

## CURRICULUM VITAE

April 20, 2018

### **DIMITRIS ANASTASSIOU**

**Charles Batchelor Professor of Electrical Engineering and Professor of Systems Biology**

**Education:** (Electrical Engineering and Computer Science)

Ph.D. University of California, Berkeley, 1979

M.S. University of California, Berkeley, 1975

Graduation Diploma National Technical University of Athens, Greece, 1974 (5 year program)

**Work Experience:**

Professor 1992 to present  
Acting Chairman Part of 1999-00  
Associate Professor 1985 to 1992  
Assistant Professor 1983 to 1985  
Department of Electrical Engineering  
Columbia University, New York

Visiting Associate Professor 1985-86 Ac. yr.  
Division of Computer Science  
National Technical University of Athens, Greece

Research Staff Member 1978 to 1983  
IBM Thomas J. Watson Research Center  
Yorktown Heights, New York

**Honors and Awards:**

Fellow, National Academy of Inventors, as of March 2014.

Charles Batchelor endowed professorship, as of March 11, 2011.

2001 Great Teacher Award, Society of Columbia Graduates, Columbia University.

IEEE Fellow, 1998, “for contributions to video technology, developing high-performance digital image and video coding techniques.”

National Science Foundation Presidential Young Investigator Award, 1986-1991.

IBM Outstanding Innovation Award, November 1982, for algorithm development and implementation for the IBM videoconferencing system.

IBM Invention Achievement Award, January 1983 for authorship of a significant number of IBM patents.

Eugene C. and Mona Fay Gee Graduate Scholarship, University of California, Berkeley, 1975-76 academic year.

**Ph.D. Thesis:**

“Applications of Information Theory to Image Encoding”

Advisor: Professor David J. Sakrison, University of California, Berkeley.

**Membership in Professional and Scientific Societies:**

International Society for Computational Biology

Sigma Xi

Institute of Electrical and Electronics Engineers (IEEE)

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Marital Status: Married, one child

### **Columbia University Administrative Service:**

Director, Genomic Information Systems Laboratory, 2002-present.

Director, Image and Advanced Television Laboratory, 1985-2000.

Director, Columbia New Media Technology Center (CNMTC), 1998.

Project Leader of "ADVENT" project, 1989-2000.

Associate Director for Multimedia Applications, Center for Telecommunications Research, 1993-1996.

Member of Executive Committee Board of Center for Telecommunications Research, 1988-1995.

Member of Executive Committee Board of "Center for Advanced Technology in Computers and Information Systems," April 1991 - July 1993.

### **Books and Book Chapters**

S.-F. Chang, D. Anastassiou, A. Eleftheriadis and J. Pavlik, Editors, "Video on Demand Systems: Technology, Interoperability and Trials," Kluwer Academic Publishers, 1997 (ISBN 0-7923-9949-8).

X. Wang and D. Anastassiou and D. Guo, "Statistical Inference of Transcriptional Regulatory Networks," in Genomic Signal Processing and Statistics, E. Dougherty et al. (Ed.), Hindawi Pub., New York, 2005, pp. 321-340.

### **Refereed Journal Publications:**

1. D. Anastassiou and D.J. Sakrison, "New Bounds to R(D) for Additive Sources and Applications to Image Encoding," IEEE Transactions on Information Theory, vol. IT-25, no. 2, March 1979, pp. 145-155.
2. D. Anastassiou and D.J. Sakrison, "A Probability Model for Simple Closed Random Curves," IEEE Transactions on Information Theory, vol. IT-27, No. 3, May 1981, pp. 376-381.
3. D. Anastassiou and D.J. Sakrison, "Some Results Regarding the Entropy Rate of Random Fields," IEEE Transactions on Information Theory, vol. IT-28, no. 2, March 1982, pp. 340-343.
4. D. Anastassiou and K.S. Pennington, "Digital Halftoning of Images," IBM Journal of Research and Development, special issue on Image Processing and Pattern Recognition, vol. 26, no. 6, November 1982, pp. 687-698. This paper is also reprinted in "Milestone Series, Selected Papers on Digital Halftoning," Jan P. Allebach, Editor, SPIE Press, 1999.

