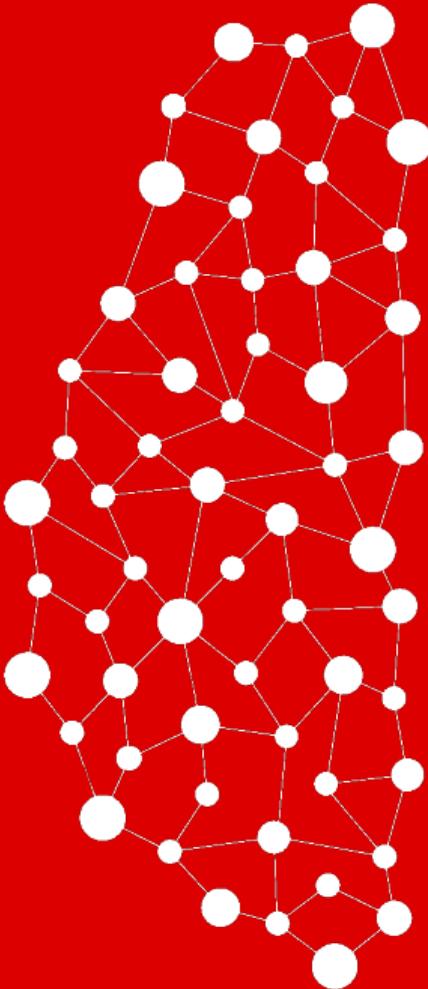


Bridging the translational gap for artificial intelligence in clinical neuroimaging



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Department of Psychology, University of Oslo
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What is artificial intelligence?

What is AI?

Artificial Intelligence (AI) is the field of computer science devoted to creating systems that can perform tasks that typically require human intelligence. These tasks include perception (e.g., recognizing images or speech), reasoning (e.g., solving problems, making decisions), learning (e.g., adapting from data and experience), and interaction (e.g., understanding natural language, generating responses, collaborating with humans).

At a high level, AI can be divided into:

- **Symbolic AI (knowledge-based, rule-based, expert systems):** Uses explicit rules, logic, and symbolic representations to encode reasoning.
- **Machine Learning (data-driven):** Learns patterns from data, with subfields like deep learning, reinforcement learning, and probabilistic modeling.

AI is not a single method but a spectrum of approaches for replicating or augmenting cognitive functions in machines.

Would you like me to give you a concise **working definition** (one sentence) or a taxonomy of types of AI (narrow, general, superintelligence, etc.)?



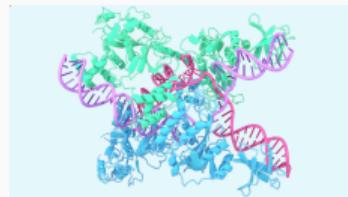
+ Ask anything



ChatGPT



Spot



AlphaFold



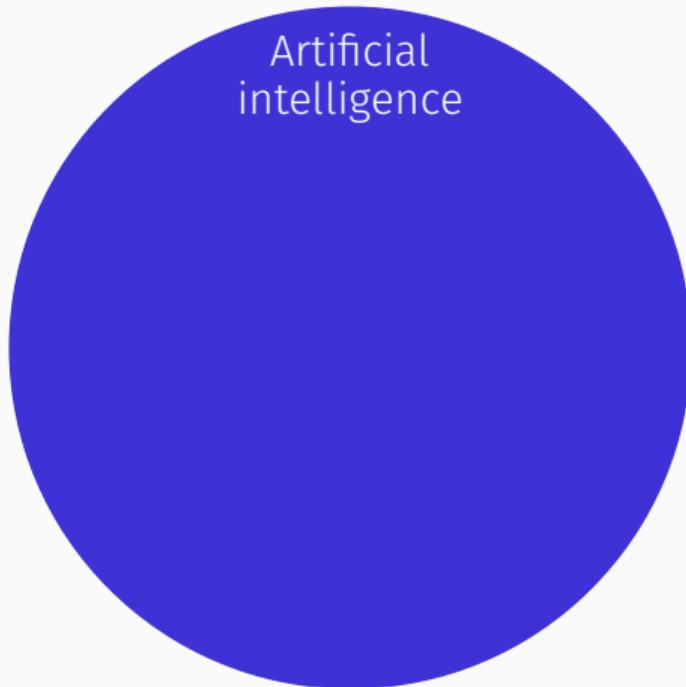
1X Neo



AlphaZero



What is artificial intelligence?

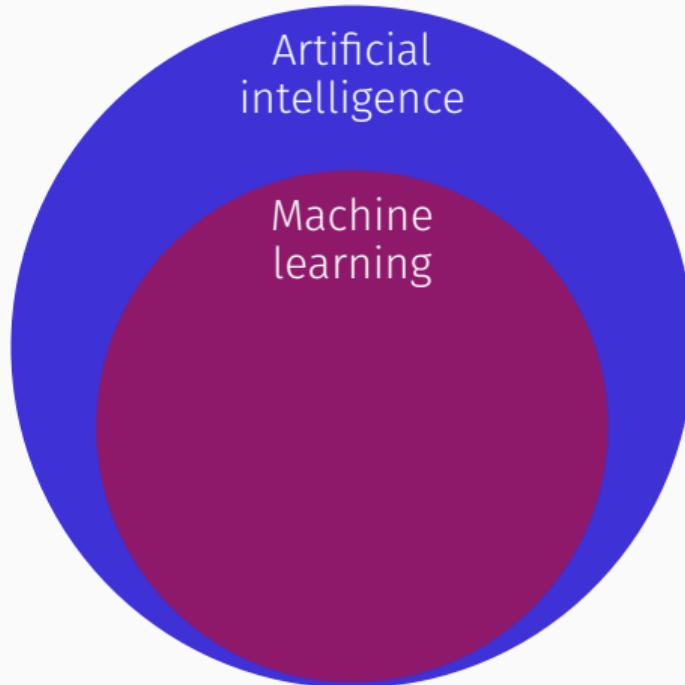


Artificial intelligence:

Machines that solve tasks requiring some kind of (often human-like) intelligence.



What is artificial intelligence?



