

# **Meet Subhash Kak, AI Visionary & Inventor Of Quantum Neural Computing Who Won The Padma Shri**

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I am an AI enthusiast and love keeping up with the latest events in the space. I love video games and pizza.

## Intro

- Subhash Kak, one of the biggest names in cryptography and neural network worldwide, recently accepted the Padma Shri award in the field of science and engineering. He is known for proposing ground-breaking advancements in artificial intelligence, cryptography and quantum computing.
- The Indian-American scientist was chosen for the award from a list of nearly 50,000 nominations. The Padma Shri is India's fourth largest civilian award and was given to Kak owing to his research in AI and cryptography.
- Kak is also on the Prime Minister's Science, Technology and Innovation Advisory Council, where he was appointed late last year. He is originally from Srinagar(Jammu & Kashmir) and has a long list of titles and awards to his name.
- On the occasion of his appointment as a Padma Shri, Analytics India Magazine delves into his contributions to AI and associated fields.

# Instantaneously Trained Neural Networks

- This was one of Kak's first groundbreaking [papers](#) in the field of artificial intelligence. The idea, first proposed in a paper published in 1993, is one of the more novel methods to implement a neural network.
- Instantaneously trained neural networks stand apart from other Neural Networks owing to their method of reiteration. In the ITNN architecture, a new hidden neuron node is created with every unique training sample. The training weights for this node spread to the other nodes near it, resulting in generalization.
- The weights for the node were proposed to be generated by a corner classification algorithm, two of which were proposed by Kak in his paper. One of these did not provide any generalization in its basic form but did not require computation to find the weights.
- In a traditional neural network, generalization is achieved by training the weights for the nodes through backpropagation and other incentive mechanisms. Moreover, the creation of a new node for every sample of data does not occur, with consecutive iterations being the primary method of training the model.
- Kak reported that this system solved a problem that previously required thousands of backpropagation steps in just eight steps. However, this implementation was criticized for not being scalable, as each new node added to the system increases the size of the network.

## Three-Stage Quantum Cryptography Protocol And Others

- In 2005, Kak also published a [paper](#) that explored a quantum protocol based on public key cryptography. This would ensure absolute security with all parties in the system while ensuring that all information exchange within the system took place in a completely quantum stage.
- This was proposed as an improvement over the existing BB84 protocol, as it did not revert to classical information transfer. The BB84 protocol featured qubits being transmitted in one direction in one of four different states, whereas Kak's model not only transmitted qubit information in both the stages but also allowed for the qubits to be in any arbitrary state.
- He has also published a [paper](#) on the trope in cryptography known as the “piggy bank” trope, wherein a secret can be inserted but not withdrawn without breaking the encryption. The system proposed in the paper is aimed at increasing the security of the piggy bank system by use of a coded letter that certifies the contents of the encryption.
- Moreover, cryptographic security can also be increased using this system, allowing for another component to be verified, thus increasing redundancy.

## Recognition

- Throughout his life, Kak has been recognised as a visionary in the fields of quantum computing, AI and ML. In chronological order, he has been recognised as a visiting faculty at Imperial College in London, a guest researcher at Bell Laboratories, and a visiting researcher at the Tata Institute of Fundamental Research.
- He was also recognised as one of the pioneers of quantum learning in a prominent journal. he is also a British Council Fellow, National Fellow of the Indian Institute of Advanced Study, Distinguished Alumnus of IIT Delhi and many more.

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