The Future of Healthcare: Better Health with AI

DSS Conference , Svendborg 26.4.2019

ATV

Healthcare and Artificial Intelligence

Content

1. Introducing myself
2. What is Artificial Intelligence?
3. Examples: What does AI for Healthcare?
4. Why should we care about AI for Healthcare in DK?
5. What does AI mean for you?
6. What can we do?

Uwe Hermann

Engineering is the effort to avoide efforts

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Since 9.2013 Eriksholm, Copenhagen

5.96 – 8.2013 Siemens

- 1.13- 8.13 Process Instrumentation, Karlsruhe, D
- 12.09 – 12.12 Process Instrumentation, Nordborg, DK
- 4.05 – 11.09 Siemens AG, Corporate Headquarter, "Zentral-Vorstandsreferat", München
- 12.01- 03.05 Siemens Business Services, München
- 2000- 01 Infineon AG (part of Siemens), München
- 1996- 99 Siemens AG, COM; München

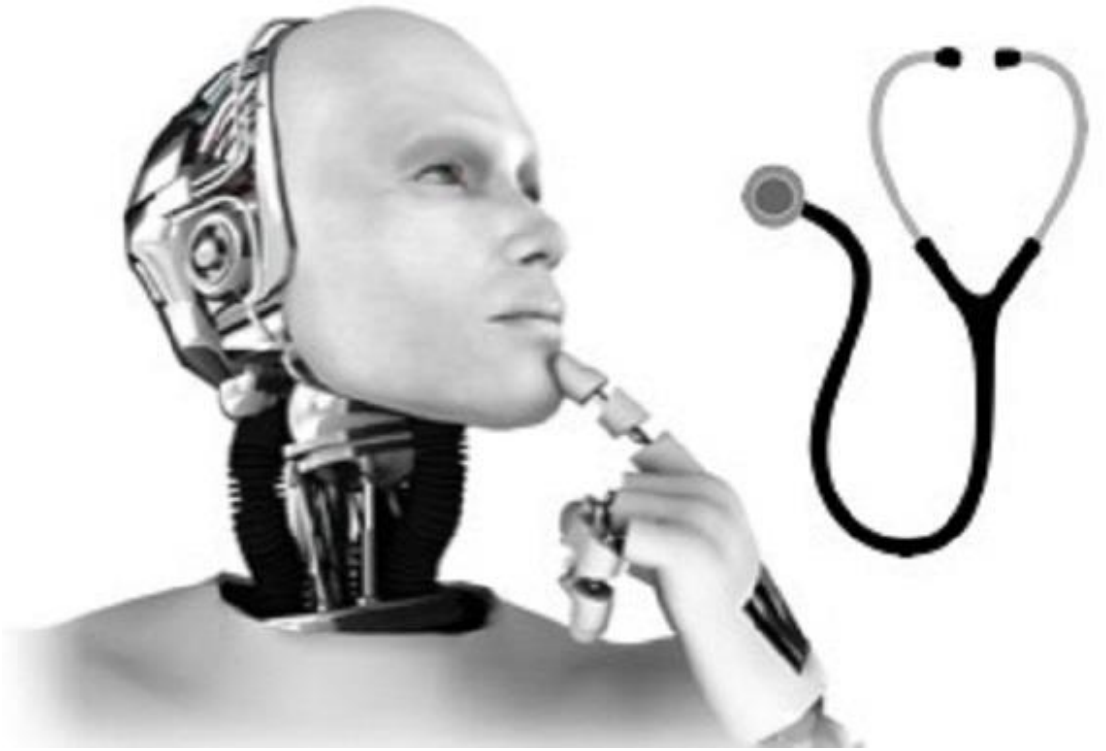
1987-96 Telecom Industries (E-Plus, Düsseldorf; Alcatel, Paris; AEG, Ulm)

1986-87 Institute for theoretical Communication Technology, Uni Hannover; Germany

1984-86 Brüel & Kjaer, Copenhagen

1978 - 84 Uni Erlangen- Nürnberg and "Danish Technical University" in Copenhagen

What is Artificial Intelligence?



Artificial Intelligence is a “Prediction Machine”…

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Lowering the cost
for prediction to Zero

And

Increasing the probability for
A correct prediction to
Almost 100%

Source: McKinsey

Artificial Intelligence is a …

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software paradigm shift

instead of writing lines of code defining behaviors

neural networks learn

behaviors by recognizing patterns in data

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supervised learning needs labeled data

The Basics of Artificial Intelligence are simple and old

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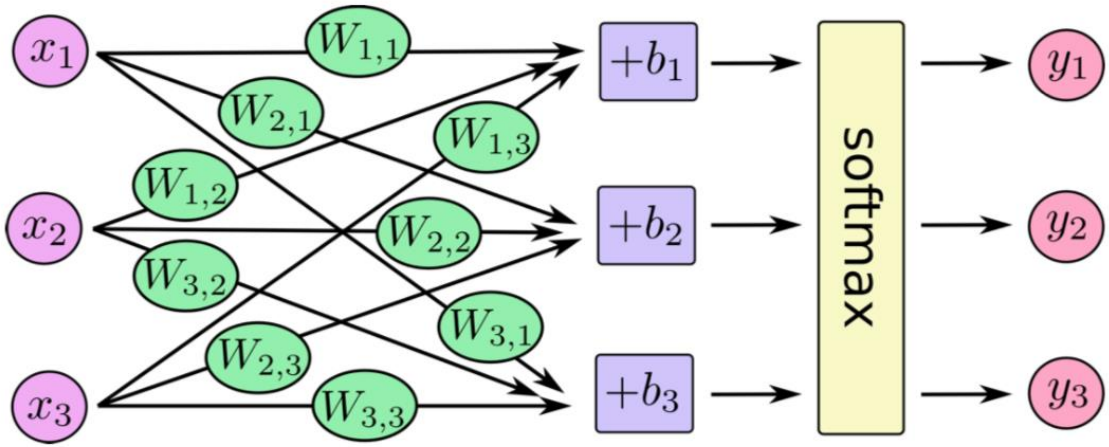

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \text{softmax}\left(\begin{bmatrix} W_{1,1} & W_{1,2} & W_{1,3} \\ W_{2,1} & W_{2,2} & W_{2,3} \\ W_{3,1} & W_{3,2} & W_{3,3} \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} \right)$$

An example for how simple Artificial Intelligence is …

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In 2015, scientists gave 16 novice testers a touch sc reen monitor showing pathology and radiology imag es of breast tissue.

After a short training period they were asked to ident ify cancerous tissues from the images.