Artificial intelligence:

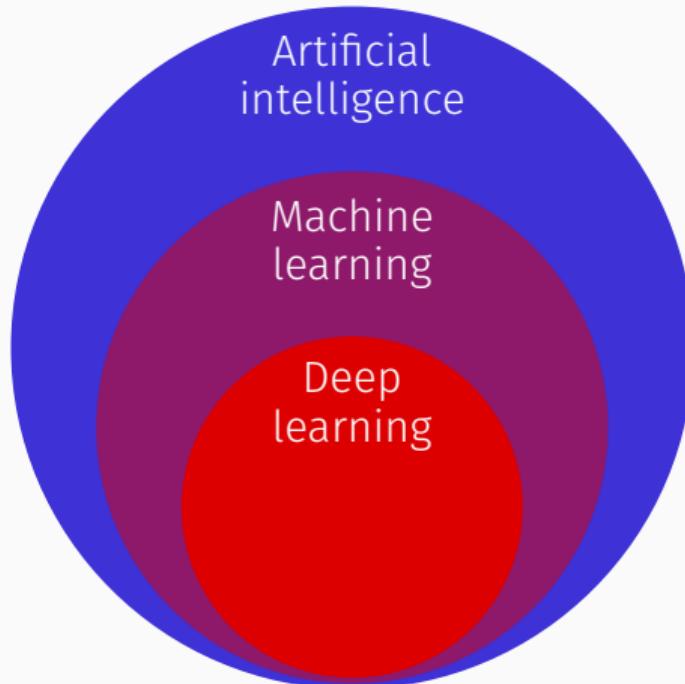
Machines that solve tasks requiring some kind of (often human-like) intelligence.

Machine learning:

Machines that learn to solve tasks by learning patterns from data



What is artificial intelligence?



Artificial intelligence:

Machines that solve tasks requiring some kind of (often human-like) intelligence.

Machine learning:

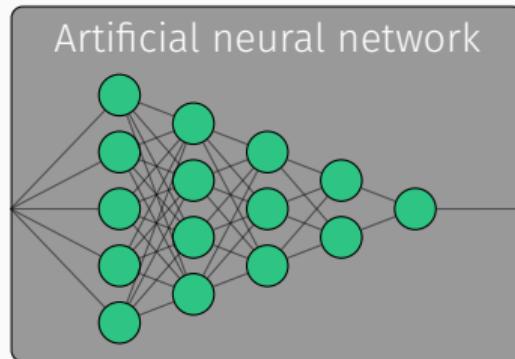
Machines that learn to solve tasks by learning patterns from data

Deep learning:

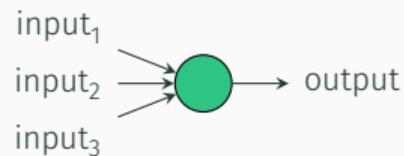
Machine learning approaches relying on artificial neural networks (inspired by the human brain)



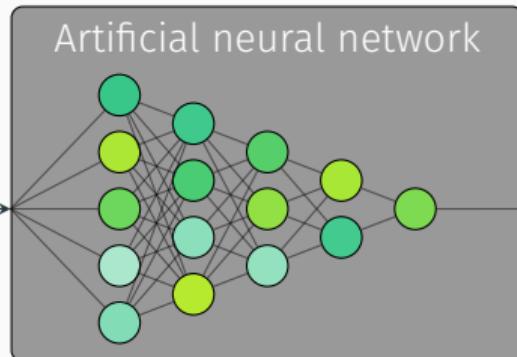
What is artificial intelligence?



Artificial neuron



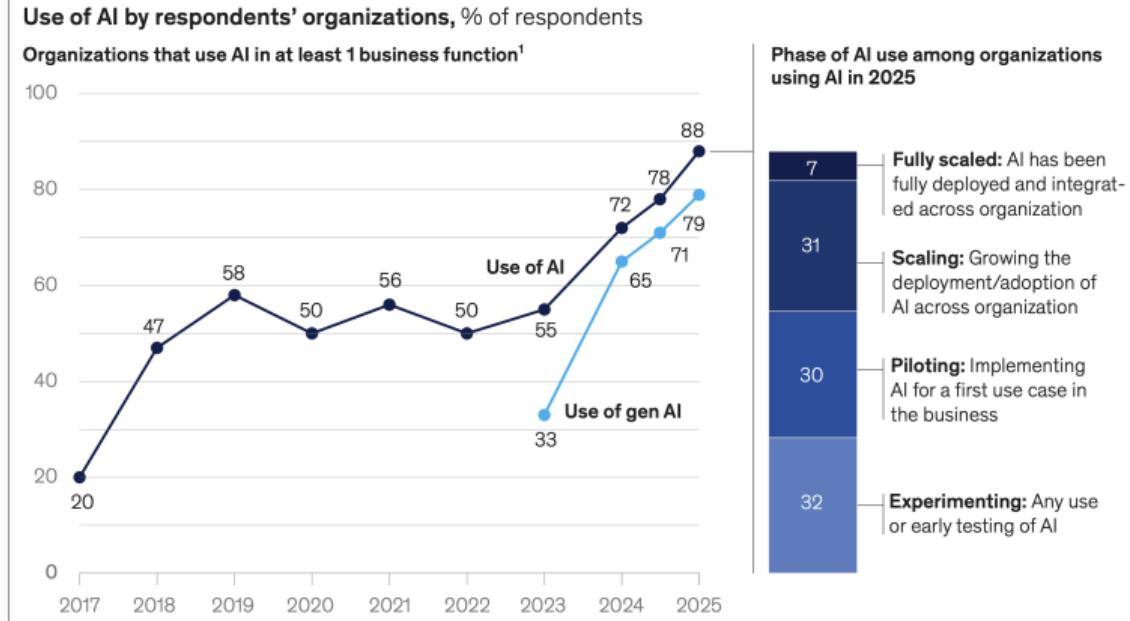
What is artificial intelligence?