5. D. Anastassiou, M. Brown, H.C. Jones, E. Kubiliun, J.L. Mitchell, W.B. Pennebaker, K.S. Pennington, "Series/I Based Videoconferencing System," IBM Systems Journal, vol. 22, Nos. 1 and 2, 1983, pp. 97-110.
6. D. Anastassiou, W.B. Pennebaker and J.L. Mitchell, "Gray Scale Image Coding for Freeze-Frame Videoconferencing," IEEE Transactions on Communications, Vol. COM-34, No. 4, April 1986, pp. 382-395. This paper is also summarized in section 6.1 of the book: Digital Pictures, by A.N. Netravali and B. Haskell, Plenum Press, 1988, pp. 506-509.
7. Y.P. Tsvividis and D. Anastassiou, "Switched-capacitor neural networks," IEE Electronics Letters, vol. 23, no. 18, August 1987, pp. 958-959.
8. D. Anastassiou, and S. Kollias, "Progressive Half-Toning of Images," IEE Electronics Letters, vol. 24, no. 8, April 14, 1988, pp. 489-490.
9. D. Anastassiou, "Neural Net Based Nonstandard A/D Conversion," IEE Electronics Letters, vol. 24, no. 10, May 12 1988, pp. 619-620.
10. Maglaris, D. Anastassiou, P. Sen, G. Karlsson and J. Robins, "Performance Models of Statistical Multiplexing in Packet Video Communications," IEEE Transactions on Communications, July 1988, pp. 834-844. This paper is reprinted in the book: Visual Communication: Technology and Applications, edited by T.R. Hsing and A.G. Tescher, SPIE publishing, pp. 359-370.
11. J.L. Mitchell, W.B. Pennebaker, D. Anastassiou and K.S. Pennington "Graphics Image Coding for Freeze-Frame Videoconferencing," IEEE Transactions on Communications, vol. 37, no. 5, May 1989, pp. 515-522.
12. P. Sen, B. Maglaris and D. Anastassiou, "Models for packet switching of variable bit rate video sources," IEEE Journal on Selected Areas in Communications, vol. 7, no. 5, June 1989, pp. 865-870.
13. S. Kollias and D. Anastassiou, "An Adaptive Algorithm for the Efficient Training of Artificial Neural Networks," IEEE Transactions on Circuits and Systems, vol. 36, no. 8, August 1989, pp. 1092-1101.
14. D. Anastassiou, "Error-Diffusion Coding for A/D Conversion," IEEE Transactions on Circuits and Systems, vol. 36, no. 9, September 1989, pp. 1175-1187. This paper is also reprinted in "Milestone Series, Selected Papers on Digital Halftoning," Jan P. Allebach, Editor, SPIE Press, 1999.

