AI Technologies for the insurance sector

Trends, problems and solutions

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Quiz time!

How do people answer to the question:

Should judges be replaced by AI?

- **NO!** We need human empathy, emotions, understanding
- **YES!** We should get rid of human bias, subjectivity
- It depends / I don't know / no response

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Roughly equally distributed…

(Helberger et al.)

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Should medical professionals be replaced by AI?

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- It would work for others, but not for me, because I am unique

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(Longoni et al.)

Quiz time! (3)

And the most important of all:

Is AI any good at recommending jokes?

- **YES**, people like jokes recommended by AI better than those recommended by humans
- **NO**, people like jokes recommended by humans better than those recommended by AI
- **It depends:**
  - When people know the joke is recommended by AI, they don't like it.
  - When they do not know this, they like AI-recommended jokes better

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(Agrawal et al.)

What does this Quiz tell us?

We are a bit confused about AI

This should come as no surprise…

AI is a so-called **key technology** (sleutel-technologie) and we simply cannot oversee its consequences.

But let's try anyway, and see **what AI can and cannot do for the insurance sector**.

Evolution of AI – Insurance

Like in many other fields, AI (machine learning) often and increasingly used for **analysis and making predictions**:

- Chance that this claim is fraudulent
- Chance of a pandemic or once-in-a-lifetime storm next year
- Chance that this person will have a car-accident next year…
- …if yes, what is the 95% confidence interval of expected damage

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- …if yes, what is the 95% confidence interval of expected damage

And, since more recently, increasingly being used for automating **decision support and decision making:**

- Automated flagging and prosecution of fraudulent claims
- Automated pricing suggestions for insurance applications
- Automated accepting / rejecting applications, claims

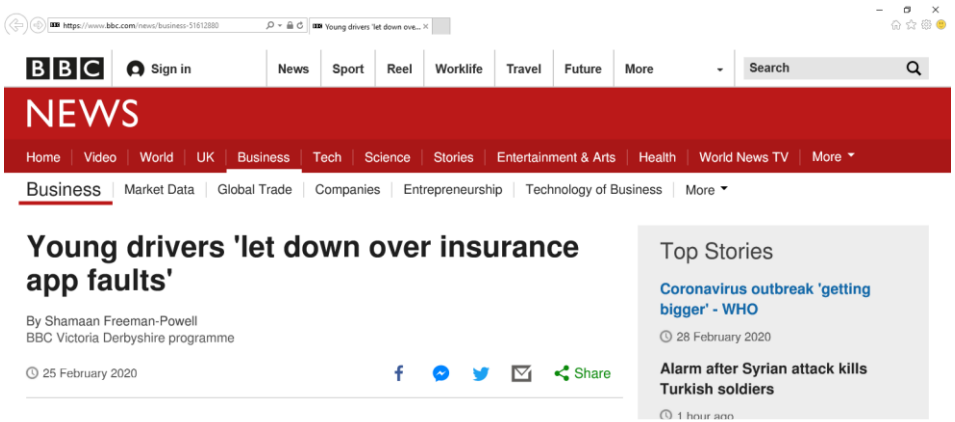
The result? Justified concerns…

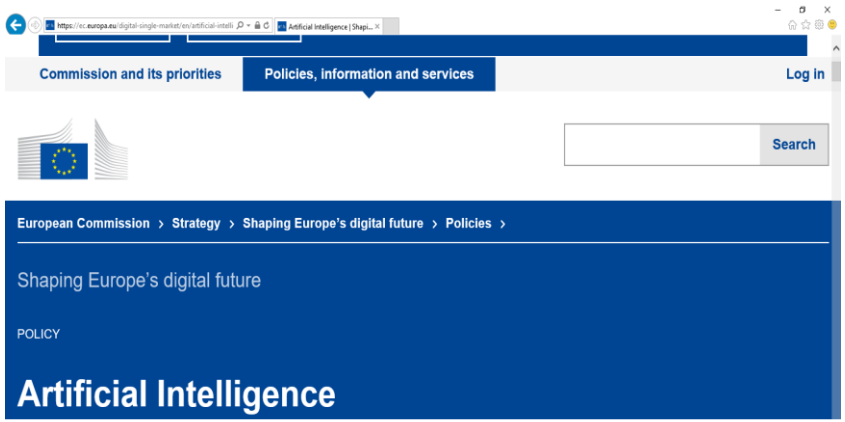
DNB/AfM 2019: *Ethiek, Consumentenvertrouwen, Reputatierisico* seen as most important AI-challenges according to insurers.

Why is that?