→ Ladybug



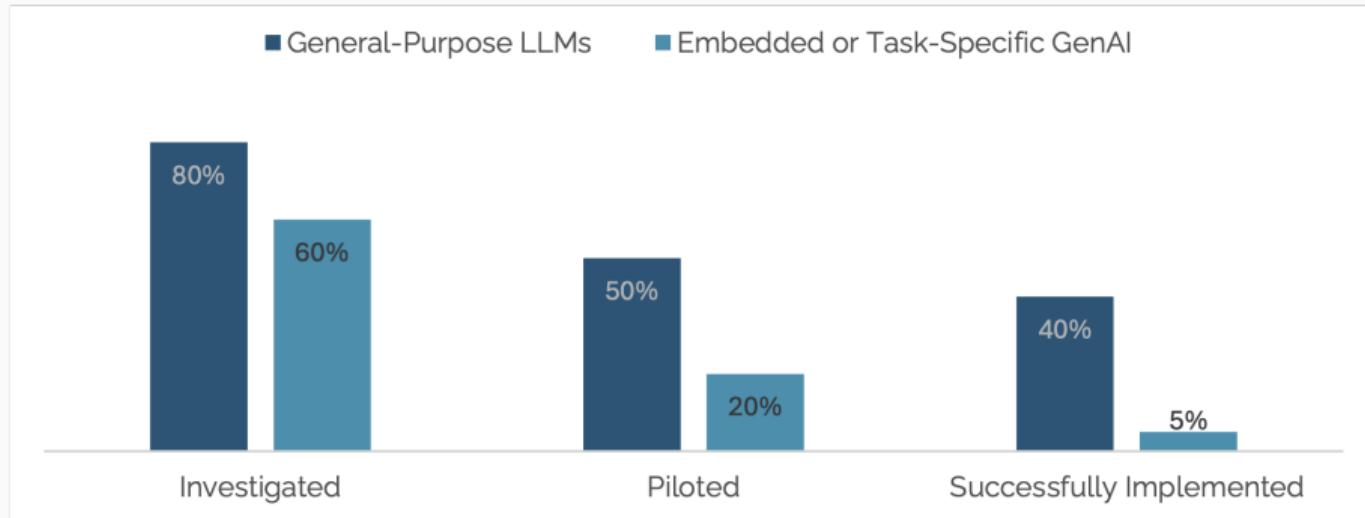
Artificial intelligence and clinical neuroimaging



The state of AI 2025, McKinsey & Company



Artificial intelligence and clinical neuroimaging



NANDA, MIT (2025). State of AI in Business 2025. Preprint at
https://www.artificialintelligence-news.com/wp-content/uploads/2025/08/ai_report_2025.pdf



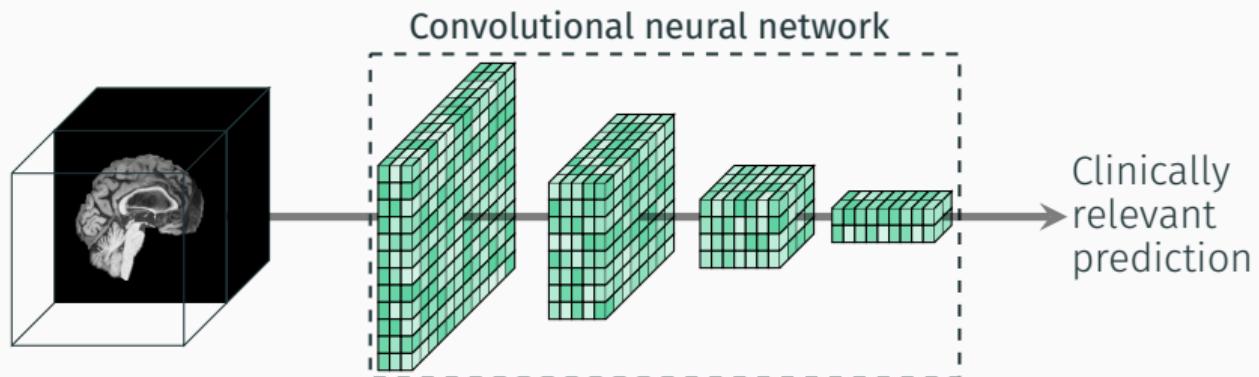
Artificial intelligence and clinical neuroimaging



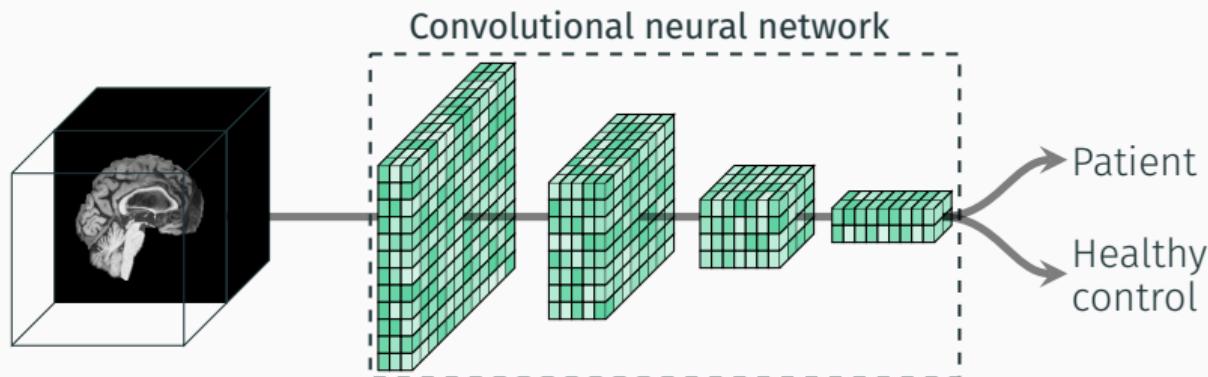
Publications containing "(neuroimaging OR clinical neuroscience) AND (artificial intelligence OR deep learning)"
from <https://pubmed.ncbi.nlm.nih.gov>



