



Nasjonalt senter for
e-helseforskning

Artificial Intelligence in Healthcare

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Director

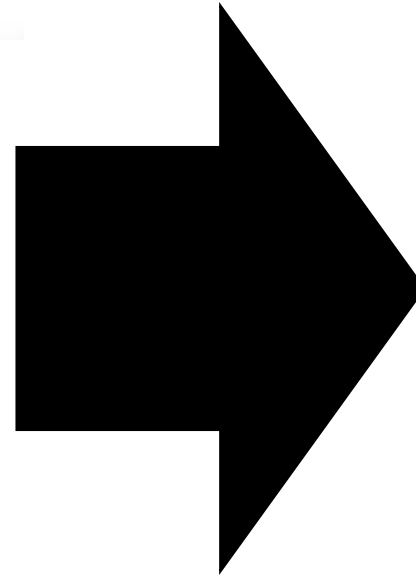
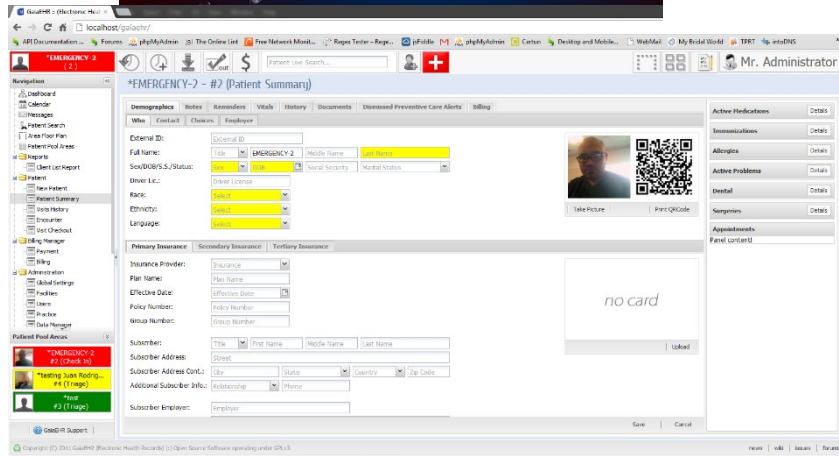
Norwegian Centre for E-health Research





*If a physician can be replaced by a computer,
then he or she deserves to be replaced by a computer.*

W. Slack, Harvard Medical School
Quoted in Topol, *Deep Medicine*



Clinical decision support
Diagnostics
Drug discovery
Trial matching
Personal assistance
Remote monitoring
etc...





Artificial Intelligence

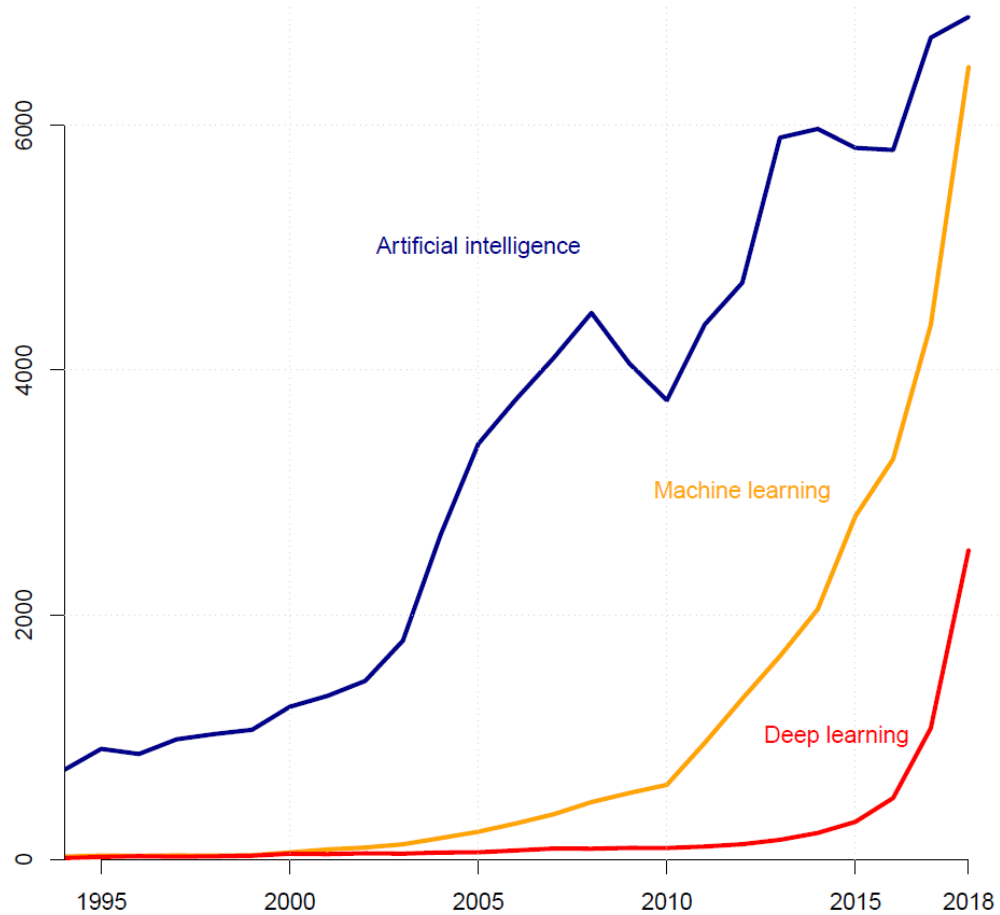
Mimick the intelligence or learning of a human