The results were impressive.

Source: John Crawford, IBM

AI today is on the level of pigeons. It is not (yet) general Artificial Intelligence!

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Pigeons (Columba livia) as trainable observers of pathology and radiology breast cancer images

Individual performance up to 85% accuracy

Pooled performance (ensemble method) 99% accuracy

Levenson et al, published: November 18, 2015 https://doi.org/10.1371/journal.pone.0141357

Source: John Crawford, IBM

Unsupervised Learning: *"God does not need a teacher"*

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Google Deepmind: AlphaGo Zero (19/10/17)

Previous versions of AlphaGo initially trained on thousands of human amateur and professional games to learn how to play Go. AlphaGo Zero skips this step and learns to play simply by playing games against itself, starting from completely random play. In doing so, it quickly surpassed human level of play and defeated the previously published champion-defeating version of AlphaGo by 100 games to 0.
It is able to do this by using a novel form of reinforcement learning, in which AlphaGo Zero becomes its own teacher.

This technique is more powerful than previous versions of AlphaGo because it is no longer constrained by the limits of human knowledge. Instead, it is able to learn tabula rasa from the strongest player in the world: AlphaGo itself.

https://deepmind.com/blog/alphago-zero-learning-scratch/

Source: John Crawford, IBM

Artificial Intelligence can in principle …

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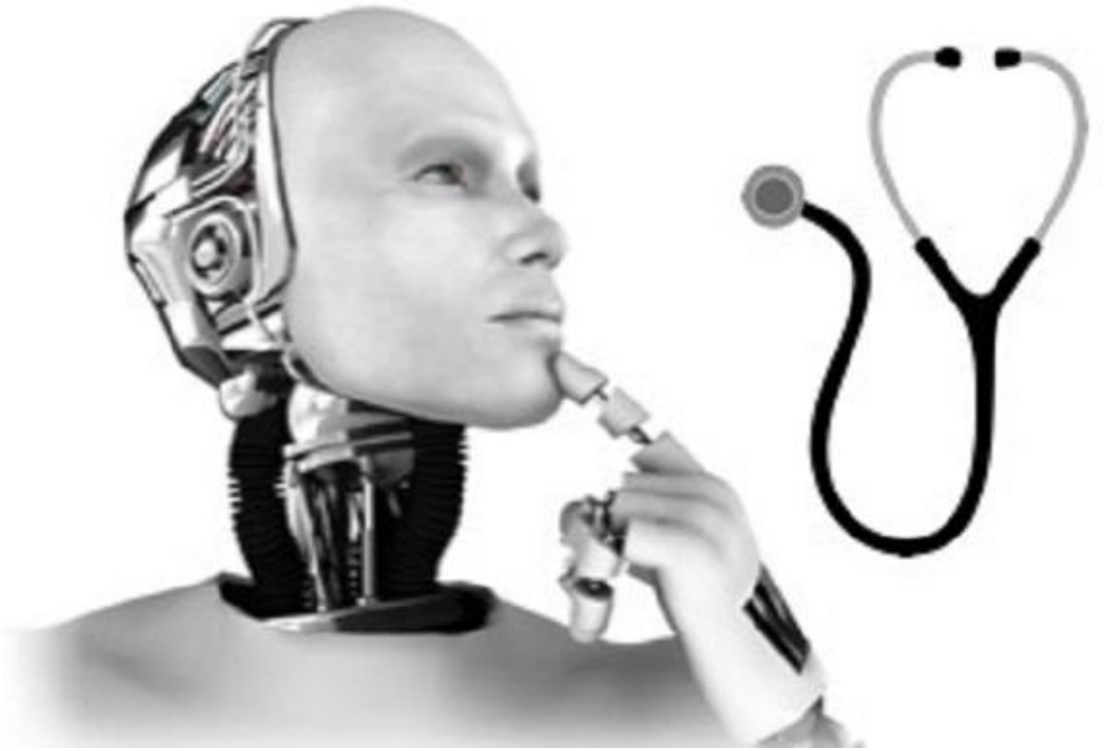
Take over all

Transaction Based

Jobs and tasks!

Examples: What does AI for Healthcare?

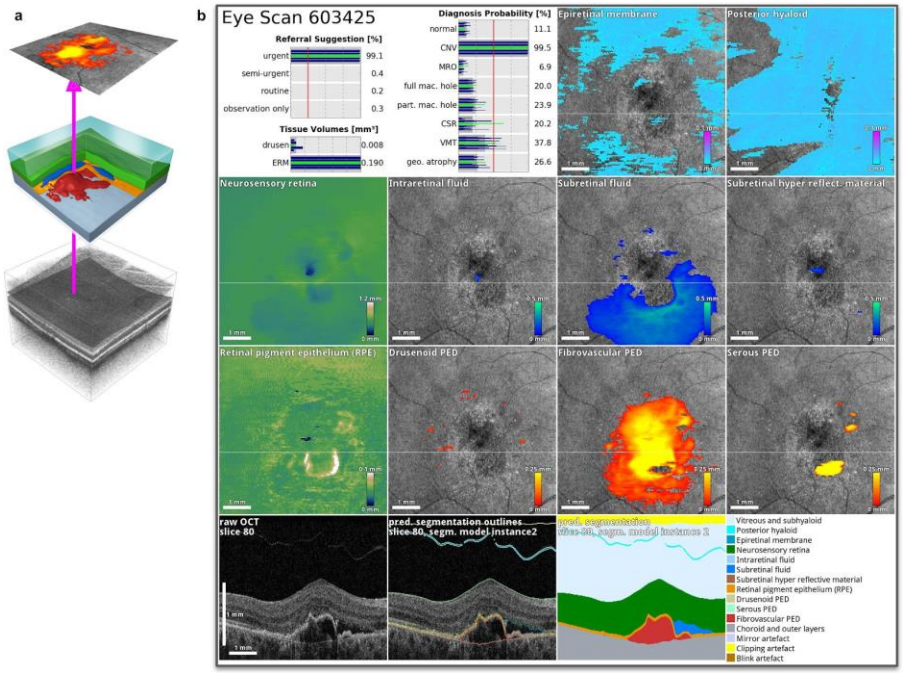


Algorithms to detect heart arrhythmias: Alivecor KardiaMobile

1-lead ECG using algorithms on smartphone to detect Atrial Fibrillation in 30 seconds and capture ECG trace

Source: John Crawford, IBM

Google Deepmind: Clinically applicable deep learning for diagnosis and referral in retinal disease (13/8/18)



Here, we apply a novel deep learning architecture to a clinically heterogeneous set of three-dimensional optical coherence tomography scans from patients referred to a major eye hospital. We demonstrate performance in making a referral recommendation that reaches or exceeds that of experts on a range of sight-threatening retinal diseases after training on only 14,884 scans.

https://deepmind.com/research/publications/clinically-applicable-diagnosis-and-referral-retinal-disease/

Source: John Crawford, IBM

Many issues are raised by AI

- Privacy – how can we protect ourselves from exploitation and prejudice
- Safety and efficacy – do we need stronger regulation of AI algorithms?
- Transparency – can we really trust AI systems to be unbiased?
- Legal – can we hold algorithms (and the companies behind them) to account?