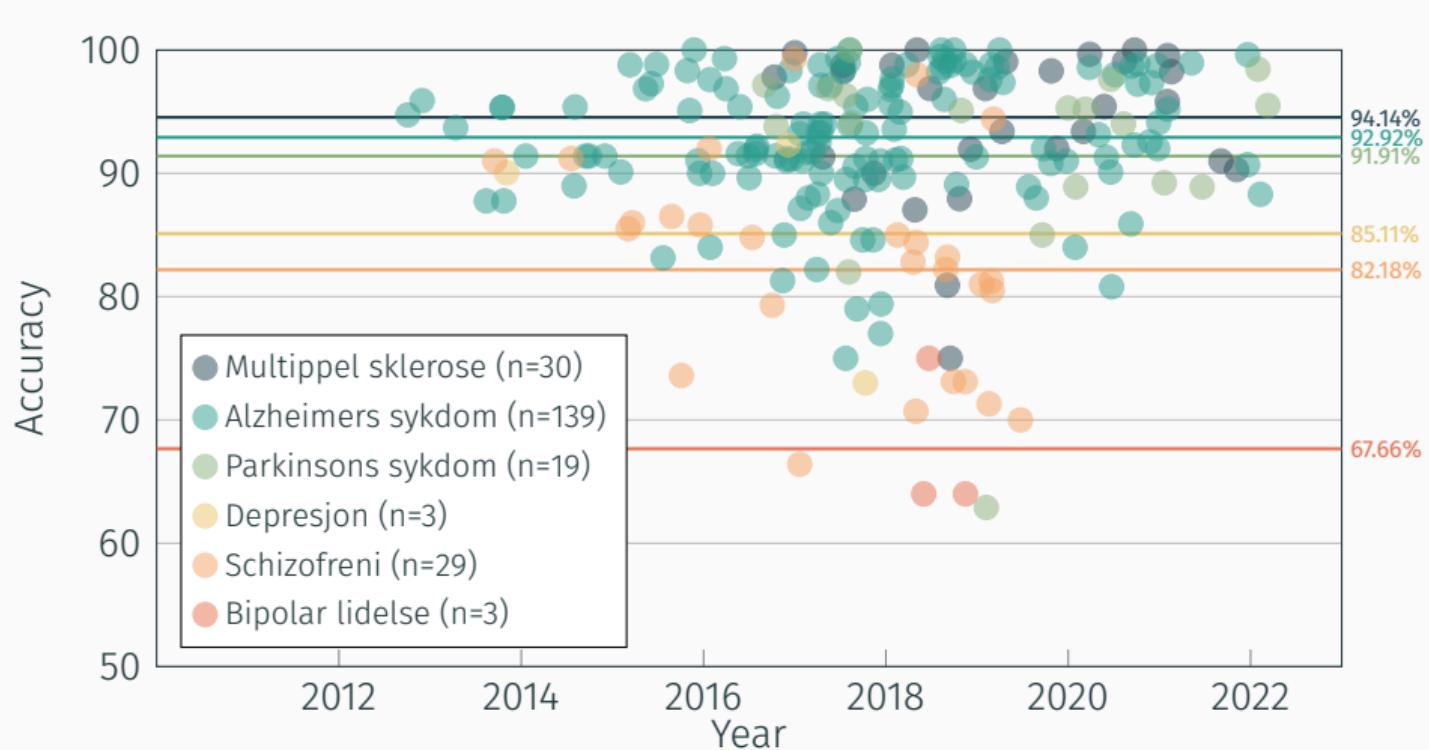
Artificial intelligence and clinical neuroimaging



Artificial intelligence and clinical neuroimaging



Artificial intelligence and clinical neuroimaging





AI adoption

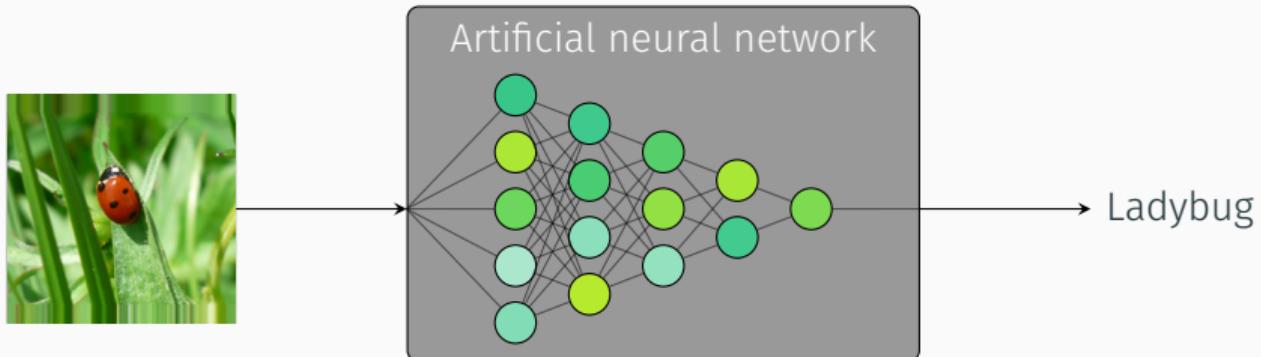


The black-box problem of artificial intelligence

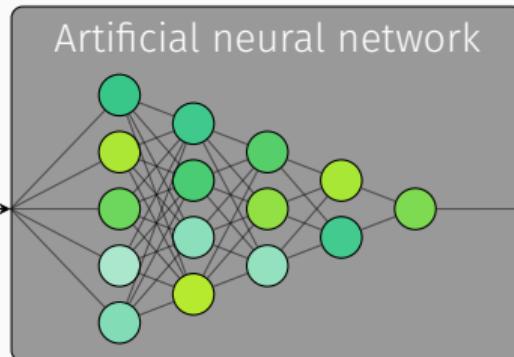


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Understanding artificial neural networks

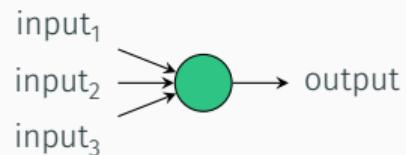


Understanding artificial neural networks

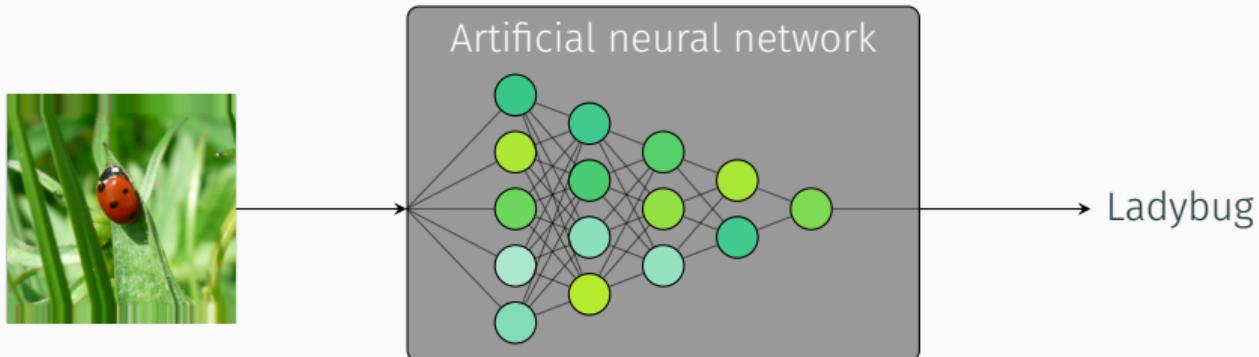


Ladybug

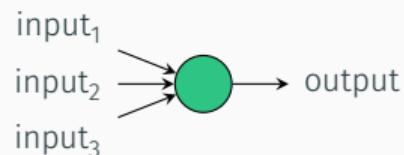
Artificial neuron



Understanding artificial neural networks



Artificial neuron



$$\text{output} = \max(0, b + w_1 * \text{input}_1 + w_2 * \text{input}_2 + w_3 * \text{input}_3)$$