Machine Learning

Learn from data without a complex set of predefined rules

Deep Learning

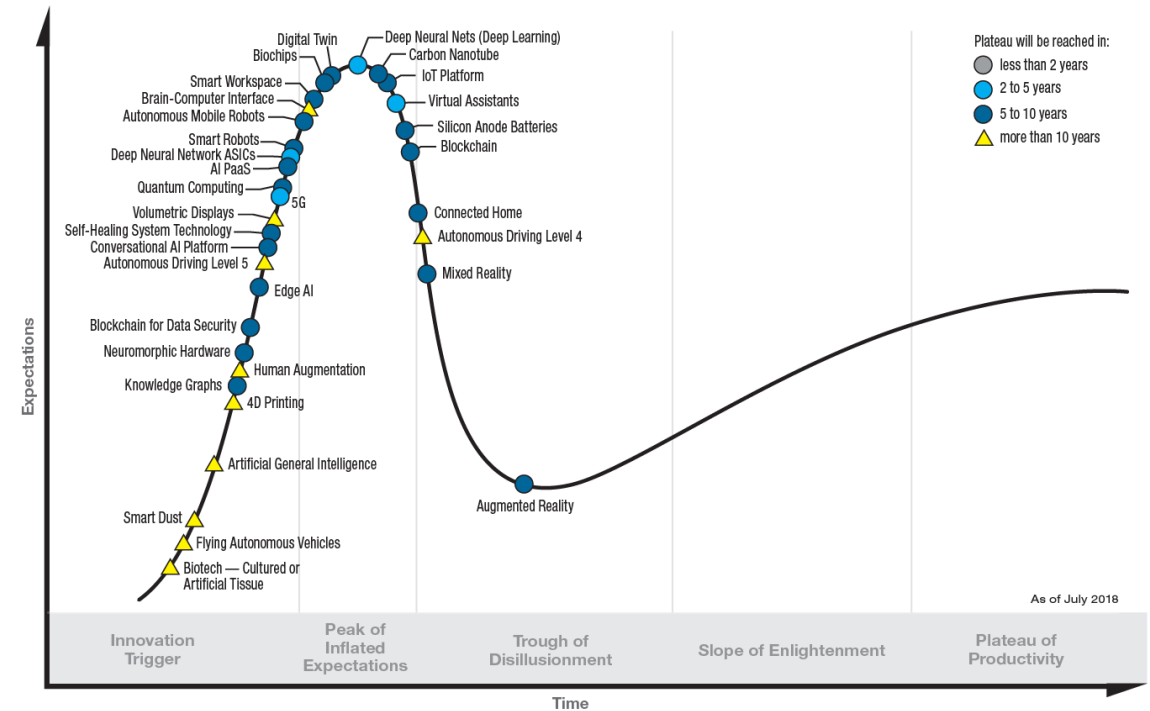
Machine learning with deep neural networks