Why should we care about AI for Healthcare in DK?

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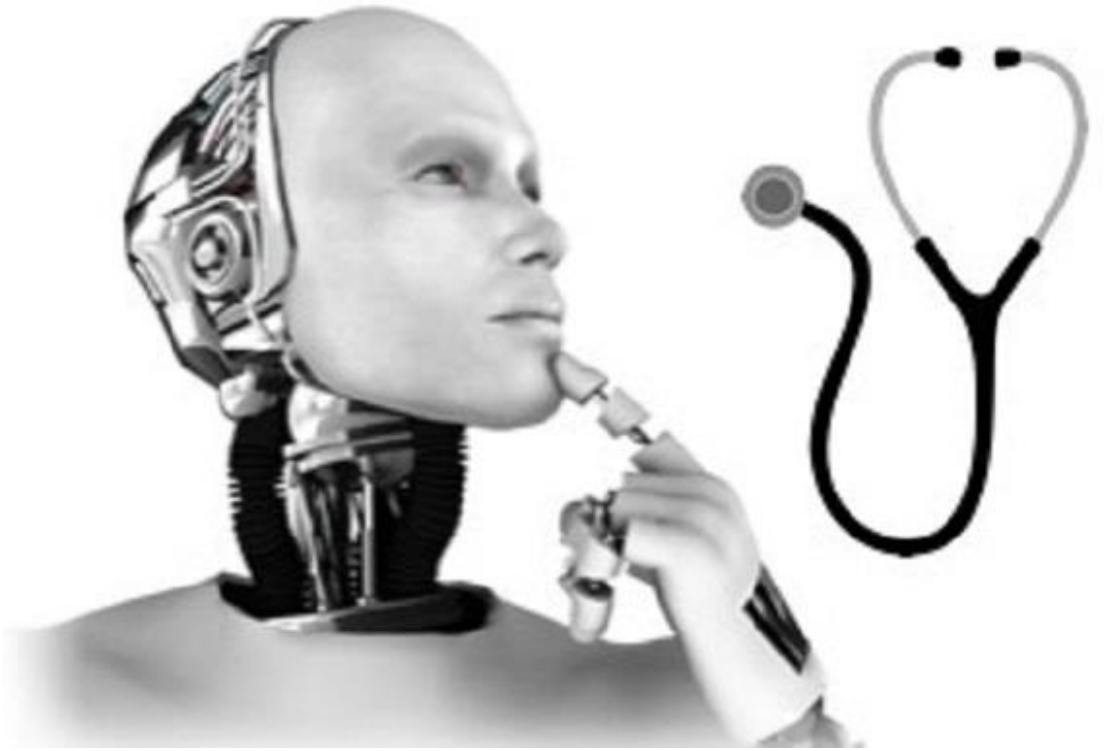

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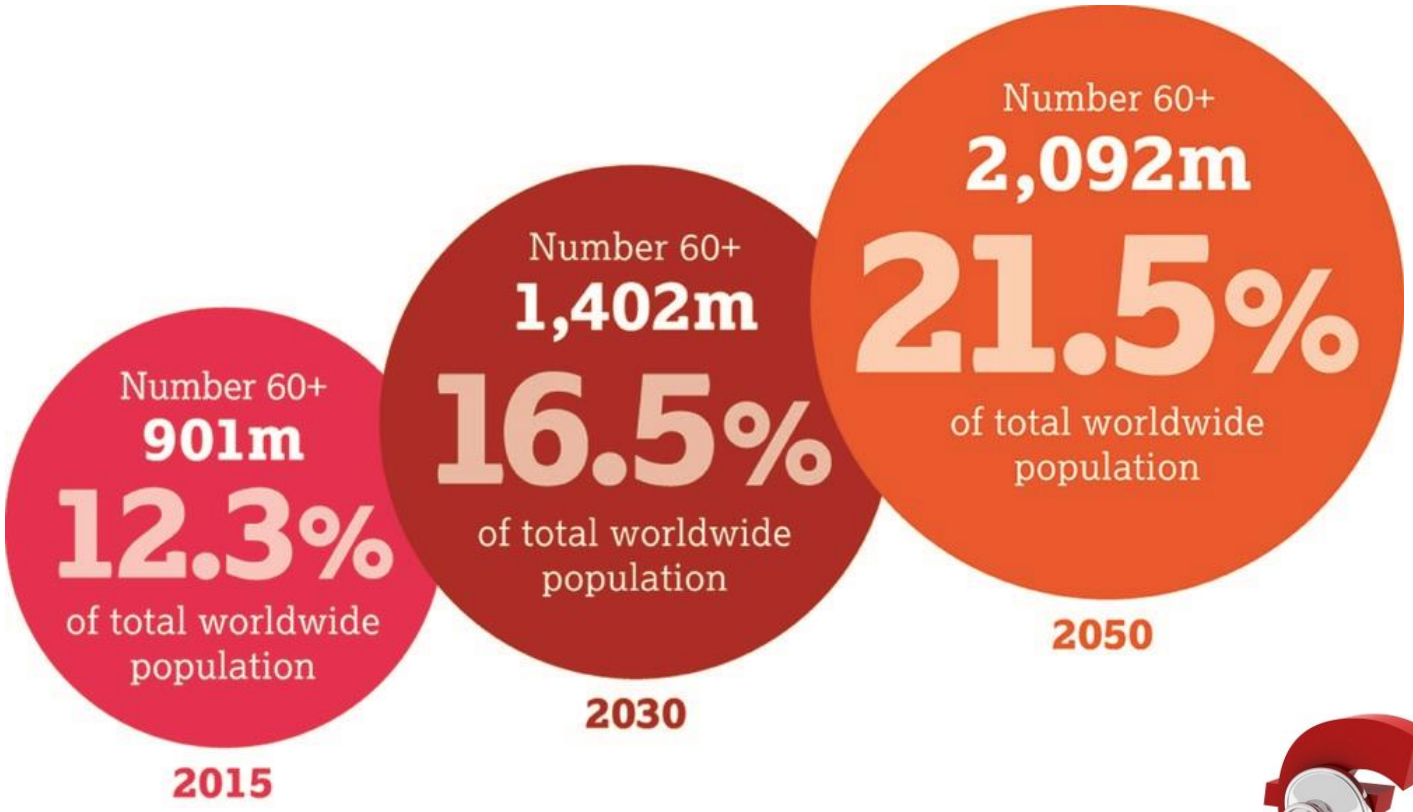

