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Curriculum vitae of P. P. Vaidyanathan

Personal details

Name: Prof. P. P. Vaidyanathan

Professional Affiliation and Title: California Institute of Technology (Caltech), Kiyo and Eiko Tomiyasu Professor of Electrical Engineering

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Office Address: Department of Electrical Engineering 136-93, California Institute of Technology, Pasadena, CA 91125, USA.

Date and place of birth: October 16, 1954; Calcutta, India.

Education

- B. Sc (with honors in Physics), University of Calcutta, India, 1974.
- B. Tech., Radiophysics and Electronics, University of Calcutta, India, 1977.
- M. Tech., Radiophysics and Electronics, University of Calcutta, India, 1979.
- Ph. D., Electrical and Computer Engineering, Univ. of California, Santa Barbara, 1982.

Professional Experience

- Assistant Professor of Electrical Engineering, California Institute of Technology, 1983-1988.
- Associate Professor of Electrical Engineering, California Institute of Technology, 1988-1993.
- Professor of Electrical Engineering, California Institute of Technology, 1993-2018.
- Kiyo and Eiko Tomiyasu Professor of Electrical Engineering, California Institute of Technology, 2018-
- Executive officer of Electrical Engineering, California Institute of Technology (2002-2005).
- Consultant to various companies.

Membership in Professional Societies:

- Fellow, IEEE (1991)
- Member, National Academy of Engineering (2019)
- Foreign Fellow, Indian National Academy of Engineering (2021)
- Member, European Academy of Sciences and Arts (2024)

Editorial Activities:

- **Guest editor**, Special Issue on Coprime Sampling and Arrays, Digital Signal Processing, vol. 61, Feb. 2017.
- **Associate editor** for the IEEE Transactions on Circuits and Systems, 1999-2002.
- **Guest editor** for the Special Issue "Applications of digital signal processing", J. of the Franklin Institute, Nov. 1998.
- **Guest editor** for the Special Issue "Multirate systems, filter banks, wavelets, and applications", IEEE Circuits and Systems Transactions II, August 1998.
- **Guest editor** for the Special Issue "Theory and application of filter banks and wavelet transforms", IEEE Signal Processing Transactions, April 1998.
- **Organizing editor** for a special mini-issue of the IEEE Transactions on Circuits and Systems, on *Complex Signal Processing*, April 1987.
- **Associate editor** for the IEEE Transactions on Circuits and Systems, 1985-87.

Research interests

- 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, filtering and wavelets
- Multidimensional systems
- Image halftoning

- Genomic signal processing
- Number theoretic signal processing
- Fast algorithms

Honors and Awards

1) Elected to the European Academy of Sciences and Arts, 2024.
2) IEEE Jack S. Kilby Signal Processing Medal, 2024.
3) Athanasios Papoulis Award, EURASIP, 2021.
4) Fellow of to the Indian National Academy of Engineering, 2021.
5) Elected to the U.S. National Academy of Engineering, 2019.
6) *Norbert Wiener Society Award* of the IEEE Signal Processing Society, 2016 (the highest award of the society).
7) *Carl Friedrich Gauss Education Award* of the IEEE Signal Processing Society, 2011 (one of the major awards of the society).
8) *Claude Shannon-Harry Nyquist Technical Achievement Award* of the IEEE Signal Processing Society, 2002 (one of the major awards of the society).
9) Northrop Grumman Prize for Excellence in Teaching, Caltech, 2016.
10) IEEE Gustav Robert Kirchhoff Award, 2016 (an IEEE Technical Field Award).
11) Sixteen papers coauthored by Prof. Vaidyanathan have received prizes at international conferenes or in international journals.
12) Seven of Prof. Vaidyanathan's doctoral students have received the Charles Wilts prize for the best doctoral dissertation in the EE Department at Caltech. One of his students is the inaugural winner of the Ben P.C. Chou Doctoral Prize in Information Sciences and Technology at Caltech.
13) Eliahu I. and Joyce Jury Award, University of Miami, 2007.
14) Distinguished speaker award, Dept. of Electrical and Computer Engr., Texas A&M University, 2006.
15) Recepient of the *Golden jubilee medal* of the IEEE Circuits and Systems Society, 2000.
16) Chosen as a *distinguished lecturer* for the IEEE Signal Processing Society for the year 1996-97.
17) Recepient of the 1995 *F. E. Terman Award* of the American Society of Engineering Education (ASEE), sponsored by the Hewlett-Packard company.
18) Fellow of the IEEE since 1991.