Very hard to understand **why** the AI made its predictions, decisions

So, we don't know if its reasons, motivations **align** with our values





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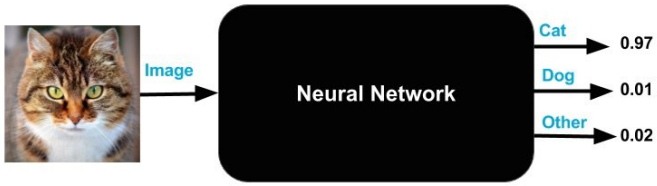
The AI is based on machine learning-techniques: **'black box'**

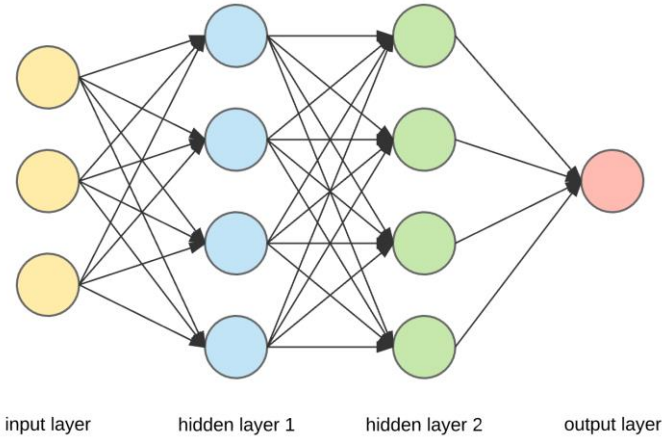
The data on which the AI is trained, may contain **'implicit bias'**

Fear of loosing **"Meaningful Human Control"**

Problem: Black Box



Machine learning, e.g. Artificial Neural Networks (ANNs), uses an **extremely flexible but in-transparent** web of connections.



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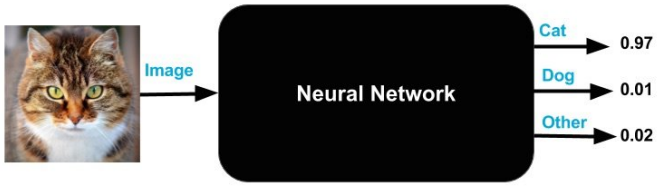

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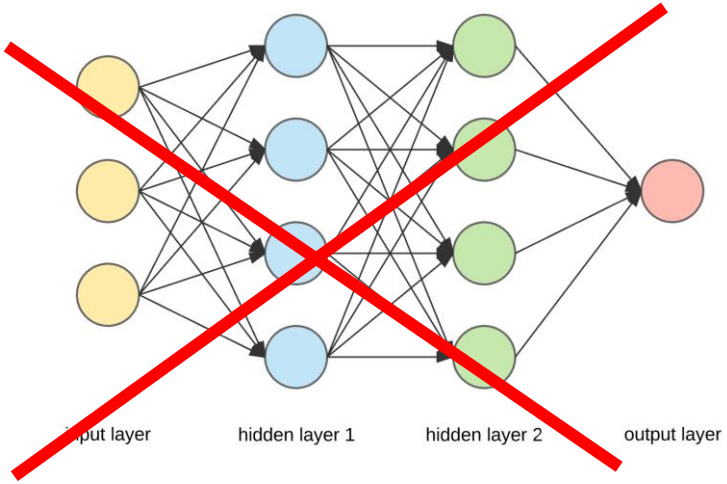

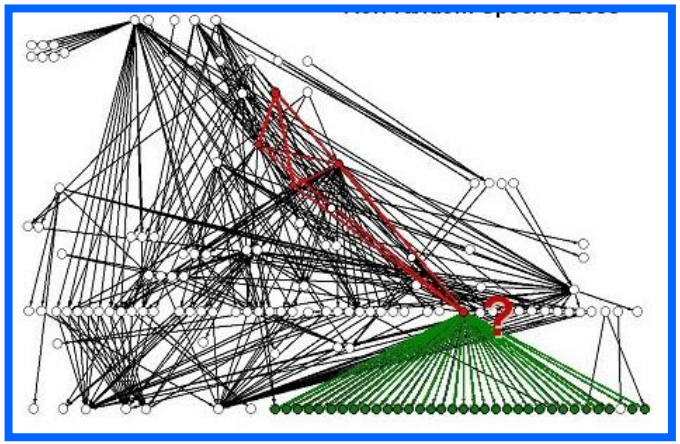

This is **not** an accidental feature!
Lies at the heart of ANN's success

Problem: Implicit Bias

Machine learning needs massive amounts of data for training.
Data often involves **past choices made by humans**.
If those contain traces of 'bias': they will end up in the machine.
And worse: they are very hard to spot early, given the black box…

Funny: **Q:** what makes this a husky, and not some other dog?

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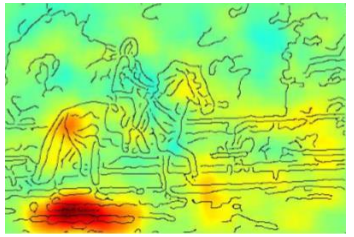
Funny: **Q:** what makes this a husky, and not some other dog?

Not so funny: **Q:** what makes that this CV is not invited for interview?
Q: what makes that this inmate will not be given parole?
Q: what makes that this person pays more for her insurance?
A: 'algorithmic discrimination' *(misnomer!)*

(some) Hope: 'greying the black box'

There has been good progress in increasing the interpretability of artificial neural networks

- **'Heat-mapping'**:
  What data-point made the ANN generate a particular prediction?