Source: Søren K. Riis, ATV

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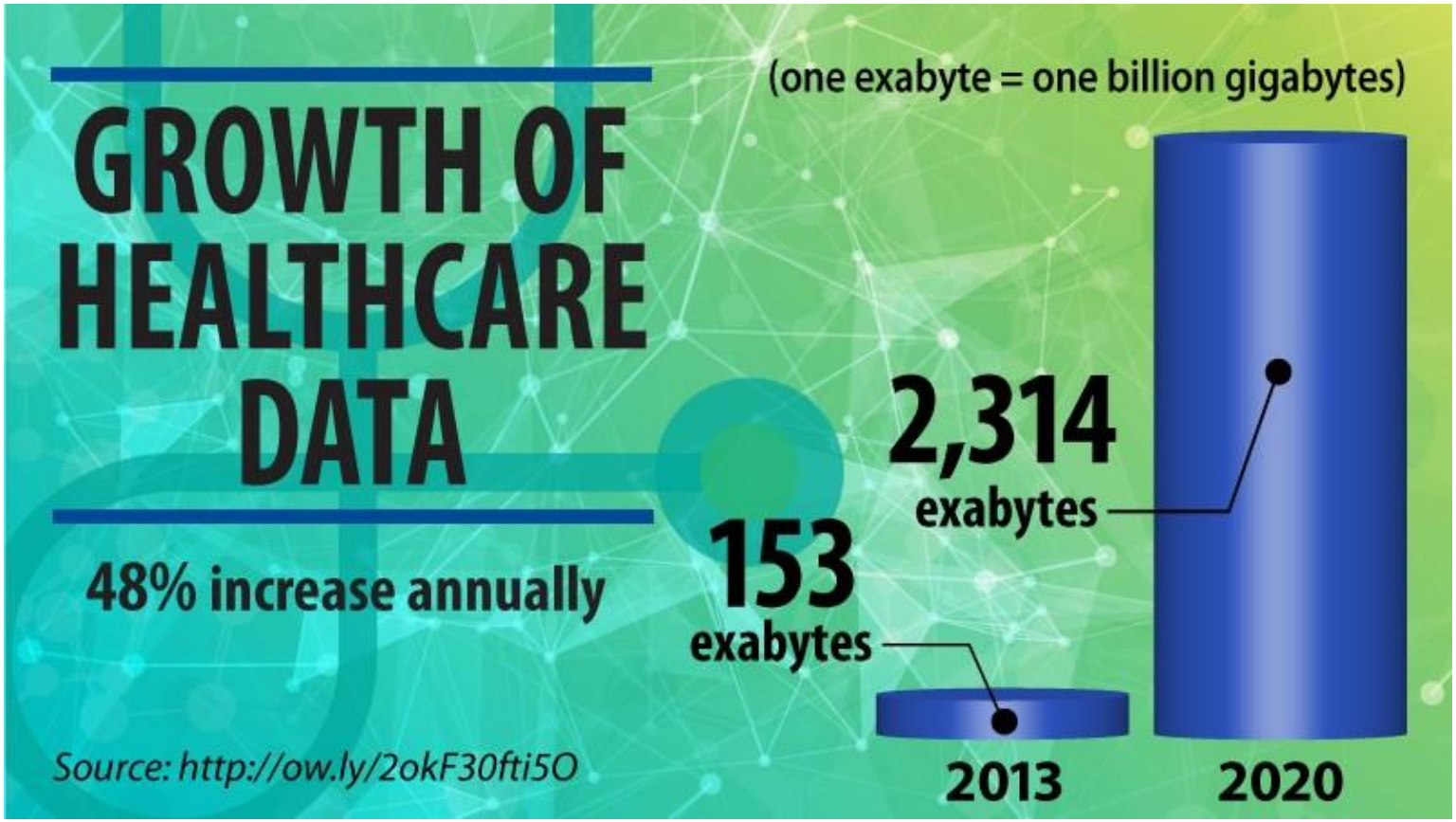

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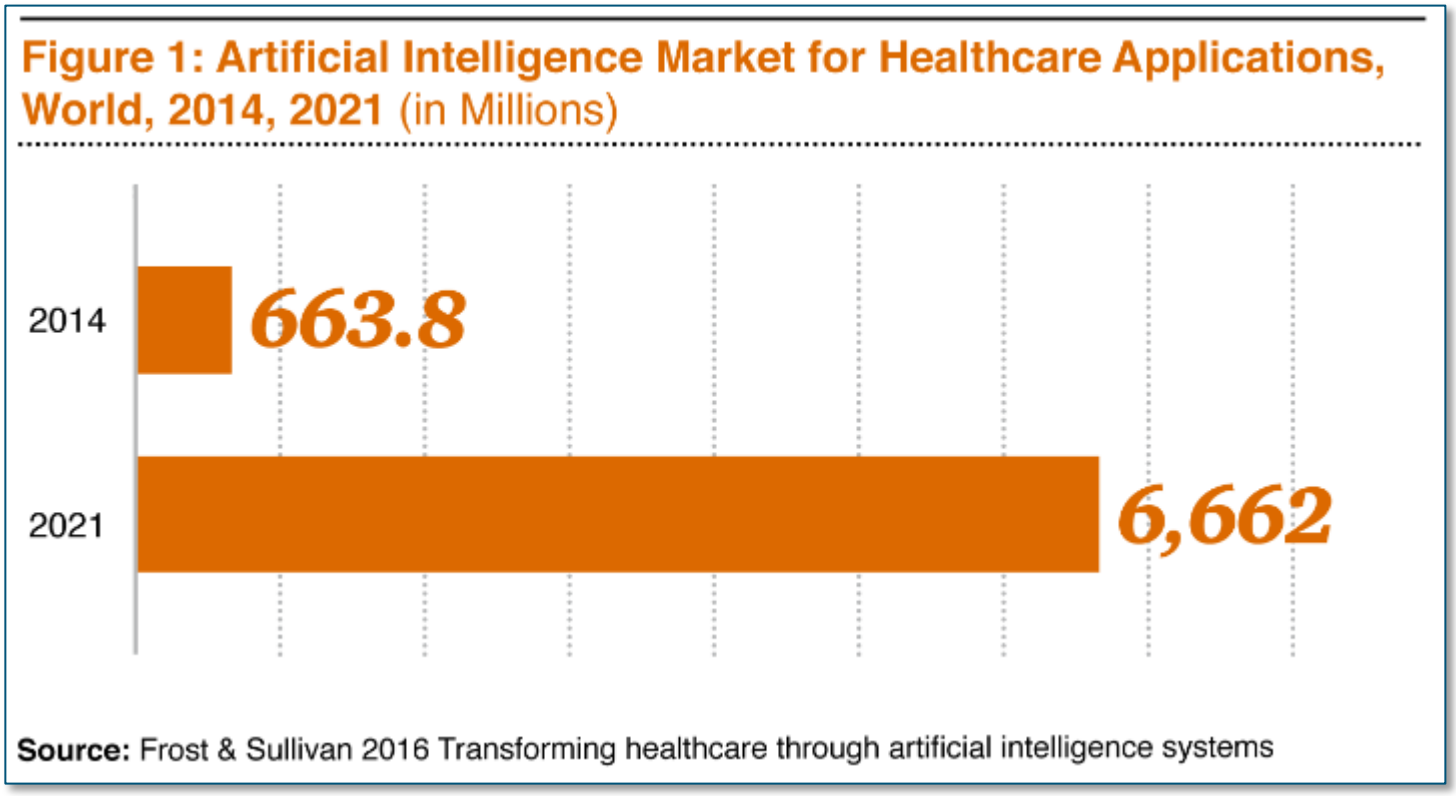

