AI + Sepsis = Sant?

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Vilka är vi?

JÖNKÖPING UNIVERSITY

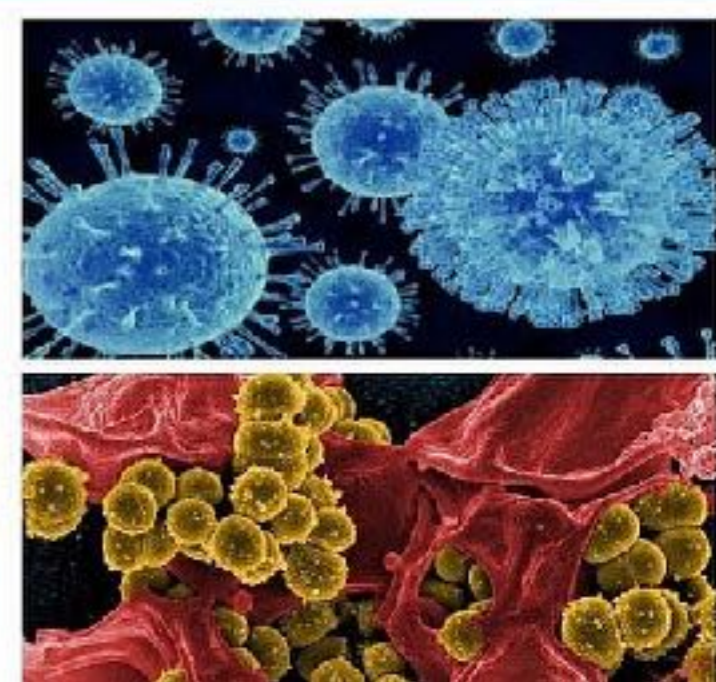Niklas

VÄSTRA GÖTALANDSREGIONEN
SAHLGRENSKA UNIVERSITETSSJUKHUSET

INFEKTION

Johan

Lars-Magnus

"Kontinuerligt, automatiskt beslutsstöd till läkare för diagnos av infektionssjukdomar"

Multi-diagnos situationen (inte bara sepsis…)

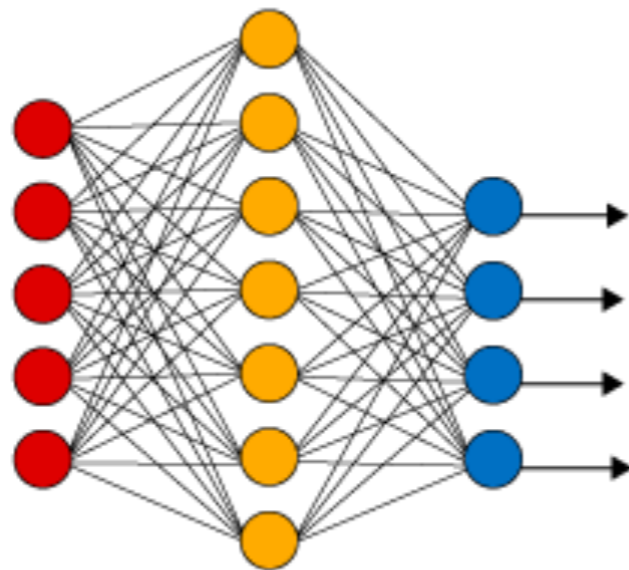*2 första case: Virus Gastroenterit & Sepsis*

Men vad är då AI?

Moving target definition of AI:

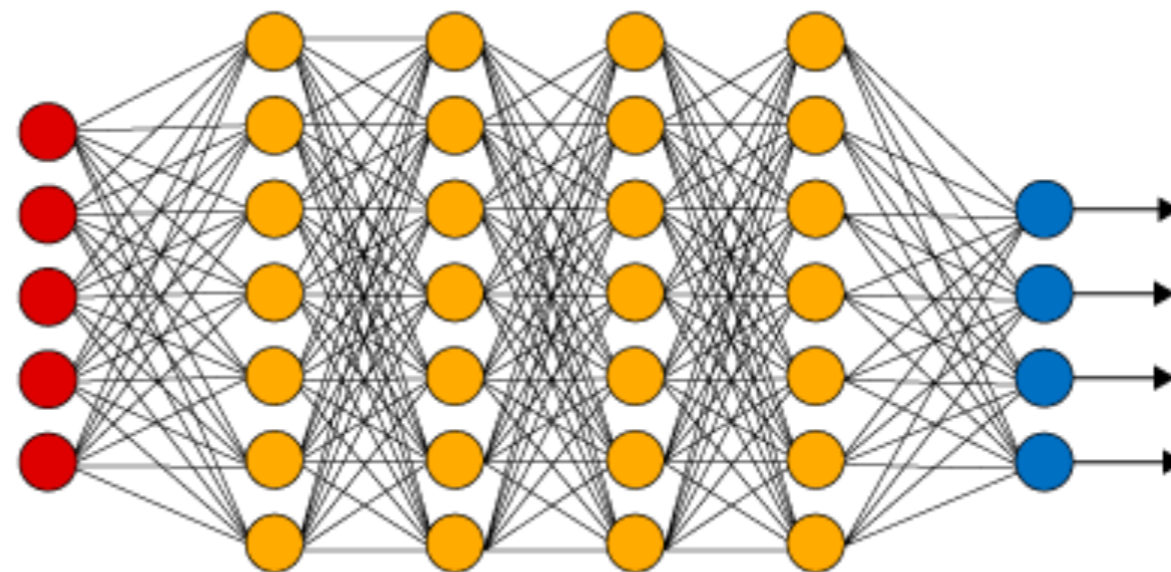*"How to make computers do things which,
at the moment, people do better"
— Elaine Rich & Kevin Knight*

Nuvarande AI hype: Deep Learning

Fanns på 80/90-talen men "funkar" nu för:

1. Vi har mycket snabbare datorer

2. Vi har mycket mer data

*"At Google we say that you typically need a **billion examples** for DL to work well"* — Kurzweil, Google Brain

Är AI bara Deep Learning / Neurala Nät?

The Five Tribes of Machine Learning

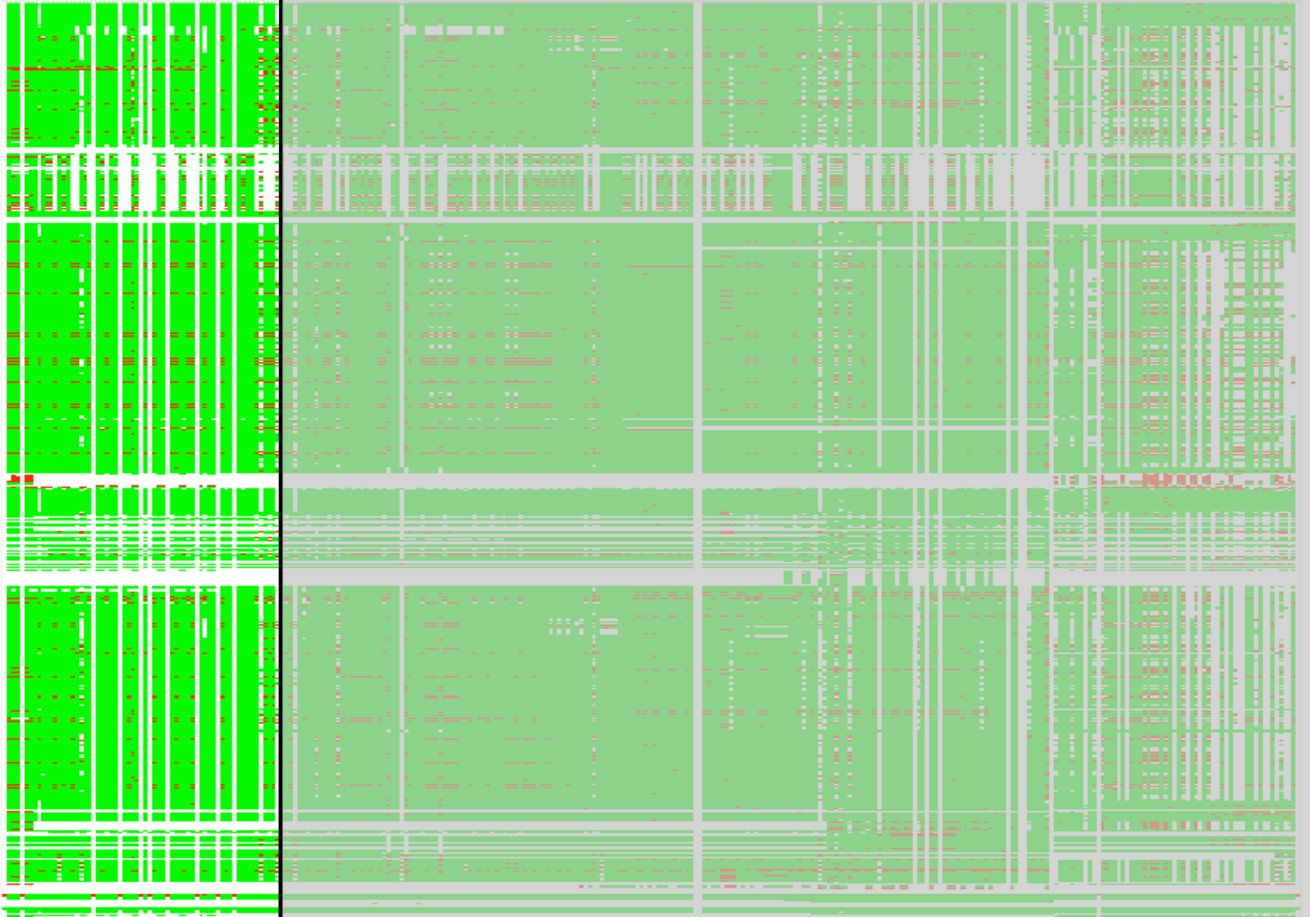| Tribe	Origins	Master Algorithm
Symbolists	Logic, philosophy	Inverse deduction
Connectionists	Neuroscience	Backpropagation
Evolutionaries	Evolutionary biology	Genetic programming
Bayesians	Statistics	Probabilistic inference
Analogizers	Psychology	Kernel machines