19) Receipient of National Science Foundation's Presidential Young Investigator Award, 1986.
20) Award for *Excellence in Teaching* from the *Associated students of California Institute of Technology*, 1983. This is an undergraduate student body at Caltech.
21) Award for *Exceptional Teaching* from the *Graduate student council*, California Institute of Technology, 1993.
22) Award for *Excellence in Teaching* from the *Associated students of California Institute of Technology*, 1994.
23) University Fellowship, Univ. of California, Santa Barbara, for Ph. D studies, 1981-82.
24) Outstanding Teaching Assistant Award, College of Engineering, UCSB, 1980-81.
25) Directorate of Public Instruction (Government of West Bengal, India) stipend for the two-year M. Tech studies (1977-79).
26) University of Calcutta stipend for the three-year duration of study of B. Tech (1974-77).

Selected plenary, keynote and invited talks

1) Plenary speaker at the 11th International Symposium on Image and Signal Processing and Analysis (ISPA), Dubrovnik, Croatia, Sept. 2019.
2) Keynote speaker at the Ramanujan Centennary held at the Royal Society, London, October 2018.
3) Plenary speaker at the 24th National Conference on Communications (NCC), Hyderabad, India, February 2018.
4) Keynote speaker at the 5th IEEE Global Conference on Signal and Information Processing (GlobalSIP), Montreal, Canada, Nov. 2017.
5) Plenary speaker at the 9th IEEE Sensor Array and Multichannel Signal Processing workshop (SAM), Rio, Brazil, July 2016.
6) Plenary speaker at the International Conference on Computers and Devices for Communication (CODEC), Kolkata, India, December, 2015.
7) Plenary speaker at the Asia Pacific Signal and Information Processing Association (APSIPA) Annual Summit Conference, Siem Reap, Cambodia, December, 2014.
8) Plenary speaker at the National Symposium on Mathematical Methods and Applications, Chennai, India, Dec. 2013. This is held to honor the late Srinivasa Ramanujan every year.
9) Plenary speaker at the International Conf. on Comm. and Signal Processing (ICCSP), Calicut, India,

2011.

10) Plenary speaker at the INAE and IIT Workshop on Image and Speech Processing (WISP), Chennai, India, 2006.
11) Plenary speaker at the IEEE International Symposium on Circuits and Systems (ISCAS), Vancouver, BC, Canada, 2004.
12) Plenary speaker at the *Fourth International Conference on Sampling Theory and Applications (SAMPTA)*, Orlando, May, 2001.
13) Plenary speaker at the *Conference on Image Processing, Multiresolution analysis, and Statistics, sponsored by Georgia Institute of Technology,* Sept. 1999.
14) Plenary speaker at the Digital Filters and Signal Processing (DFSP'98), Victoria, Canada, June 1998.
15) Plenary speaker at the Eusipco '98, Rhode Island, Greece, 1998.
16) Plenary speaker at the IEEE sponsored conference, SPCOM'95, Bangalore, India, 1995.
17) Plenary speaker at the IEEE sponsored Asilomar Conference on Signals, Systems and Computers, 1988.
18) Many distinguished departmental seminars at various universities. Three recent ones are:
    - Speaker at the ECE Distinguished Lecturer Series, University of Toronto, Feb. 2023.
    - Special inaugural distinguished webinar, Indian Institute of Science, Bangalore, India, Oct 2020.
    - Special distinguished webinar, Rice University, Houston, TX, USA, August 2020.

Prize papers

There are 16 prize winning papers.