Source: Søren K. Riis, ATV

Why should we care about AI for Healthcare in DK?

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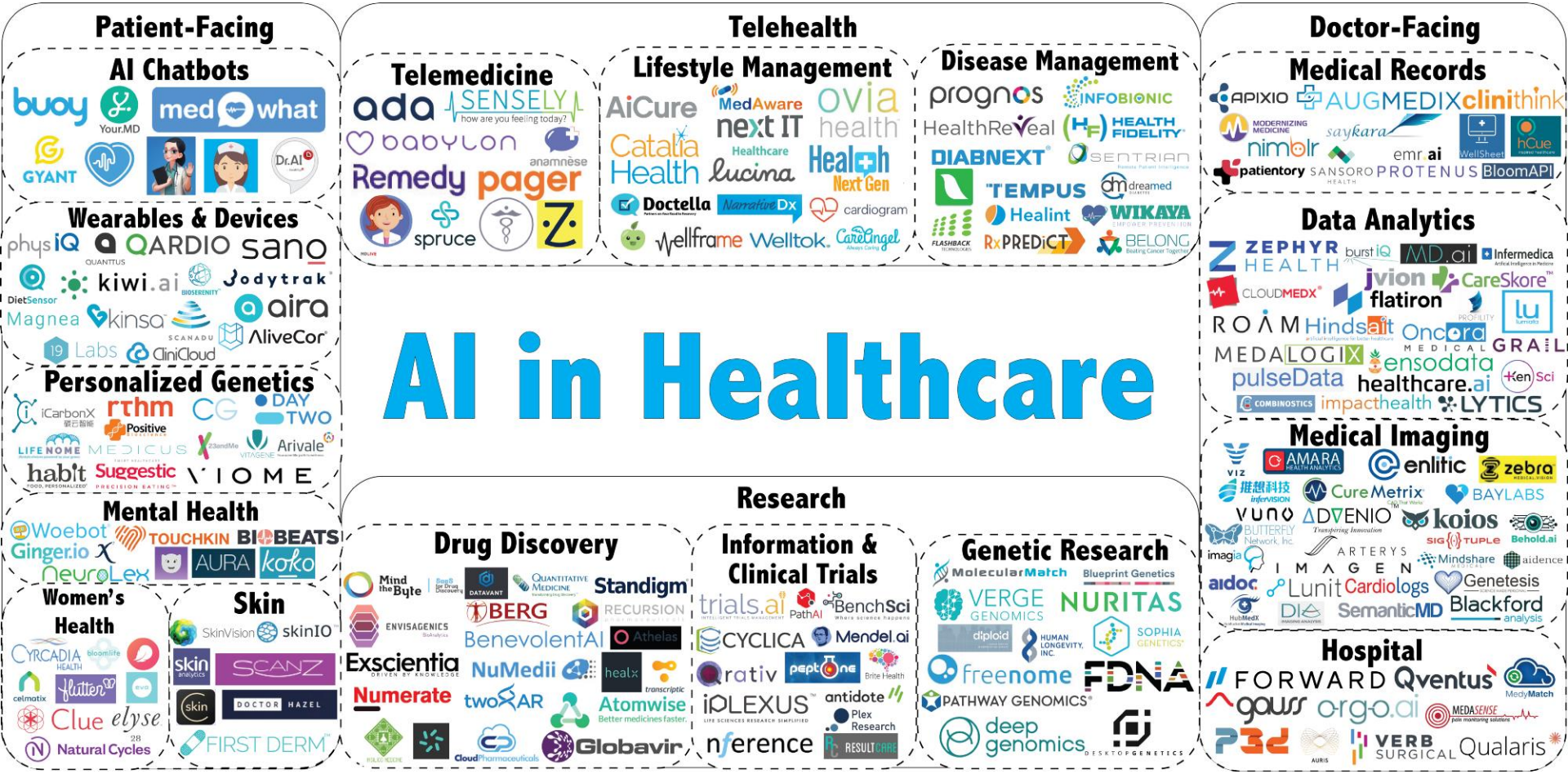
US 200 AI Health companies, mostly startups