15. F.M. Wang, D. Anastassiou and A.N. Netravali, "Time-Recursive De-interlacing for IDTV and Pyramid Coding," *Image Communication Journal*, vol. 2, no. 3, October 1990, pp. 365-374.
16. R. Mokry, D. Anastassiou and D. Teichner, "Bandwidth Reduction for HDTV Transmission-Alternatives and Subjective Results," *IEEE Transactions on Consumer Electronics*, vol. 36, no. 4, November 1990, pp. 837-847.
17. D. Anastassiou and M. Vetterli, "Television by the Bit," *IEEE Circuits and Devices Magazine*, vol. 7, no.1, January 1991, pp. 16-22.
18. F.M. Wang and D. Anastassiou, "High Quality Coding of the Even Fields Based on the Odd Fields of Interlaced Video Sequences," *IEEE Transactions on Circuits and Systems*, vol. 38, no. 1, January 1991, pp. 140-142.
19. S. Kollias and D. Anastassiou, "A Unified Neural Network Approach to Digital Image Half-Toning," *IEEE Transactions on Signal Processing*, vol. 39, no. 4, April 1991, pp. 980-984. This paper is also reprinted in "Milestone Series, Selected Papers on Digital Halftoning," Jan P. Allebach, Editor, SPIE Press, 1999.
20. Y. Papananos and D. Anastassiou, "Analysis and VLSI Architectures of a Nonlinear Edge-Preserving Noise Smoothing Image Filter," *IEE Proceedings-G*, vol. 138, no. 4, August 1991, pp. 433-441.
21. D. Anastassiou and S. Kollias, "A Progressive Scheme for Digital Image Half-Toning, Coding of Half-Tones and Reconstruction," *IEEE Transactions on Selected Areas in Communications*, special issue on Speech and Image Coding, June 1992.
22. Y.B. Yu and D. Anastassiou, "Interlaced Video Coding with Field-Based Multiresolution Representation," *Image Communication Journal*, vol. 5, nos. 1-2, February 1993, pp. 185-199.
23. K. Jensen and D. Anastassiou, "Digitally Assisted De-interlacing for EDTV," *IEEE Transactions on Circuits and Systems for Video Technology*, April 1993.
24. D. Anastassiou, "Digital Television," Invited Paper, *IEEE Proceedings*, April 1994.
25. T.H. Chiang and D. Anastassiou, "Hierarchical coding of Digital Television," *IEEE Communications Magazine*, May 1994.
26. R. Mokry and D. Anastassiou, "Minimal Error Drift in Frequency Scalability for Motion Compensated DCT Coding," *IEEE Transactions on Circuits and Systems for Video Technology*, August 1994.

27. A. Eleftheriadis, S. Pejhan, and D. Anastassiou, "Architecture and Algorithms of the Xphone Multimedia Communication System", ACM/Springer-Verlag Multimedia Systems Journal, Vol. 2, No. 2, August 1994, pp. 89-100.
28. K. Jensen and D. Anastassiou, "Sub-Pixel Edge Localization and the Interpolation of Still Images," IEEE Transactions on Image Processing, Vol. 4, No. 3, March 1995.
29. S. Pejhan, A. Eleftheriadis, and D. Anastassiou, "Distributed Multicast Address Management in the Global Internet", IEEE Journal on Selected Areas in Communications (Special Issue on the Global Internet), Vol. 13, No. 8, October 1995, pp. 1445-1456.
30. S.-F. Chang, A. Eleftheriadis and D. Anastassiou, "Development of Columbia University's Video on Demand Testbed," Image Communication Journal, special issue on Video on Demand and Interactive Television, Vol. 8, No. 3, April 1996, pp. 191-208.
31. S. Pejhan, M. Schwartz and D. Anastassiou, "Error Control Using Retransmission Schemes in Multicast Transport Protocols for Real-Time Media, IEEE/ACM Transactions on Networking, Vol. 4, No. 3, June 1996, pp. 413-428.
32. B.L. Tseng and D. Anastassiou, "Multi-Viewpoint Video Coding with MPEG-2 Compatibility," IEEE Transactions on Circuits and Systems for Video Technology, Vol. 6, No. 4, August 1996, pp. 414-419.
33. D. Anastassiou, "What does MPEG-4 mean to me," Image Communication Journal, special issue on MPEG-4, Part 1: Invited Papers, Vol. 9, No. 4, May 1997, p. 469-470.
34. C.-T. Chu, D. Anastassiou and S.-F. Chang, "Hybrid Object-Based/Block Based Coding in Video Compression at Very Low Bitrate," Image Communication Journal, special issue on MPEG-4, Part 2, Vol. 10, Nos. 1-2, pp. 159-172, July 1997, pp. 159-172.
35. S.-F. Chang, A. Eleftheriadis, D. Anastassiou, S. Jacobs, H. Kalva and J. Zamora, "Columbia's VoD and Multimedia Research Testbed with Heterogeneous Network Support," International Journal on Multimedia Tools and Applications, special issue on Video on Demand Systems, Vol. 5, No. 2, September 1997, pp. 171-184.
36. S. Jacobs, A. Eleftheriadis and D. Anastassiou, "Silence Detection for Multimedia Communication Systems," ACM/Springer Verlag Multimedia Systems Journal, Vol. 7, No. 2, March 1999, pp. 157-164.
37. T.-H. Chiang and D. Anastassiou, "Hierarchical HDTV/SDTV Compatible Coding Using Kalman Statistical Filtering," IEEE Transactions on Circuits and Systems for Video Technology, Vol. 9, No. 3, April 1999, pp. 424-438.

