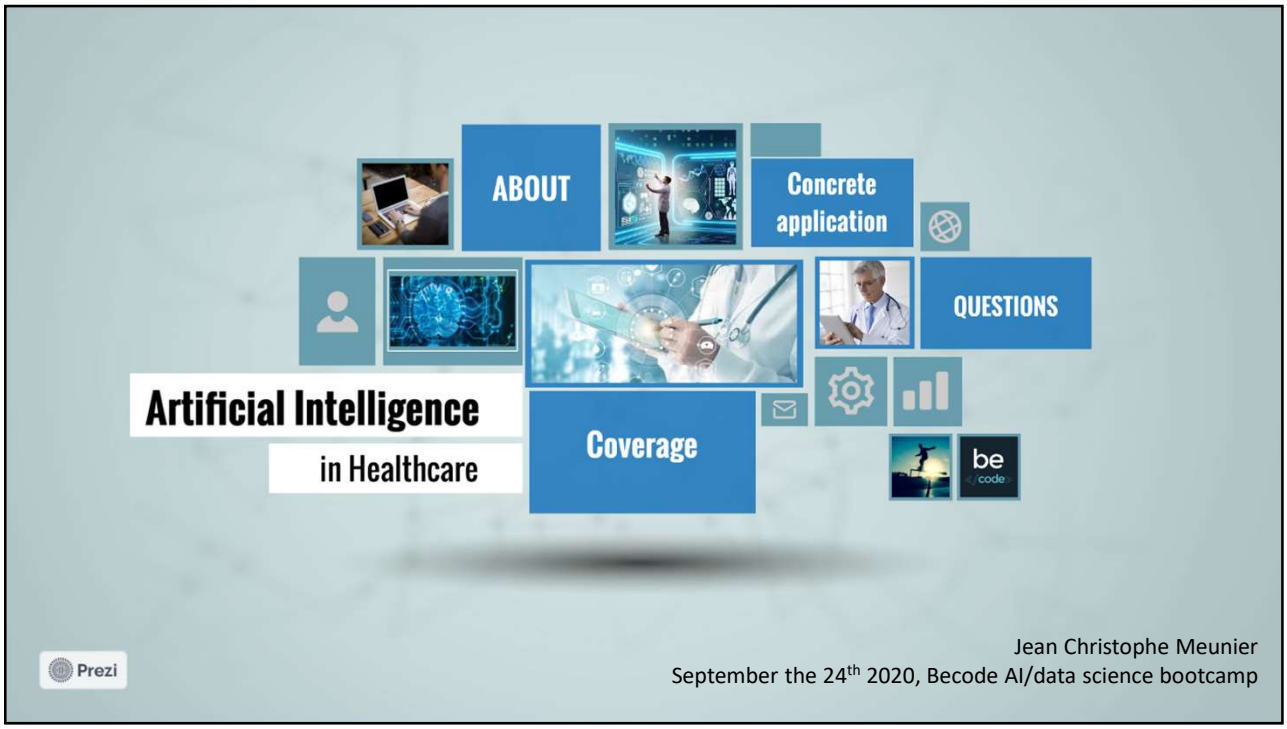

Jean Christophe Meunier
September the 24th 2020, Becode AI/data science bootcamp

What

Use of complex AI

- ...to emulate human cognition

- ...in the analysis, interpretation, and comprehension

- ...of complicated medical and healthcare data.

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Why ?

To increase/improve

- link prevention/treatment and patient outcomes

- efficacy and reliability (cost saving)

- patient satisfaction

- adequation to need (staff, workforce, material,...)

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Who ?

NHS

Memorial Sloan Kettering Cancer Center

But also...

Google

Microsoft

IBM

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First steps

60's : Dendral & first AI attempt to identifying unknown organic molecules
- based on mass spectra and knowledge of chemistry

70's : Mycin & identification bacteria causing severe infections
- recommend right antibiotics and right dosage (based on BMI)

From 80's onwards : Plethora of initiatives

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Radiology

Better than 'human eye'
- Stanford university : detecting pneumonia higher accuracy/recall metric

AI plateforms for uploading images
- many intitiatives : icometrix, QUIBIM, Robovision,...
- trainable to detect a wide range of specific diseases

However, perceived as a threat by some specialists

Prezi

Screening

Several disease/affection could be detected more accurately by AI

- using DL convolutional neural network
- e.g. skin cancer (95% instead of 86.6% for dermatologist), breast cancer (Google DeepMind algorithm), prostate cancer (university of Pittsburg)

Psychiatry

In phase of proof-of-concept

- e.g. chatbots or conversational agents that imitate human behaviour (anxiety and depression).