Source: Søren K. Riis, ATV

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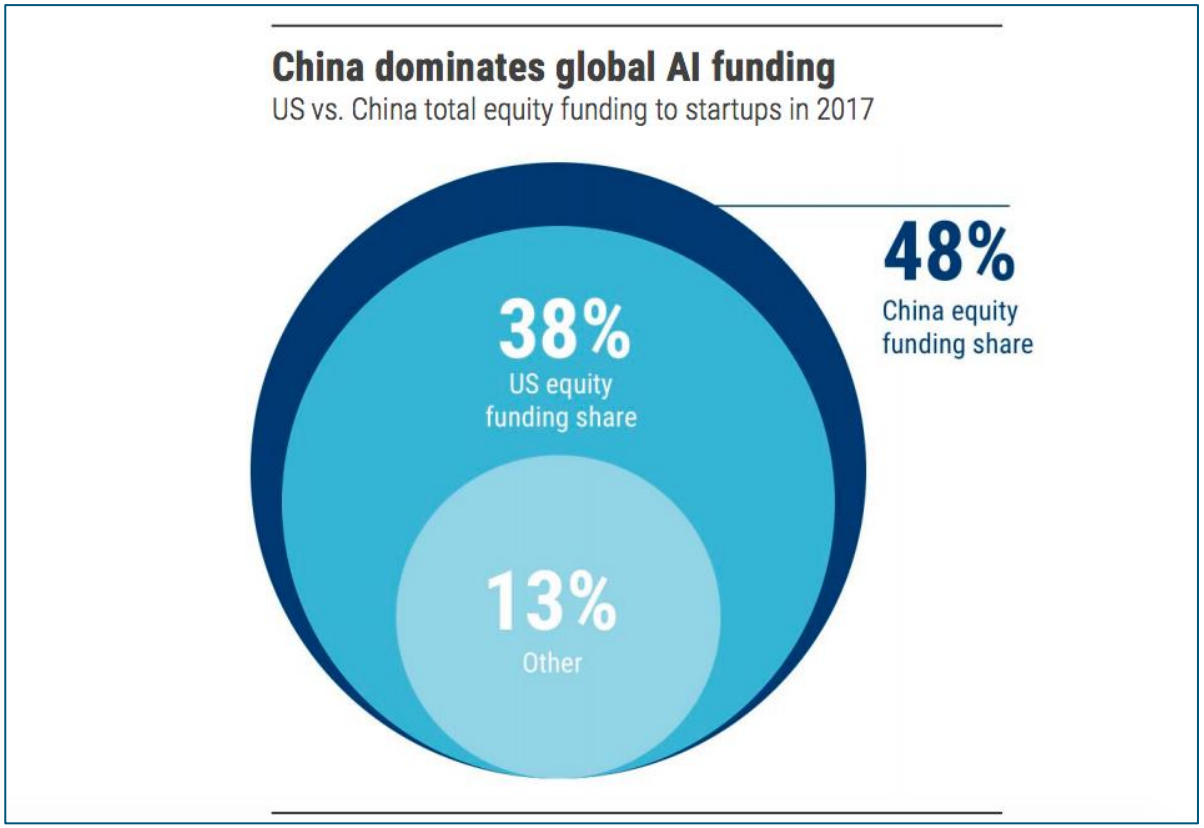

深睿医生 让看病不再困难
Easy Healthcare with Dr. Wise

iCarbonX 碳云智能

WuXiNextCODE

Source: Søren K. Riis, ATV

Why should we care about AI for Healthcare in DK?

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Healthcare costs are growing with aging population

Big data infrastructure and AI algorithms are maturing fast

China and US are moving fast - will their models apply to DK/EU ethics/”thinking”?

New business opportunities for DK companies – or face the “Kodak moment”?

Patients expect involvement, better and more individualized care

Complexity of (required) health care is increasing – multimodal data

Data driven Quality Assurance for cost control

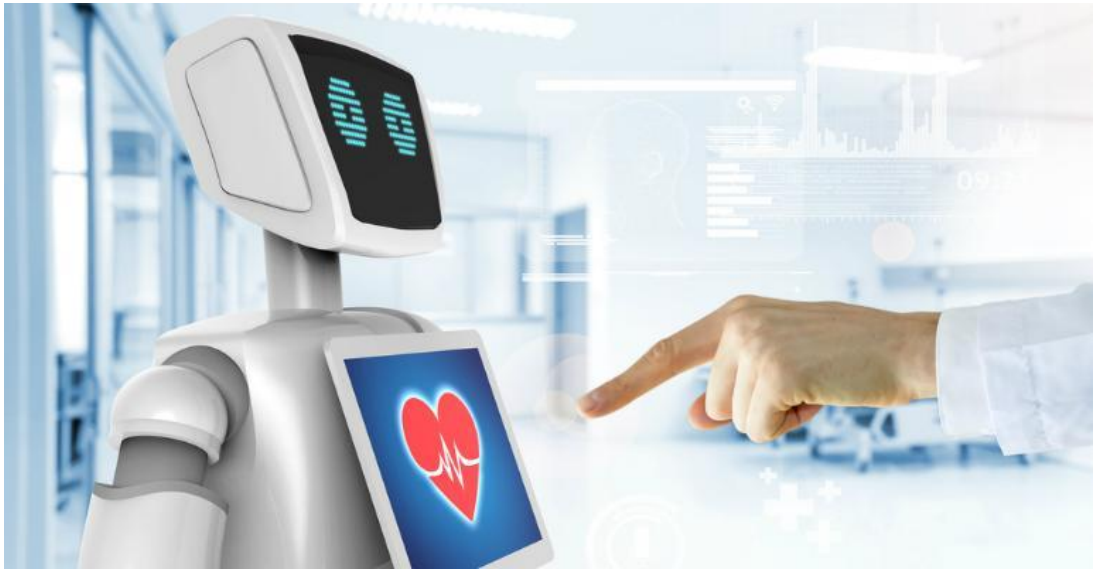
…

Source: Søren K. Riis, ATV

Why should we care about AI for Healthcare ?

