

Report
Neural Networks as a paradigm to simulate
human intelligence

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a) What led Geoffrey Hinton to believe in neural networks as the right path to understanding and simulating human intelligence?

There were a few reasons for Geoffrey Hinton to believe in neural networks as the right path to simulate human intelligence. First of all, when Hinton studied physiology he didn't get the answer to one of the most thrilling questions that bothered him - how the brain works. They were only taught about the work mechanism of neurons, but not the whole system itself. That forced Hinton to switch his field of work to philosophy and AI later.

Geoffrey Hinton's discoveries in the sphere of artificial intelligence were profoundly impacted by the works of Donald Hebb, which suggested that connections between brain's neurons can strengthen. This thought correlated with Hinton's idea about the nature of brain. What he saw as an unlikely scenario is that our brain uses a logical rule of inference as a way to make predictions.

b) How physics fundamentals help Geoffrey Hinton to obtain the necessary insights to develop his research and discoveries related with Neural Nets?

Physics fundamentals, especially the field of statistical physics, made a big impact on how Geoffrey Hinton looked at the subject of artificial intelligence. That's where the idea of studying the groups of neurons rather than single ones arose. The statistical physics explore the behaviour of large groups of small objects (like molecules) through probabilities and statistical analysis. This approach is the only way to make assumptions and calculations in systems where each individual node can not be observed.

Hinton also benefitted from having learned about magnetic materials that have special characteristics thanks to their atomic spin – a property that makes each atom a tiny magnet. The spins of neighbouring atoms affect each other; this can allow domains to form with spin in the same direction. He was able to make a model network with nodes and connections by using the physics that describes how materials develop when spins influence each other. This led to the development of systems that "finds" the stable patterns, just like in physics atoms seek balance.