Often proposed by private corporations

- e.g. screening for suicidal ideation (Facebook, 2017)
- outside the healthcare system
- various professional, ethical and regulatory questions

Primary Care

Area of application
- decision making
- predictive modelling
- business analytics

Seen by generalist as limited (only for administrative and routine tasks)

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Telehealth

Monitor patients and improve communication with medical practitioners
- detecting disease changes
- wearable devices

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Electronic health records

EHR crucial to the digitalization and information spread of the healthcare industry
- but difficult for users (cognitive overload and burnout)

AI for scanning EHR data and automating and improving process (NLP)

Centerstone research institute
- 72% accuracy in predicting treatment response

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Drug Interactions

- Danger of multiple medication

- AI - such as NLP - to identify such interaction
  - from scientific litterature
  - from electronic health records
  - from Adverse event reporting (FDA, WHO)

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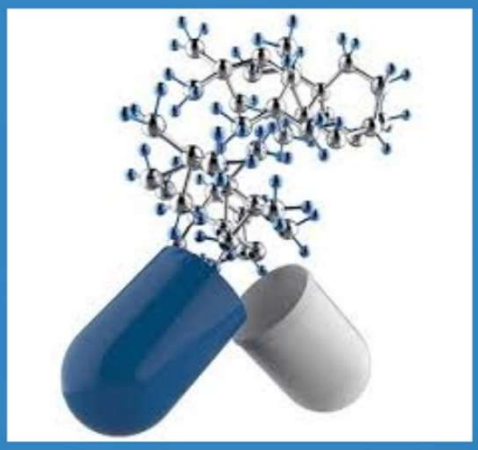
Creation of new drugs

Molecule DSP-1181 (OCD)
- 1 year by AI instead of 5 on average

Six inhibitors of the DDR1 gene (fibrosis)
- Generative Tensorial Reinforcement Learning (GENTRL)
- designed in 21 days

Many other examples :
- new drug for Wilson's disease



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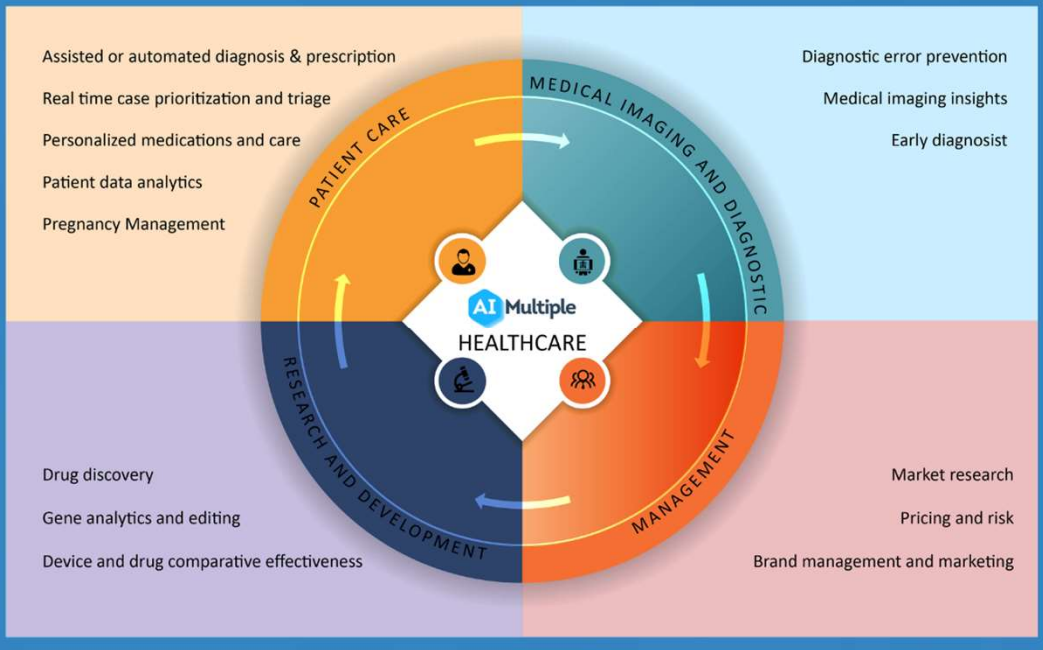