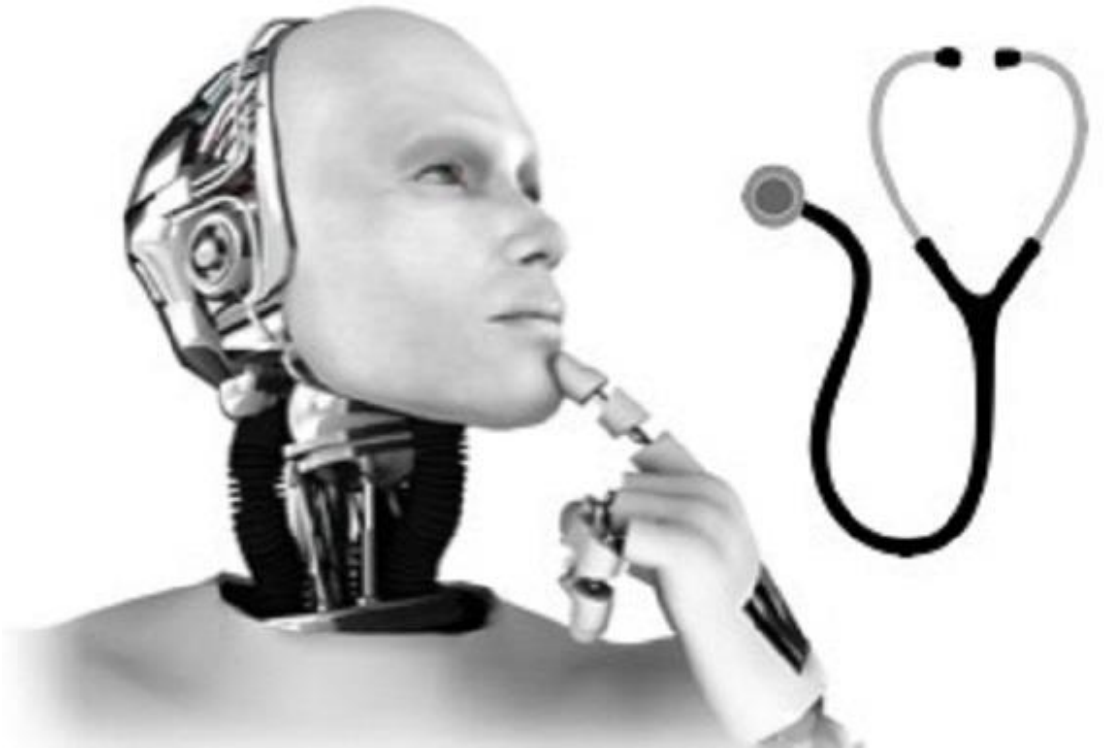
AI for Health promises and consequences

- Improve outcomes (and cost) for individual patients
- Provide new treatment opportunities and modalities
- Keep Healthcare costs under control (savings pr. patient)
- Disrupt healthcare businesses (from device to data service…)
- Disrupt roles of healthcare professionals in a changed healthcare landscape
- ...



Source: Søren K. Riis, ATV

What does AI mean for you?



Promise 1: We keep you Healthy

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“The cheapest patient is either a healthy or dead one”

Lowering the prediction cost to almost zero and the prediction quality to almost 100!

>>> give me all you Data and I tell you what it takes to keep you fit and healthy !

>>> you do not need to be sick for using AI Healthcare Services

https://www.youtube.com/watch?v=6aKNK7OTHKs

Google wants to be the world biggest healthcare provider…

Promise 2: Global Service 7* 24

ATV

www.sensely.com/#about

SENSELY

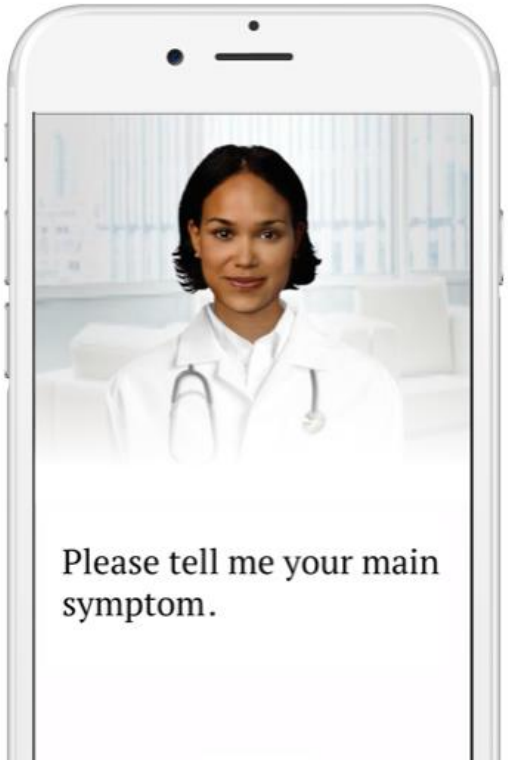
LET'S TALK MENU

Speech Recognition

Using a proprietary classification engine, Molly listens to your member and delivers an appropriate response.

Text to Speech

Molly dynamically generates speech, creating a highly personalized lifelike experience.



Images & Video

Members can send images back to Molly, allowing for intelligent routing back to the member services team.

Data Integration

Member data can be seamlessly integrated with your existing data storage system.

Promise 3: The Rules of the Global Game

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1. Disrupt or be disrupted!

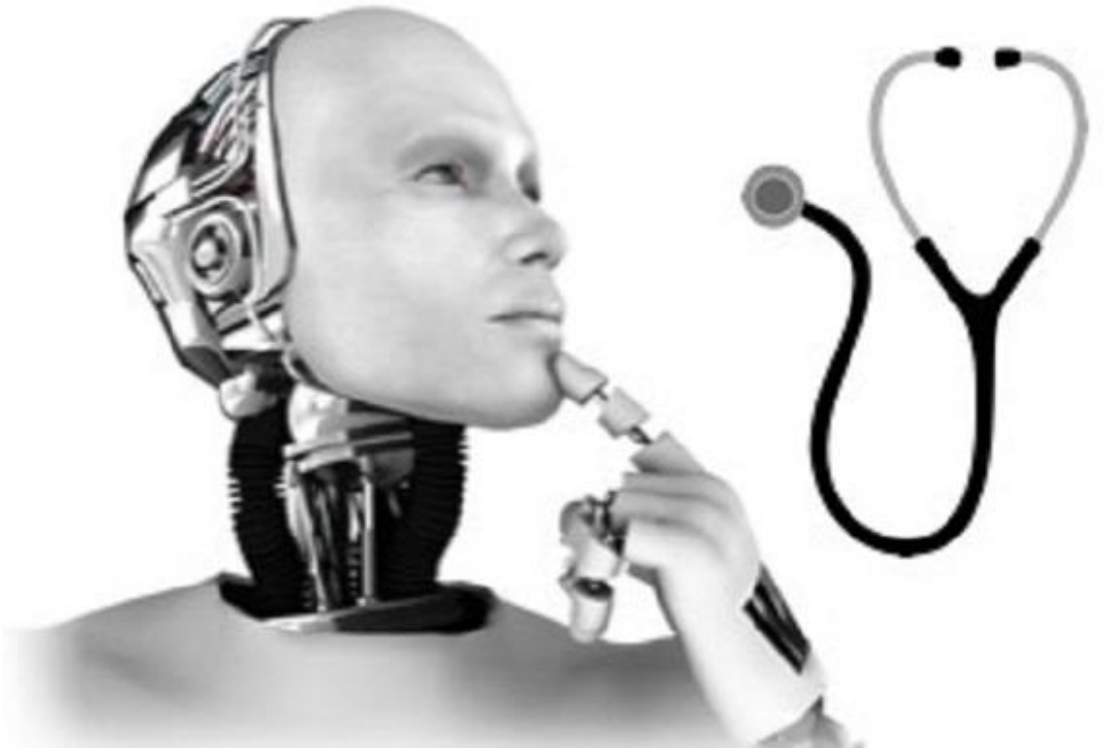
2. The winner takes it all!