38. J. Zamora, D. Anastassiou, S.-F. Chang, and L. Ulbricht, "Objective and Subjective Quality of Service Performance of Video-on-Demand in ATM-WAN," *Image Communication Journal*, special issue on Error Resilience, No. 24, August 1999, pp. 635-654.
39. J. Zamora, S. Jacobs, A. Eleftheriadis, S.-F. Chang and D. Anastassiou, "A Practical Methodology for Guaranteeing QoS for Video on Demand," *IEEE Transactions on Circuits and Systems for Video Technology*, Vol.10, No 1, February 2000, pp. 166-178.
40. D. Anastassiou, "Frequency-Domain Analysis of Biomolecular Sequences," *Bioinformatics*, vol. 16, no. 12, December 2000, pp. 1073-1081.
41. D. Anastassiou, "Genomic Signal Processing," *IEEE Signal Processing Magazine* theme article, Vol. 18, No 4, July 2001, pp. 8-20.
42. D. Sussillo, A. Kundaje and D. Anastassiou, "Spectrogram Analysis of Genomes," *EURASIP Journal on Applied Signal Processing*, special issue on Genomic Signal Processing, Vol. 2004, No. 1, Jan. 2004, pp. 29-42.
43. G. Cavelier and D. Anastassiou, "Data-Based Model and Parameter Evaluation in Dynamic Transcriptional Regulatory Networks," *Proteins: Structure, Function and Bioinformatics*, Vol. 55, No. 2, May 2004, pp. 339-350.
44. G. Cavelier and D. Anastassiou, "Phenotype Analysis Using Network Motifs Derived from Changes in Regulatory Network Dynamics," *Proteins: Structure, Function and Bioinformatics*, Vol. 60, No. 3, August 2005, pp. 525-546.
45. D. Anastassiou, H. Liu and V. Varadan, "Variable Window Binding for Mutually Exclusive Alternative Splicing," *Genome Biology*, Vol. 7, Issue 1, pp. R2.1-R2.12, 2006. [Highly accessed]
46. V. Varadan, D. Miller III and D. Anastassiou, "Computational Inference of the Molecular Logic for Synaptic Connectivity in *C. elegans*," *Bioinformatics*, Vol. 22, Issue 14 – ISMB 2006, pp. e497-506, 2006.
47. V. Varadan and D. Anastassiou, "Inference of Disease-Related Molecular Logic from Systems-Based Microarray Analysis," *PLoS Computational Biology*, Vol. 2, Issue 6, June 2006, pp. 585-597.
48. D. Anastassiou, "Computational Analysis of the Synergy among Multiple Interacting Genes" (Review Article), *Molecular Systems Biology*, Vol. 3, No. 83, February 2007.