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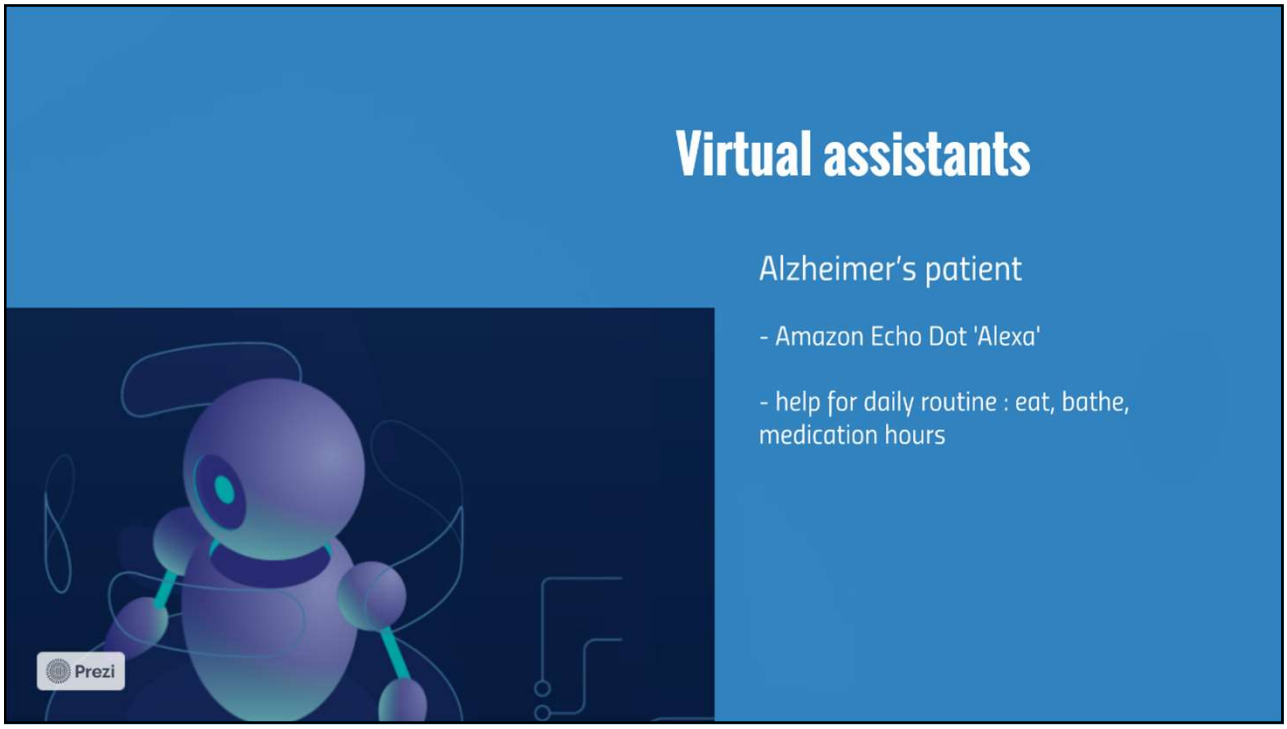
Concrete
application


Virtual assistants
Alzheimer's patient
- Amazon Echo Dot 'Alexa'
- help for daily routine : eat, bathe, medication hours
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MelaFind

Use infrared light to evaluate pigmented lesions

AI Analyzes irregular moles and diagnose serious skin cancers

Do note replace biopsy but help early identification

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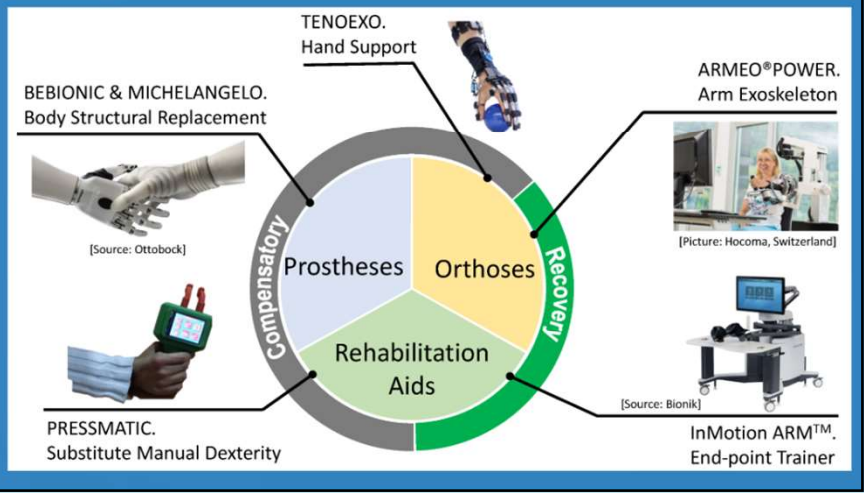
Robotic assisted therapy

Bionik, Watertown, Mass.

- Stroke recovery
- Articulated body limbs
- Detect motions that patients can't execute during therapy and guides them
- More recorded movements per hour (than with physical therapist alone)



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Caption Guidance

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Echocardiography (heart disease)

Help diagnose for non-specialized medical professional

AI trained through high quality ultrasound images and videos