanford University in 1997. The successful business model rests on a simple user interface and advertisement. The official beta phase lasted until 1999 and in 2000, Google became market leader in the field of online search engines. Since then, the company has expanded beyond the original idea, developing other types of software (such as gmail) and hardware (such as Google Phones).

Since 2015, when the business was reorganized, the superordinate holding company is called Alphabet Inc. However, the online services still operate under the name Google.


- *6 Analyses of the initiative [Global Forest Watch](#) reveal that in the years 2000–2015 1,6 million hectares of forest gave way to palm-oil plantations, 45% of which are located in protected areas. This endangers the local ecosystem and releases large amounts of CO₂. How can we prevent that?«
- *7 The [ITU magazine by the UN](#) gives a good overview on different possibilities how artificial intelligence can help to build a more sustainable world.


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Quellen und weiterführende Links


- #1 Here you can find our introductory text on artificial intelligence by the physicist and neuroscientist David Hofmann (German)
 <https://perspective-daily.de/article/441>


- #2 Do we want that robots take care of us in the future, wonders Dirk Walbrühl here (German)
 <https://perspective-daily.de/article/405>

- #3 Here, Dirk Walbrühl describes how filter bubbles work online (German)
 <https://perspective-daily.de/article/140>

- #4 Effective Altruism poses the question: What is the most efficient way to help? (German)
 <https://perspective-daily.de/article/104>

- #5 Tijmen Schep, technology critic and »privacy-designer« talks about the power of data (2016)
 <https://www.youtube.com/watch?v=XNF-rGiGb50>


- #6 The newspaper Handelsblatt reports on the »Scary Power« of data (German, 2017)
 <http://www.handelsblatt.com/my/unternehmen/it-medien/wie-facebook-und-co-milliarden-mit-unseren-daten-verdienen-die-unheimliche-macht-/20503170.html>

- #7 Here you can find long-term data about the climate development (German)
 <https://perspective-daily.de/article/391>

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- #8** DataKind's official website
 - <http://www.datakind.org/>


- #9** Maren Urner writes about how we can get rid of old habits (German)
 <https://perspective-daily.de/article/6/>


- #10** Interview with Daniel Kirsch from Berlin (German)
 - <http://www.trendradar.org/de/analyse/how-to-turn-activists-into-data-analysts-and-vice-versa/>


- #11** The platform AI for Good from Amsterdam connects computer science
 - students and NGOs<http://www.aiforgood.nl/>

- #12** The UN-program Global Pulse uses data to tackle humanitarian issues
 - <https://www.unglobalpulse.org/projects>

- #13** Peter Dörrie writes about the possibilities to forecast social conflicts
 (German)
<https://perspective-daily.de/article/131>

- #14** Here, guest author Franziska Grillmeier writes about digital humanitarian aid (German)
 <https://perspective-daily.de/article/181>

- #15** Why we aren't helpless in the face of world hunger – explained by Peter
 Dörrie (German)
<https://perspective-daily.de/article/212>

- #16** Felix Austen outlines models of sustainable agriculture (German)
 <https://perspective-daily.de/article/168>

- #17** The platform Global Forest Watch was created by the World Resource
 - Institute<http://www.globalforestwatch.org/>

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#18 Felix Austen on the impact of pesticides on insect populations (German)

 <https://perspective-daily.de/article/392>

#19 How the use of pesticides can be improved with artificial intelligence

- <https://itu4u.wordpress.com/2017/05/23/ai-for-good-how-advanced-crop-intelligence-can-help-solve-food-production-challenges/>

#20 Study about the connection between the use of pesticides and harvest yields in conventional farms (2017)



<https://www.nature.com/articles/nplants20178>

#21 Gamaya uses data analysis to optimize the use of pesticides and fertilizers

- <https://gamaya.com/>

#22 You throw away 2 kilograms of food every day – explained by Peter Dörrie and David Ehl (German)



<https://perspective-daily.de/article/223>

#23 The start-up FoodTracks optimizes purchases for bakeries

- <https://www.foodtracks.de>

#24 Why do you think you are right – ask Maren Urner and Han Langeslag here (German)



<https://perspective-daily.de/article/215>

#25 Maren Urner and Han Langeslag discuss, how free our will really is



(German)

<https://perspective-daily.de/article/268>

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