1) Winner of the IEEE Acoustics, Speech and Signal Processing Society's Senior Award for the paper "Theory and design of M-channel maximally decimated quadrature mirror filters with arbitrary M, having the perfect reconstruction property," IEEE Trans. ASSP, pp. 476-492, April 1987.
2) Winner of the S. K. Mitra Memorial award, 1990, awarded by the Institution of Electronics and Telecommunications Engineers (IETE), India, for the paper "Compression of two-dimensional band-limited signals using sub-sampling theorems," published in the IETE journal in Sept-Oct. 1988.
3) Coauthor of a paper for which the first author (former Ph.D student) received a prize from the IEEE Signal Processing Society in 1992. The paper is *T. Q. Nguyen and P. P. Vaidyanathan, "Structures*

for M-channel perfect reconstruction FIR QMF banks which yield linear-phase analysis filters," IEEE Trans. on Acoustics, Speech and Signal Processing, vol. 38, pp. 433-446, Mar. 1990.

4) P. P. Vaidyanathan, "Fundamentals of multidimensional multirate digital signal processing," Sadhana, Indian Academy of Sciences, pp. 157-176, Nov. 1990.
5) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: Byung-Jun Yoon and P. P. Vaidyanathan, "Improved estimation of discrete probability density functions using multirate models", Proc. 37th Asilomar Conference on Signals, Systems, and Computers, Monterey, CA, Nov. 2003.
6) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: Chun-Yang Chen and P. P. Vaidyanathan, "A subspace method for MIMO radar space-time adaptive processing", Proc. IEEE Int. Conf. Acoust. Speech, and Signal Proc., Honolulu, Hawaii, April 2007.
7) Winner of the IETE Students' Journal Award, 2009, awarded by the Institution of Electronics and Telecommunications Engineers (IETE), India, for the paper "Eigenfunctions of the Fourier transform" published in the IETE journal in 2008.
8) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: *P. Pal and P. P. Vaidyanathan, "Coprime sampling and the MUSIC algorithm," IEEE Signal Processing Workshop, held in Sedona, AZ, 2011.*
9) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: Piya Pal and P. P. Vaidyanathan, "Non Uniform Linear Arrays For Improved Identifiability in Cumulant Based DOA Estimation," Proc. 45th Asilomar Conference on Signals, Systems, and Computers, Monterey, CA, Nov. 2011.
10) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: Srikanth Tenneti and P. P. Vaidyanathan, "Minimal Dictionaries For Spanning Periodic Signals," Proc. 49th Asilomar Conference on Signals, Systems, and Computers, Monterey, CA, Nov. 2015.
11) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize: C.-L. Liu and P. P. Vaidyanathan, "Remarks on the spatial smoothing step in coarray MUSIC," IEEE Signal Processing Letters, vol. 22, no. 9, pp. 1438–1442, Sept. 2015.
12) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize

from the IEEE Signal Processing Society: Chun-Lin Liu and P. P. Vaidyanathan, "Super nested arrays : sparse arrays with less mutual coupling than nested arrays," Proc. IEEE Int. Conf. Acoust. Speech, and Signal Proc., Shanghai, China, March 2016.

13) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize from the IEEE Signal Processing Society: Chun-Lin Liu and P. P. Vaidyanathan, "High Order Super Nested Arrays," Proc. IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM), Rio de Janerio, 2016.

14) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize: Chun-Lin Liu and P. P. Vaidyanathan, "Two-Dimensional Sparse Arrays with Hole-Free Coarray and Reduced Mutual Coupling," Proc. 50th Asilomar Conference on Signals, Systems, and Computers, Monterey, CA, Nov. 2016.

15) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize: C.-L. Liu and P. P. Vaidyanathan, "Robustness of coarrays of sparse arrays to sensor failure," Proc. IEEE Int. Conf. Acoust. Speech, and Signal Proc., Calgary, Canada, April 2018.

16) Coauthor of a paper for which the first author (Ph.D student) received the best student-paper prize: P. Kulkarni and P. P. Vaidyanathan, "Rational Arrays for DOA Estimation: New Insights and Performance Evaluation," Proc. Asil. Conf. Sig., Sys., and Comp., Monterey, CA, Oct.-Nov. 2022.

Publications

There are about 580 publications. The googlescholar h-index is 89.