- **Prototyping:**
  Ask ANN to draw a prototypical example of a prediction.

But there is a **fundamental limit** to this!
Will never reach full interpretability…

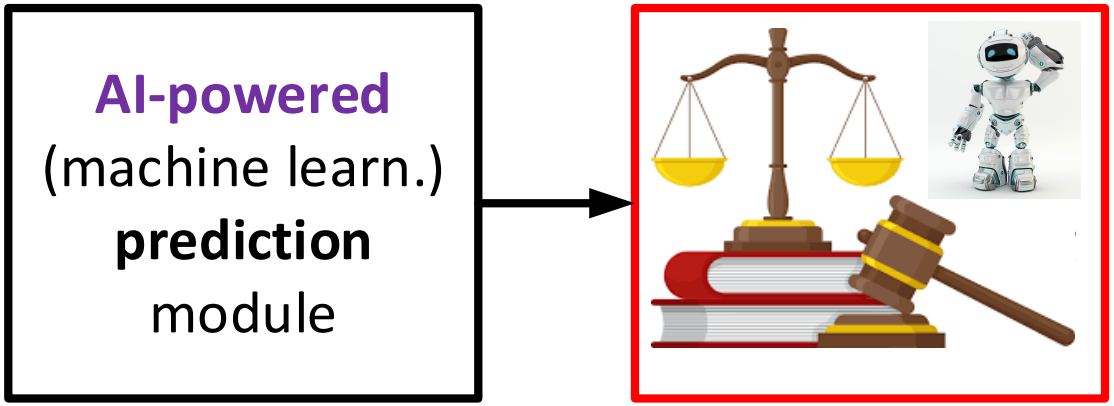
The wave of the future: decouple analysis from decisions

Machine Learning confined to **analysis**, making predictions:

- When perfect interpretability is not demanded
- Use interpretability-enhancing tools where needed

Other methods are used to automate **decision**-making

- Interpretability, accountability are key requirements
- **But HOW?**



How to automate human decision making and domain expertise?

Rule-based systems? IF–THEN

- Perfectly interpretable, **but:**
- *Rigid*
- *Too generic*
- *Very hard to elicit*

Discrete choice analysis

DATA: Choice Experiments

- Carefully crafted and statistically efficient choice tasks

MODEL: Choice Models

- Use observed choices to estimate weights, trade-offs

Example: setting price (*Premie*) for a car insurance application

	A	B	C
Chance of **Accident**	3.5%	1%	0.5%
Confidence interval **Damages**	10K – 35K	20K – 25K	50K – 60K
Chance of **Fraud**	5%	7.5%	10%
Premium	250	200	300
YOUR CHOICE (acc. / rej.)	□	•	•
YOUR CHOICE (best deal)	□	•	□

Stated choice experiment

Based on careful statistical design (← example task)

Allowing for small samples.

Result: mathematical model of the weights, trade-offs of experts

$$U = -.0167 \cdot Acc - .0232 \cdot Damage - .178 \cdot Fraud + .0652 \cdot Premium$$

e.g. a 1% increase in Acc is compensated by a 13.4 euro increase in $Premium$. Or, a 1% increase in $Fraud$ is compensated by… etc.

Best of both worlds

- Harnessing the power of AI
- While maintaining Meaningful human control

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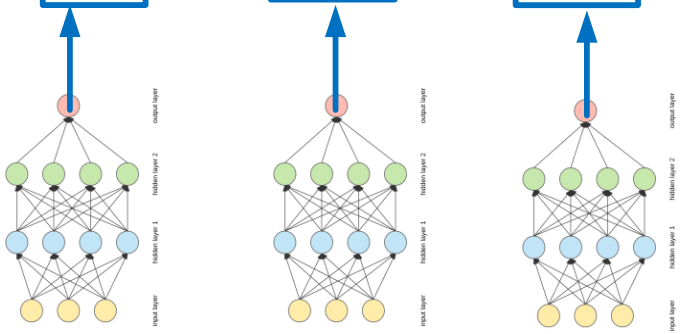

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Current status:

Development of **moral** choice models

Pilot studies for MinDef, UMCG

Discussion started with DNB, AfM

Ready for exploring value proposition for your company

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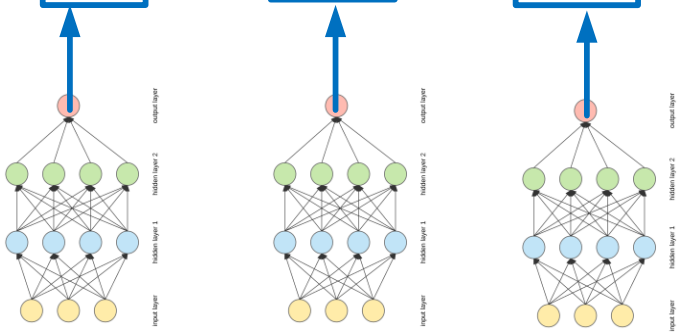

Thank you for your attention!

Questions?

Discuss with me or with
Nicolaas Heyning ,
Hubert Linssen ,
during the break or over lunch!