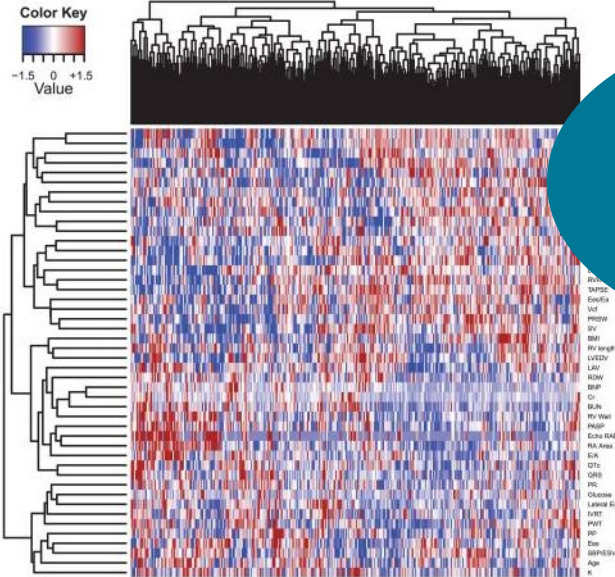


Pubmed-indexed papers



Hype Cycle for Emerging Technologies, 2018

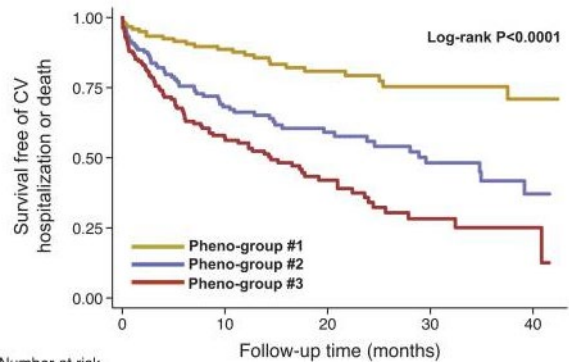




Unsupervised learning

Supervised learning

