

May 2025

## **Prof. P. P. Vaidyanathan: Short biography and research interests**

---

---

Prof. P. P. Vaidyanathan is the Kiyoo and Eiko Tomiyasu Professor of electrical engineering at the California Institute of Technology (Caltech), and has been on the faculty since 1983. His research interests include sparse array signal processing, signal processing for digital communications, estimation theory, sparse reconstruction and compressive sensing, graph signal processing, multirate signal processing, digital filter banks and filtering, wavelets, image halftoning, genomic signal processing, and number theoretic signal processing, to name a few.

Considered to be one of the pioneering contributors to multirate signal processing research, Vaidyanathan has strongly influenced the research directions in filter banks and multirate systems. He is most well known for developing the general theory of filter banks with perfect reconstruction, as well as orthonormal filter banks, which have impacted digital communications, audio, and image coders. Vaidyanathan's book on *Multirate Systems and Filter Banks* (1992) was used as a classroom text and a research reference for more than two decades worldwide, and had major impact in the field.

One of his earliest contributions was in the area of low-sensitivity digital filter structures. He showed how such structures can be designed directly in discrete time, without the need for transforming electrical circuits into the digital domain. An early proponent of applying signal processing methods to genomics, Vaidyanathan developed methods to computationally predict the location of protein coding genes and noncoding genes. His recent work on Ramanujan-sums, and his introduction of Ramanujan subspaces have resulted in new representations and efficient algorithms for signals with hidden patterns such as periodicities. His work on sparse arrays such as coprime and nested arrays has had a major impact in array processing research, leading to many new directions in this area. A key property of these arrays is that they can identify many more sources than the number of sensors in the array. Systematic algorithms for this were developed for the first time from his research group.

A Life Fellow of IEEE, Prof. Vaidyanathan received the B.Sc., B.Tech. and M.Tech. degrees from the University of Calcutta, India, in 1974, 1977 and 1979, respectively, and the Ph.D. degree in electrical and computer engineering from the University of California at Santa Barbara, in 1982. He has written over 550 research papers and four books. He has an h-index of 85, and over 37,000 citations in googlescholar. He was the recipient of the IEEE CAS Society Golden Jubilee Medal, the Terman Award of the ASEE, the

IEEE Gustav Robert Kirchhoff Technical Field Award (2016), the IEEE Signal Processing Society's Shannon-Nyquist Technical Achievement Award (2001), the IEEE Signal Processing Society's Carl Friedrich Gauss Education Award (2012), the Norbert Wiener Society Award (2016), and the EURASIP Athanasios Papoulis Award (2021). He is a recipient of multiple awards for teaching at Caltech, including the Northrop Grumman teaching prize (2016). He is a Foreign Fellow of the Indian National Academy of Engineering (2021), a member of the U.S. National Academy of Engineering (2019), a member of the European Academy of Sciences and Arts (2024), and a recipient of the IEEE Jack S. Kilby Signal Processing Medal.