Understanding artificial neural networks



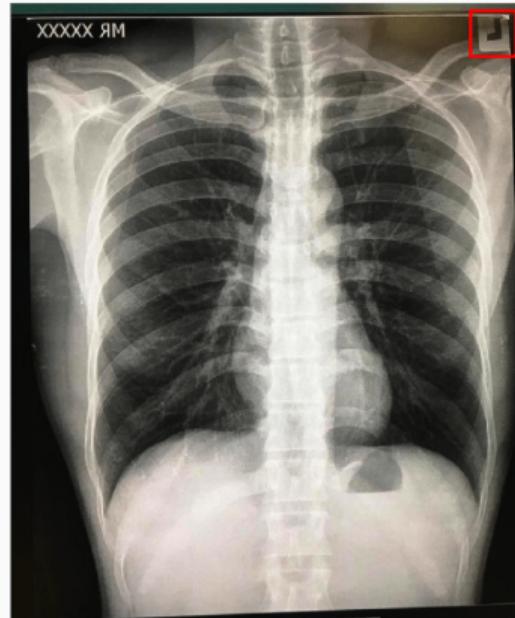
Understanding artificial neural networks



Understanding artificial neural networks



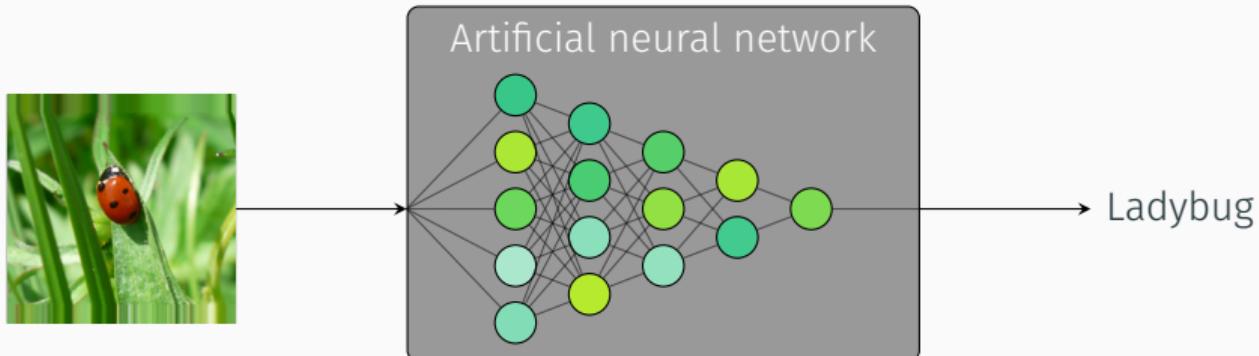
Understanding artificial neural networks



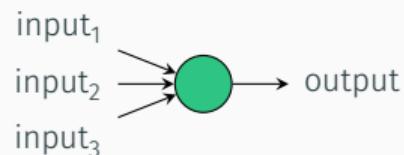
Banerjee, I., Bhattacharjee, K., Burns, J. L., Trivedi, H., Purkayastha, S., Seyyed-Kalantari, L., ... & Gichoya, J. (2023). "Shortcuts" causing bias in radiology artificial intelligence: causes, evaluation, and mitigation. *Journal of the American College of Radiology*, 20(9), 842-851.



Understanding artificial neural networks



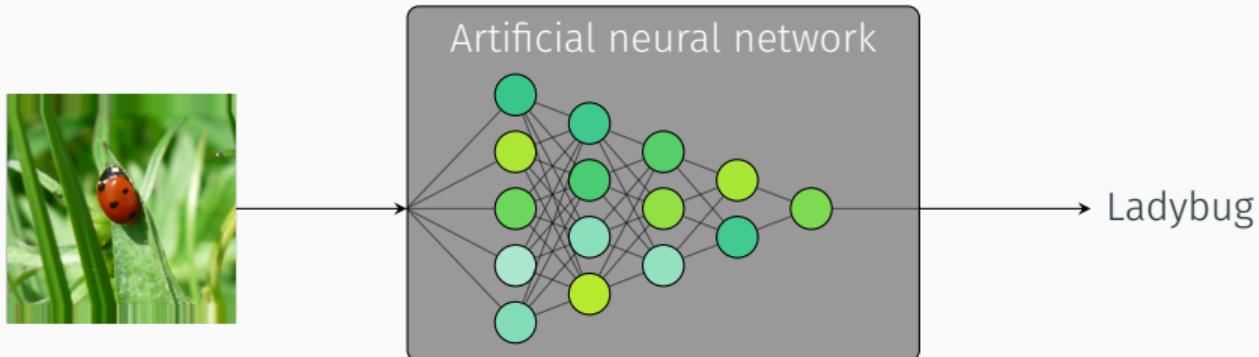
Artificial neuron



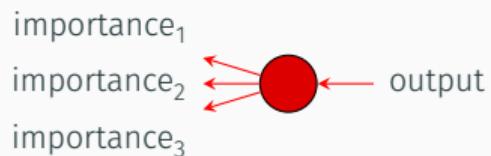
$$\text{output} = \max(0, b + w_1 * \text{input}_1 + w_2 * \text{input}_2 + w_3 * \text{input}_3)$$



