

Geoffrey Hinton HW6

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

Geoffrey Hinton's belief in neural networks arose from a combination of dissatisfaction with existing methods and early inspiration from neuroscience and computational theories. His experience at Cambridge and exposure to physiological and philosophical explanations of brain function frustrated him with his lack of depth of understanding of cognitive processes. He turned instead to artificial intelligence, where he could model learning and test theories through computation. Influences such as Donald Hebb's work on learning with neural networks and John von Neumann's study of brain computation reinforced his belief in the connectionist approach. Hinton believed that traditional logic-based methods were inadequate for modelling how the brain learns and adapts, preferring instead the concept of adaptive weighted connections in neural networks as a more plausible and scalable mechanism.

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

Physical principles have greatly influenced Hinton's research on neural networks. An example of this is his work on Boltzmann machines, which applied statistical physics to model systems with many interacting elements, such as molecules in a gas. Boltzmann machines used equations developed by physicist Ludwig Boltzmann to determine energy states and optimise data structure, allowing tasks such as classification and generative modelling. These methods were inspired by associative memory networks by John Hopfield, who compared neural activity to energy minimisation in physical systems. Hinton developed these ideas to improve the efficiency and scalability of neural network training, which fuelled the revival of machine learning in the 2000s.