Machine learning



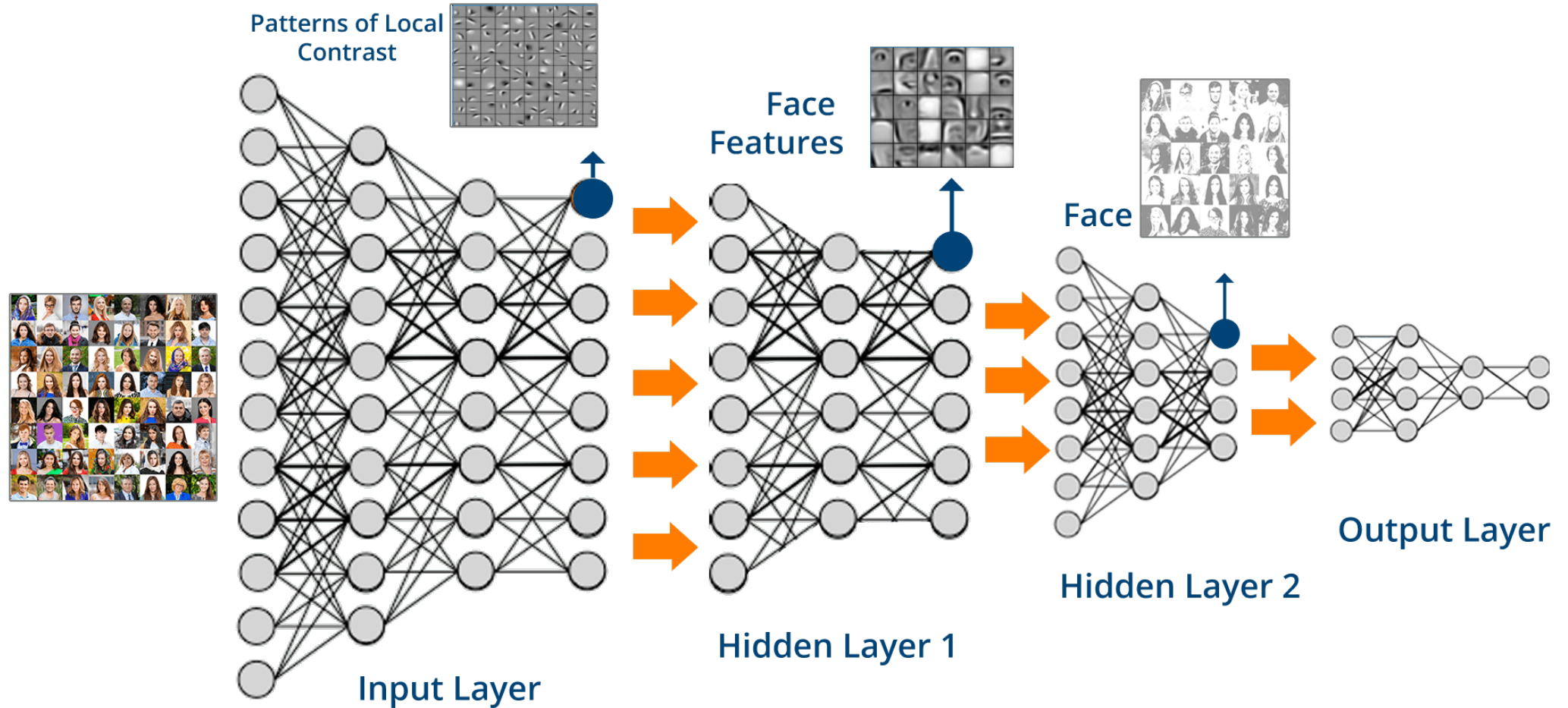
Deo, Circulation (2015)

Reinforcement learning





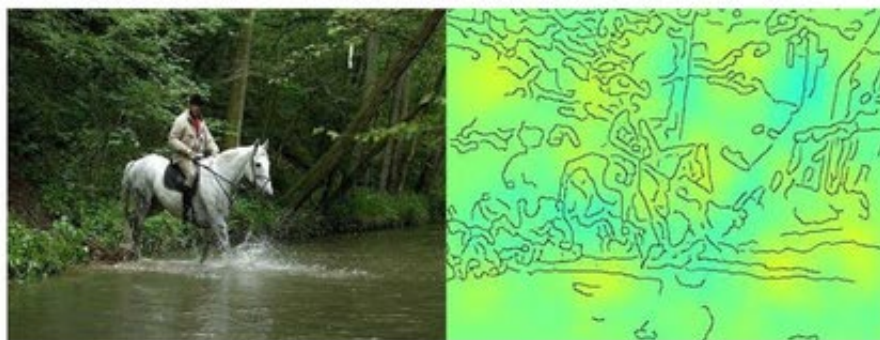
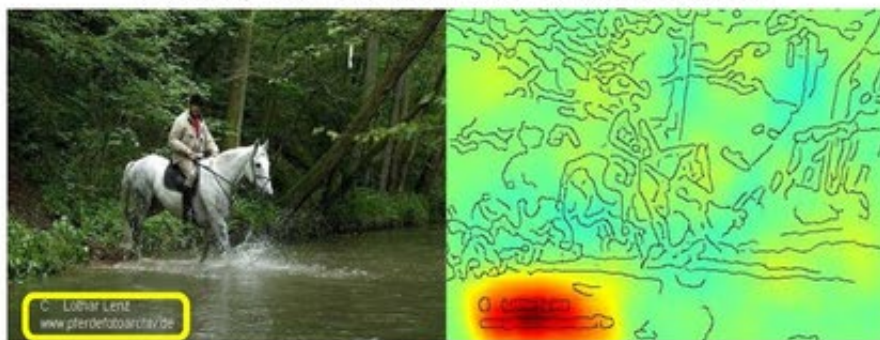
Deep learning