Googlescholar page: https://scholar.google.com/citations?user=JZlbx8cAAAAJ&hl=en

1) **Papers.** About 580 papers have been authored or coauthored. Of these, over 200 are journal articles and the others are articles in various Conference Proceedings. Sixteen papers have received prizes for technical quality.

2) **Text books.** Author or coauthor of five text books.

   a) P. P. Vaidyanathan, *Multirate systems and filter banks,* Prentice Hall, 1993. This has been used for graduate level courses at many Universities, including Caltech.

   b) P. P. Vaidyanathan, *The theory of linear prediction,* Morgan & Claypool publishers, 2008.

   c) P. P. Vaidyanathan, S.-M. Phoong, and Y.-P. Lin, *Signal processing and optimization for transceiver systems,* Cambridge University Press, 2010.

d) Y.-P. Lin, S.-M. Phoong, and P. P. Vaidyanathan, *Filter bank transceivers for OFDM and DMT systems,* Cambridge University Press, 2010.

e) P. P. Vaidyanathan, *Signals, Systems, and Signal Processing,* Cambridge University Press, 2024.

3) **Chapters.** More than 10 chapters have been written for various books (edited collections).

Other Professional Activities

1) Awards Board Member, IEEE Signal Processing Society, 2013-16.
2) **Special session organizer and chairman** for a session on *Optimization of subband coders based on the input signal,* IEEE Int. Symp. on Circuits and Systems, Monterey, CA, May 1998.
3) **Editorial board member** for the journal *Applied and computational harmonic analysis,* 1993–2003
4) **Associate editor** for the new journal *The IEEE Signal Processing Letters,* 1993–
5) **Special session organizer and chairman** for a session on *Filter banks and wavelets* IEEE Int. Symp. on Circuits and Systems, Chicago, Illinois, May 1993.
6) **Technical Program Chairman,** IEEE International Symposium on Circuits and Systems, San Diego, CA, May 1992.
7) **Special Sessions Organizer and chairman,** for a session on *Multirate digital filters, filter banks and applications,* IEEE Int. Symp. on Circuits and Systems, New Orleans, Louisiana, May 1990.
8) **Member,** Technical Committee on Digital Signal Processing, IEEE Signal Processing Society, 1990–
9) **Member,** Technical Committee on Digital Signal Processing, IEEE Circuits and Systems Society, 1987–
10) **Special Sessions organizer and chairman** for a session on digital filters, Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, Nov. 1987.
11) **Vice Chairman** for the Technical Program Committee, at the IEEE International Symposium on Circuits and Systems, Newport Beach, CA, May 1983.
12) **Editorial Reviewer** of textbook manuscripts for several leading publishers.
13) **Reviewer** for several journals including IEEE and IEE. Reviewer for proposals submitted for the National Science Foundation.
14) **Consultant** for several Companies in the US, in the Signal Processing technical area. This includes

(i) Lockheed, (ii) Niravoice, (iii) Interstate electronics, and (iv) Aware, Inc., Boston. (v) the DSP group at the Jet Propulsion Laboratories (JPL) (vi) Sonix Technologies, Inc. Salt Late city, Utah, (vii) Fish and Neave, Palo Alto, CA.

15) **Professional Societies**: Member of the IEEE Societies on Circuits and Systems, and Signal Processing.

Courses taught at Caltech

1) 1983-1984: EE112abc. Three term sequence on *passive and active filters*.
2) 1984-1987. EE112abc. Three term sequence on *digital signal processing*.
3) 1987-88: Fall and winter: EE32ab, *Linear Systems* (required EE junior level course); Spring: EE128 (new course), *Multirate signal processing.*
4) 1988-1989: Fall and winter: EE112ab; Spring: EE164 (new course), *Adaptive filters, linear prediction and optimal filters.*
5) 1990-1992: EE112ab and EE128 repeated.
6) 1992-1993: Fall and winter: Taught EE32ab and supervised EE112ab; Spring: EE128 (mutitrate DSP and wavelets).
7) 1993-1994 and 1994-1995: EE112 (DSP basics), EE128 (multirate DSP and wavelets), and EE166 (Data compression).
8) 1995-1996: EE32a, EE32b and EE166 (Fall, Winter and Spring).
9) 1996-1997: EE112, EE128, EE166 (Fall, Winter and Spring).
10) 1997-1998: EE112, EE128 (Fall and Winter).
11) 1999: EE32, EE112b , EE 112c (Fall, Winter, Spring).
12) 2000-2001: EE112abc (Fall, Winter, Spring).
13) 2002-: EE111, EE112ab (Fall, Winter, Spring).
14) 2003-2018: EE 111, EE112 (Fall, Winter).
15) 2019-2023: EE 1, EE 111, EE112