Understanding artificial neural networks



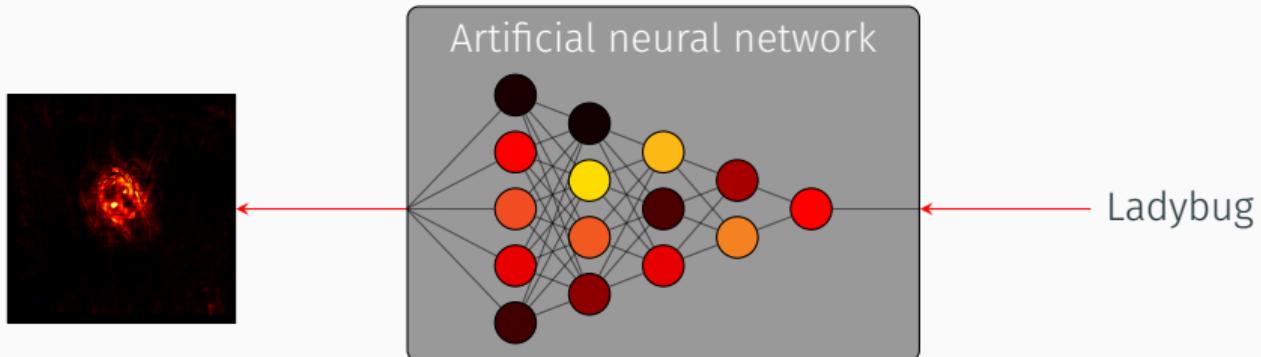
Artificial neuron



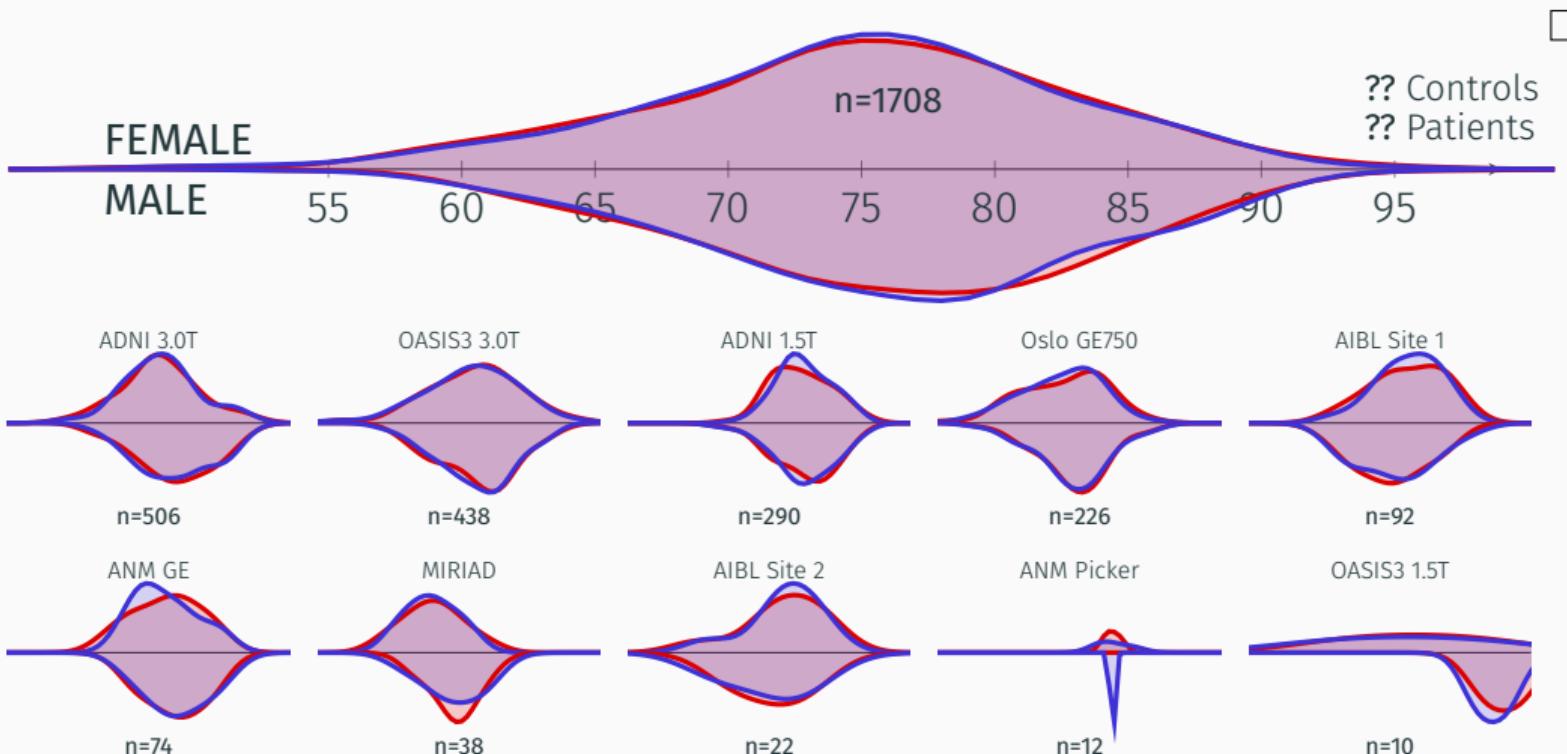
$$\text{importance}_i = \frac{\text{input}_i * w_i}{\sum \text{input}_j * w_j} * \text{output}$$



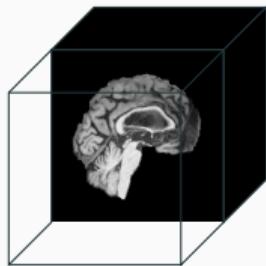
Understanding artificial neural networks



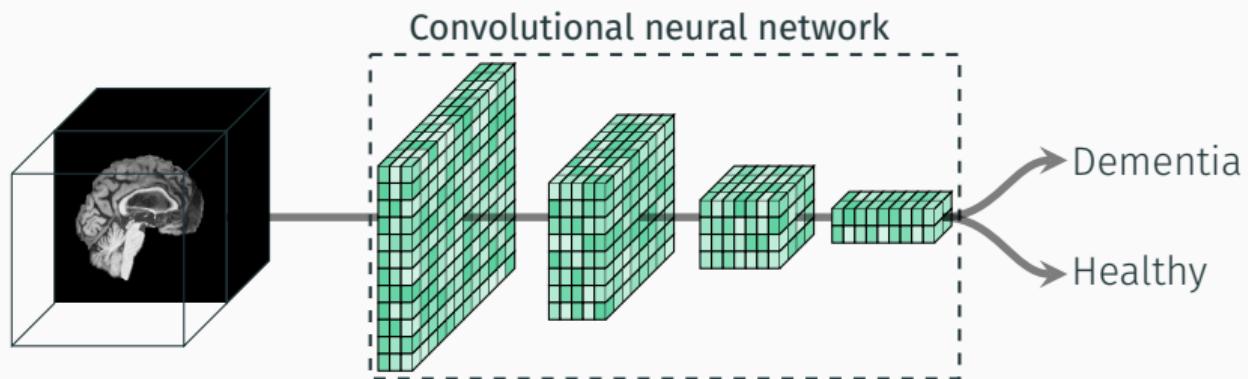
Explainable artificial intelligence and dementia