The black box

Horse-picture from Pascal VOC data set



Source tag present



Classified as horse

No source tag present



Not classified as horse

Artificial picture of a car





The black box



x
“panda”
57.7% confidence

+ .007 ×



$\text{sign}(\nabla_x J(\theta, x, y))$
“nematode”
8.2% confidence

=



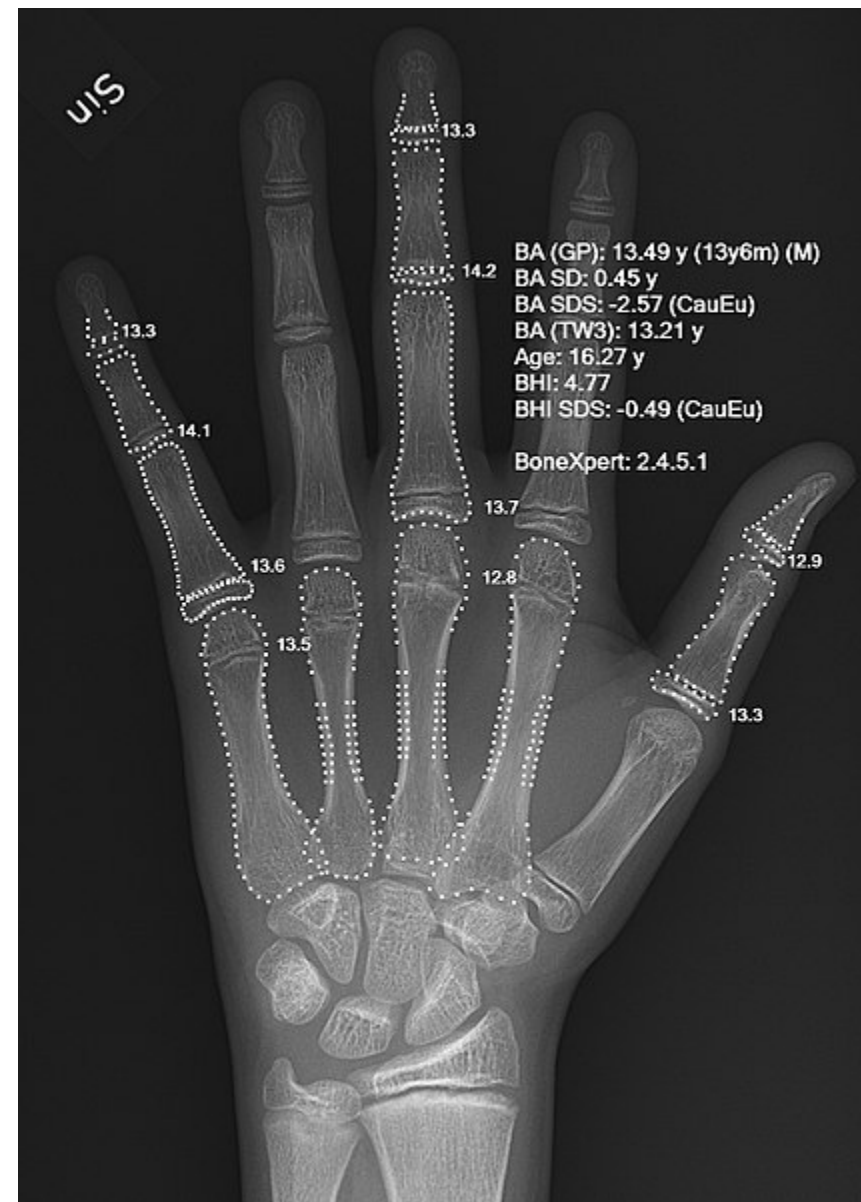
$x + \epsilon \text{sign}(\nabla_x J(\theta, x, y))$
“gibbon”
99.3 % confidence



The state of AI in healthcare

- Great expectations, likely to disrupt much of healthcare
- Fragmented systems make data assembly hard
- Research gap between piloting on retrospective data vs prospective studies in clinical settings

- *It's not about technology alone, it's about technology in context*





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