Prof. Vaidyanathan's students who received Ph.D from Caltech

1) Dr. T. Q. Nguyen (Ph.D, June 1989). Professor and past Chairman, Electrical and Computer Engineering, University of California, San Diego.

2) V. C. Liu (Ph.D, June 1990). Presently with General Instrument, San Diego, CA.
3) Dr. (Ms.) Z. Doganata (Ph.D, June 1990).
4) Dr. R. D. Koilpillai (Ph.D June 1991), Dean of Planning, Indian Institute of Technology (IIT) Madras, India.
5) Dr. V. Sathe (Ph.D June 1991). Presently with General Instrument, San Diego, CA.
6) Dr. Anand Soman (Ph.D 1993), Signal Labs, Bombay, India.
7) Dr. Tsuhan Chen (Ph.D 1993), Deputy President at National University of Singapore.
8) Dr. Igor Djokovic (Ph.D 1995).
9) Dr. See-May Phoong (Ph.D 1996), Faculty at National Taiwan University, Taipei, Taiwan.
10) Dr. Yuan-Pei Lin (Ph.D 1997), Faculty at Chiao-Tong University, Hsinchu, Taiwan.
11) Dr. Jamal Tuqan (Ph.D 1998)
12) Dr. Ahmet Kirac (Ph.D 1998)
13) Dr. Murat Mese (Ph. D 2001), Member of Technical Staff, Broadcom, Irvine, CA.
14) Dr. Sony Akkarakaran (Ph. D 2001), Member of Technical Staff, Qualcom, San Diego, CA.
15) Dr. Bojan Vrcelj (Ph. D 2003), now at Qualcom, San Diego, CA.
16) Dr. Andre Tkacenko (Ph. D 2005), now at JPL, La Canada, CA.
17) Dr. Byung-Jun Yoon (Ph. D 2007), now a faculty member at Texas A&M University.
18) Dr. Borching Su, (Ph. D 2008), now a faculty at the National Taiwan University, Taipei, Taiwan.
19) Dr. Chun-Yang Chen, (Ph. D 2009), Facebook.
20) Dr. Ching-Chih Weng, (Ph. D 2011), Facebook.
21) Dr. Chih-Hao Liu, (Ph. D 2013), Qualcom, San Diego.
22) Dr. Piya Pal (Ph. D 2013), Associate professor at University of California, San Diego.
23) Dr. Chun-Lin Liu, (Ph. D 2018), Assitant Professor at National Taiwan University.
24) Dr. Srikanth Tenneti, (Ph. D 2018), now with Amazon Web Services.
25) Dr. Oguzhan Teke, (Ph. D 2020), now with Neural Propulsion Systems, Inc., Pasadena, CA.

Vaidyanathan's students who received best Ph.D thesis prizes

Item 8 is the Ben Chou prize in Information Science and Technology. The others are Charles Wilts prizes in Electrical Engineering.

1) Tsuhan Chen, 1993.

2) See-May Phoong, 1997.
3) Andre Tkacenko, 2004.
4) Borching Su, 2008.
5) Ching-Chih Weng, 2012.
6) Piya Pal, 2014.
7) Srikanth Tenneti, 2018.
8) Chun-Lin Liu, 2018.
9) Oguzhan Teke, 2020.

Vaidyanathan's students who are Fellows of the IEEE

1) Dr. T. Q. Nguyen (Ph.D, June 1989). Distinguished Professor, Dept. Electrical and Computer Engineering, University of California, San Diego.
2) Dr. Tsuhan Chen (Ph.D 1993), Deputy President, National University of Singapore.

Current Doctoral Students:

Pranav Kulkarni and Po Chih Chen.