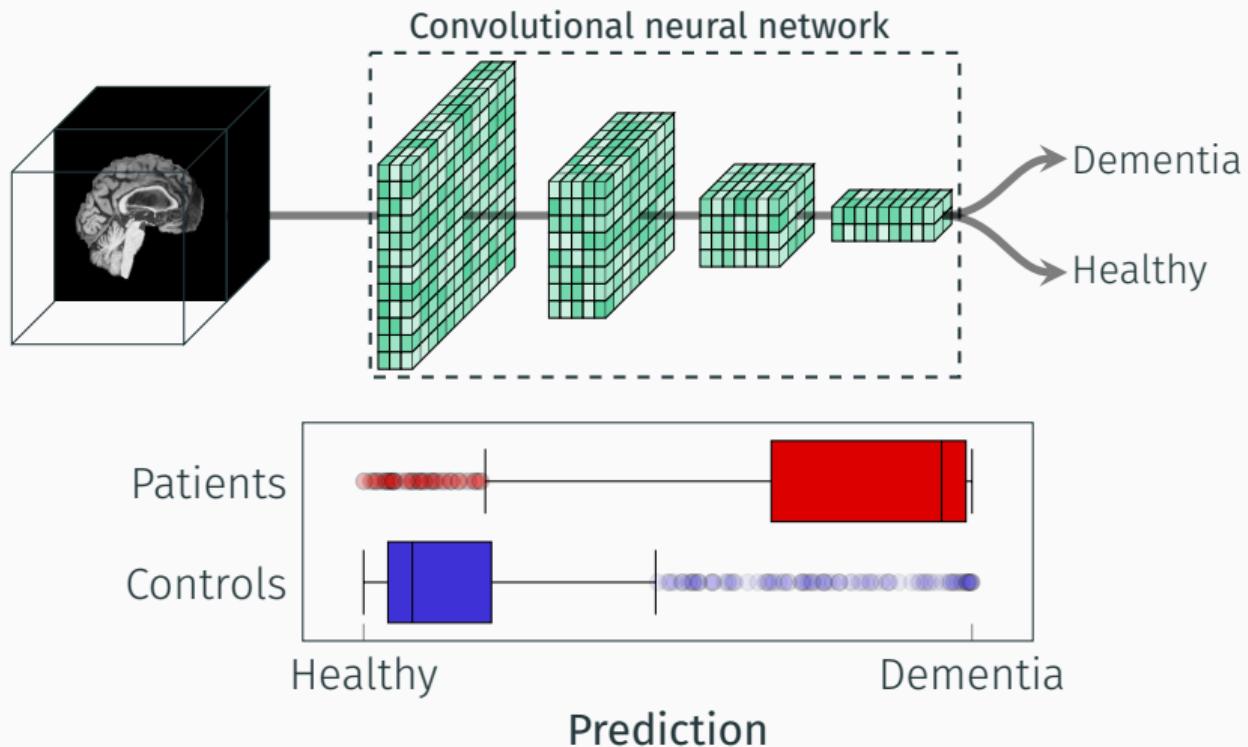
Explainable artificial intelligence and dementia



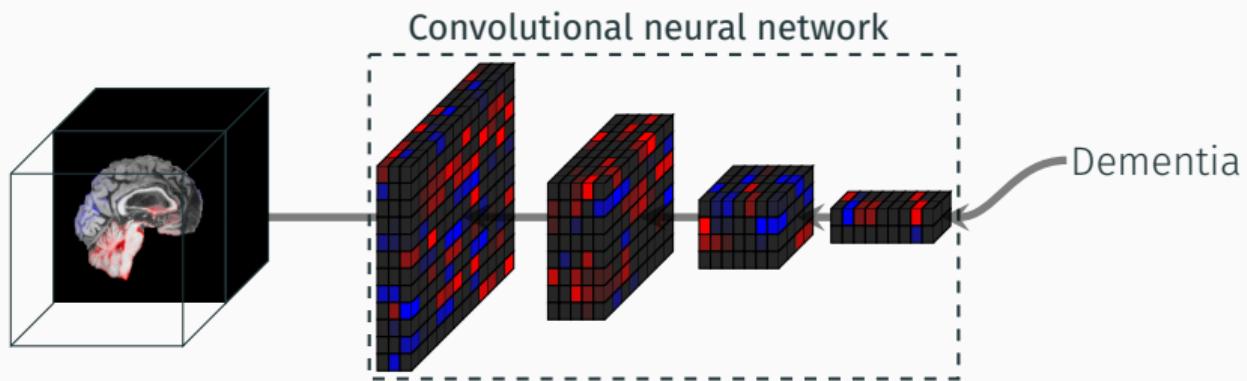
Explainable artificial intelligence and dementia



Explainable artificial intelligence and dementia



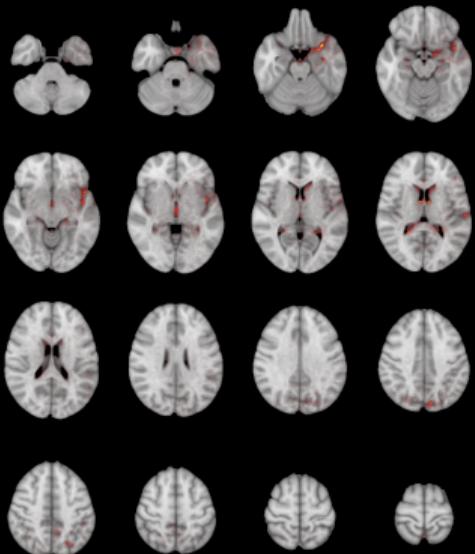
Explainable artificial intelligence and dementia



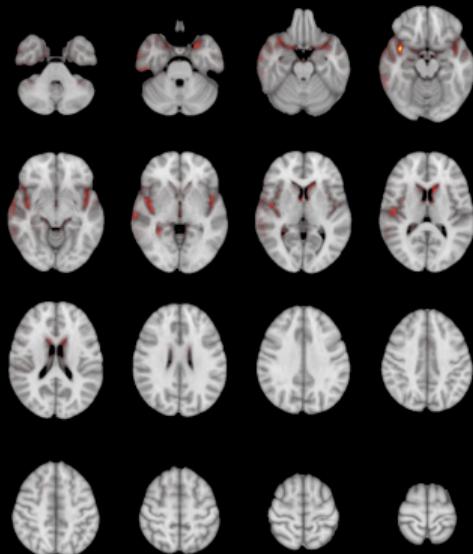
Explainable artificial intelligence and dementia