3. New Game, New Luck! >>> New players coming.

4. It is global, no national niches anymore!

5. Digital Leadership required: Understand the technology and the opportunities.
    1. Brute Force AI solutions: Old skills are devaluated.
    2. If you own the data, you own the customers. If you own the customers you get all the business.
    3. Think in Platforms, not in products. >>> 0 cost for new customers.
    4. What does 0 cost and almost 100% prediction quality mean for your business?

What can we do?



What can ATV do?

Step 1: ATV Whitebook on AI for Health in DK

Purpose

- Enable more stakeholders to participate in an informed debate
- Inform and inspire on opportunities – rather than getting stuck on discussing barriers
- Facilitate matchmaking/network across industry, academia and authorities on AI Health
- Catalyze collaboration – also across corporations, SMEs and startups
- Catalyze AI for healthcare ecosystem in DK across industry, academia and authorities

Content

- AI fundamentals and healthcare application examples relevant in DK Context
- DK case studies and examples of key actors in DK
- Format: 20pp, easy to read for general audience, graphical

Source: Søren K. Riis, ATV

What can we do?

Step 2: Debate & ATV Recommendations

Education - targeted towards AI for healthcare

Attracting Talent – AI Health ecosystem attractive for international talents

Ethics – DK / EU models vs e.g. China and US

Regulatory – setups and support for data-driven solutions in healthcare

Start-ups – funding models, cross-industry collaboration and incubators

Research – Strategic focus on AI Health care research and funding models

Infrastructure – National health care data center supporting fast AI innovation

…

Source: Søren K. Riis, ATV

What can we do?

Step 3: Support implementation of recommendations

…for a strong AI for Healthcare ecosystem in DK

Concrete initiatives on training/education

Networking/matchmaking events across industry, academia and authorities

Facilitate collaboration between industrial actors (SMEs, start-ups, corporates)

Roundtables/workshops to detail implementation of specific recommendations

Facilitate AI Health Innovation Hub setup (Sound Hub Denmark)

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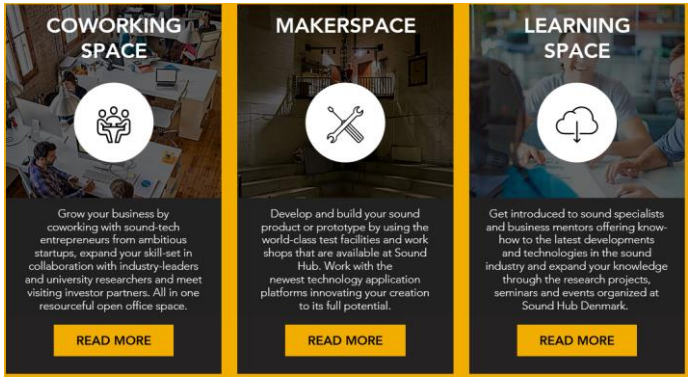
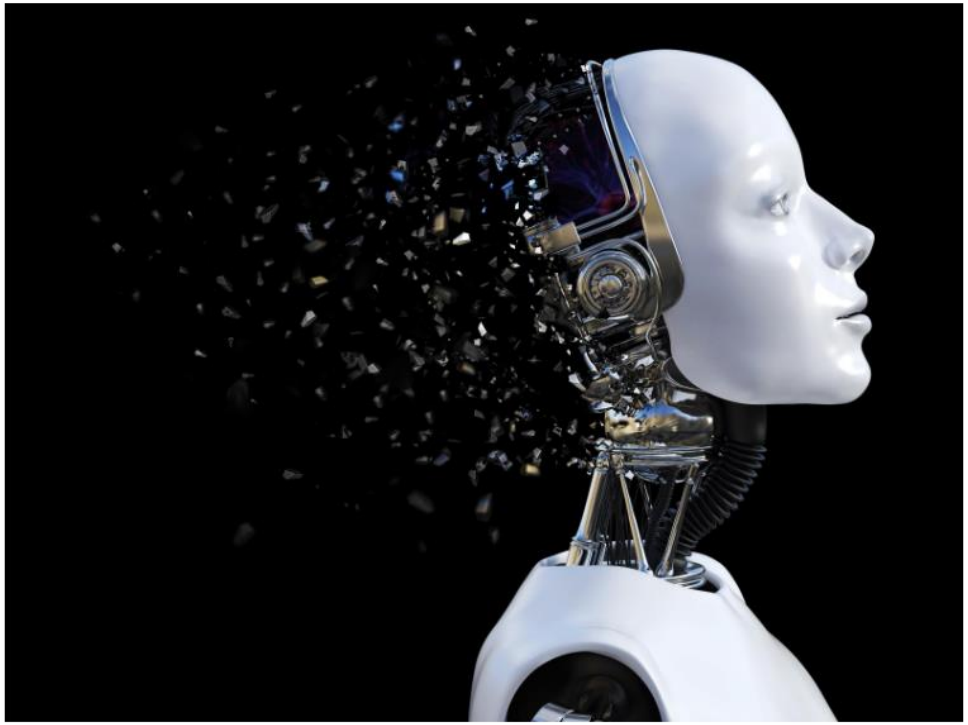


Source: Søren K. Riis, ATV

What can we do?

https://atv.dk/life-science-ai-academy-2019-the-silicon-valley-way



Life Science AI Academy 2019 - The Silicon Valley Way

Innovation Centre Denmark, Silicon Valley og Akademiet for de Tekniske Videnskaber (ATV) inviterer topledere i erhvervslivet, det offentlige og på højere læreanstalter med interesse i digital transformation til en spændende og lærerig rejse ind i det lovende AI univers for kunstig intelligens i Danmark og Silicon Valley: "Life Science AI Academy 2019".

Life Science AI Academy er et åbent og tankeprovokerende miljø, hvor deltagerne tager på en fælles udviklingsrejse om at undersøge potentielle samarbejder og vækstmuligheder.

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DOKUMENTER

HENT PROGRAMMET FOR LIFE SCIENCE AI ACADEMY

LINKS

- Klik her for at komme til ansøgningsskemaet
- Hvad siger tidligere deltagere om Applied AI Academy?
- Læs mere om Innovation Centre Denmark, Silicon Valley

Thank you for you audience

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