[Domingos2015 "The Master Algorithm"]

Supporting technologies:

Advanced Statistics + Search/Optimisation

Taking it **Online**

Flight code changes about ▾

Range from few to many line changes

* No matching module found

2012   Feb   Mar   Apr

Test executions about ▾

Range from more failed to more su...

Row numbers: Total number of executions.

2012   Feb

- Quality of data more important than advanced AI/ML
  - How much data do you have? Enough?
  - Do the data represent all important aspects?
- Simple statistical models often almost as good as advanced AI/ML
  - Data often unreliable => simple models give (at least) 80% of value for 20% of complexity
  - Statistical models easier to understand => robust
- Online algorithms almost always worth it => scalability
- Visualising results important for impact, Human + AI > AI
- An AI system is not enough, people need training + understanding to change their behaviour
- Interval prediction better than point estimates

Ett axplock på vad finns gjort på AI inom Sepsis

- Mani et al 2013
  - Data: 299 spädbarn, 3 variabler baserat på blodprov
  - Teknik: 9 olika "off the shelf" ML tekniker
  - Resultat: 8 av 9 testade tekniker var bättre än läkarna
- Gultepe et al 2013
  - Data: 741 vuxna, E-journaler & många olika variabler
  - Teknik: 4 ML tekniker av väldigt olika slag
  - Resultat: Laktatnivåer mycket bra, Mortalitetsrisk bra
  - Nyckel: Data dynamiskt över tid är centralt
- Horng et al 2017
  - Data: Alla 230,936 patienter under 5 år, vital signs & fritext från E-journaler (Läkare resp Sköterskors noteringar)
  - Tekniker: Traditionell ML (SVM) + Topic models (för text)
  - Resultat: Bättre resultat om fritext inkluderades

Horng 2017: Datakällor

Table 1. Data types used in models and amount of missing or out of range data.

Feature	Data Type	Missing or Out of Range Data
Age	Continuous	0%
Gender	Binary	0%
Acuity	5-level ordinal	2.7%
Systolic blood pressure	Continuous	4.9%
Diastolic blood pressure	Continuous	5.2%
Heart rate	Continuous	4.6%
Pain scale	Continuous	6.6%
Respiratory rate	Continuous	6.5%
Oxygen saturation	Continuous	5.6%
Temperature	Continuous	6.7%
Free text chief complaint	Text	0%
Free text nursing assessment	Text	2.9%

https://doi.org/10.1371/journal.pone.0174708.t001

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