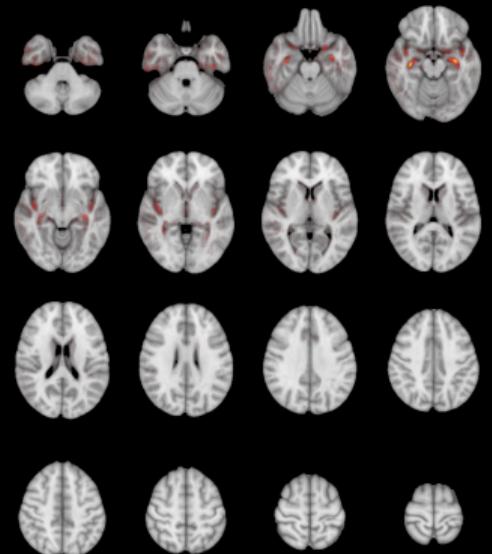
Patient 1



Patient 2



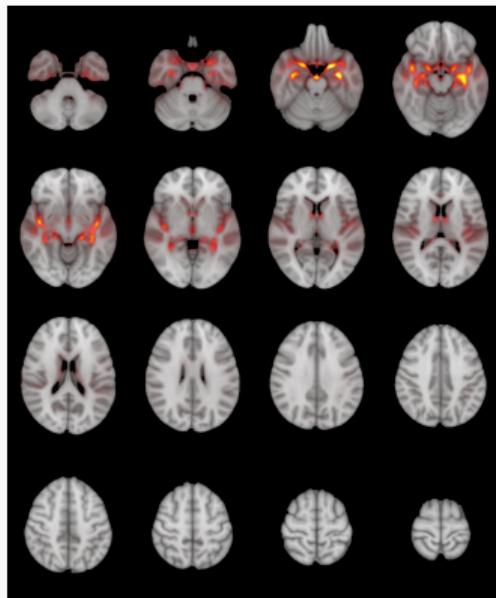
Patient 3



Explainable artificial intelligence and dementia



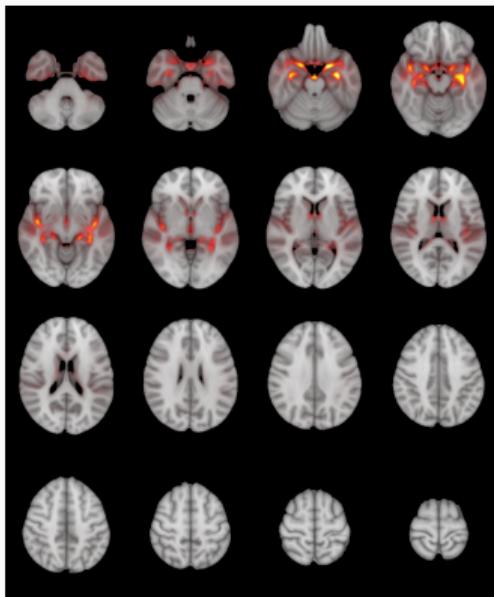
Explainable AI



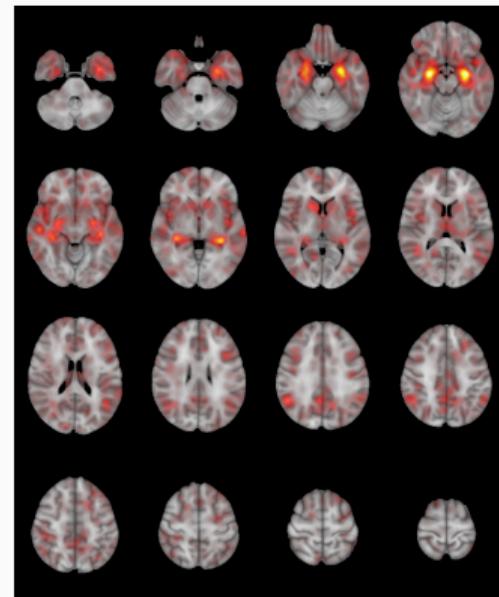
Explainable artificial intelligence and dementia



Explainable AI



Human researchers



Explainable artificial intelligence and dementia



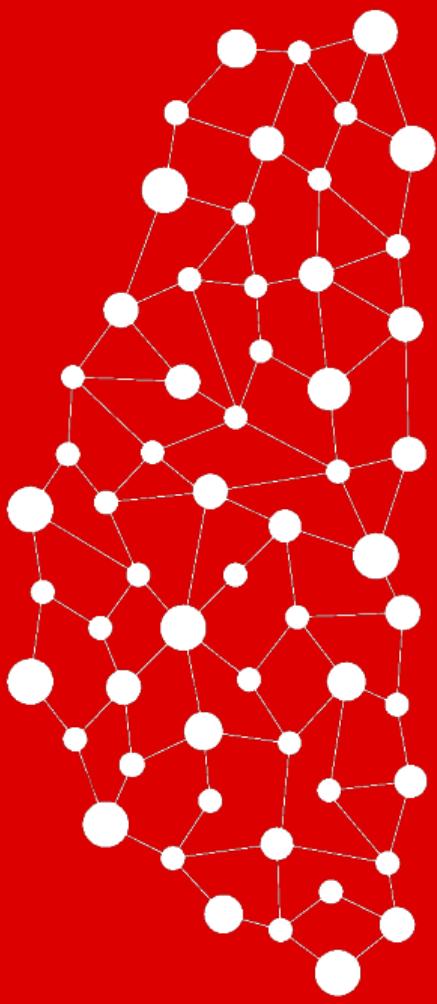
Explainable artificial intelligence and clinical neuroimaging

Although artificial neural networks very often result in accurate predictions, their opaque nature make it hard to understand how they work.

- Learning shortcuts to solve problems that appear valuable but are really not related to the problem at hand gives rise to "Clever Hans"-predictors.
- Explainable artificial intelligence provides methodology for probing how these models work, building trust and potentially enabling clinical use.



Thank you for your attention!
estenhl@ui.no



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