49. K.C. Liang, X. Wang and D. Anastassiou, "Bayesian basecalling for DNA sequence analysis using hidden Markov models," *ACM/IEEE Transactions on Computational Biology and Bioinformatics*, Vol. 4, No. 3, July-September 2007, pp. 430-440.
50. K.C. Liang, X. Wang and D. Anastassiou, "A Profile-Based Deterministic Sequential Monte Carlo Algorithm for Motif Discovery," *Bioinformatics*, Vol. 24, Issue 1, January 2008, pp. 46-55.
51. J. Watkinson, X. Wang, T. Zheng and D. Anastassiou, "Identification of gene interactions associated with disease from gene expression data using synergy networks," *BMC Systems Biology*, Vol. 2, Issue 10, February 2008. [Highly accessed].
52. K.C. Liang, X. Wang and D. Anastassiou, "A sequential Monte Carlo Method for Motif Discovery," *IEEE Transactions on Signal Processing*, Vol. 56, No. 9, September 2008, pp. 4496-4507.
53. J. Watkinson, K.C. Liang, X. Wang, T. Zheng and D. Anastassiou, "Inference of regulatory gene interactions from expression data using three-way mutual information," *Annals of the New York Academy of Sciences*, invited paper as best performer in the DREAM2 "Genome Scale" network inference challenge, Vol. 1158, pp. 302-313, March 2009.
54. J. Watkinson and D. Anastassiou, "Synergy Disequilibrium Plots: graphical visualization of pairwise synergies and redundancies of SNPs with respect to a phenotype," *Bioinformatics*, Vol. 25, No. 11, pp. 1445-1446, July 2009.
55. A. Iliadis, J. Watkinson, D. Anastassiou and X. Wang, "A haplotype inference algorithm for trios based on deterministic sampling," *BMC Genetics*, Vol. 11:78, pp. 1-11, August 2010.
56. H. Kim, J. Watkinson, V. Varadan and D. Anastassiou, "Multi-cancer computational analysis reveals invasion-associated variant of desmoplastic reaction involving INHBA, THBS2 and COL11A1," *BMC Medical Genomics*, Vol. 3, Issue 51, November 2010. [Highly accessed]
57. Y.H. Cheung, J. Watkinson and D. Anastassiou, "Conditional meta-analysis stratifying on detailed HLA genotypes identifies a novel type 1 diabetes locus around TCF19 in the MHC," *Human Genetics*, Vol. 129, No. 2, pp. 161-176, February 2011.
58. H. Kim, J. Watkinson and D. Anastassiou, "Biomarker Discovery Using Statistically Significant Gene Sets," *Journal of Computational Biology*, Vol. 18, No. 10, pp. 1329-1338, October 2011.



59. D. Anastassiou, V. Rumjantseva, W.Y. Cheng, J. Huang, P. Canoll, D.J. Yamashiro and J.J. Kandel, "Human cancer cells express Slug-based epithelial-mesenchymal transition gene expression signature obtained in vivo," *BMC Cancer*, Vol. 11, Issue 529, December 2011. [Highly accessed]
60. B. Andreopoulos and D. Anastassiou, "Integrated Analysis Reveals hsa-miR-142 as a Representative of a Lymphocyte-Specific Gene Expression and Methylation Signature," *Cancer Informatics*, Vol. 11, pp. 61-75, March 2012.
61. W.Y. Cheng, J.J. Kandel, D.J. Yamashiro, P. Canoll and D. Anastassiou, "A multi-cancer mesenchymal transition gene expression signature is associated with prolonged time to recurrence in glioblastoma," *PLoS ONE*, Vol. 7, Issue 4, April 2012.
62. A. Iliadis, D. Anastassiou and X. Wang, "A unified framework for haplotype inference in nuclear families," *Annals of Human Genetics*, Vol. 76, Issue 4, pp. 312-25, July 2012.
63. A. Iliadis, D. Anastassiou and X. Wang, "Fast and accurate haplotype frequency estimation for large haplotype vectors from pooled DNA data," *BMC Genetics*, Vol. 13, Issue 94, pp. 312-25, October 2012.
64. W.Y. Cheng, T.H. Ou Yang and D. Anastassiou, "Biomolecular events in cancer revealed by attractor metagenes," *PLoS Computational Biology*, Vol. 9, Issue 2, February 2013.
65. W.Y. Cheng, T.H. Ou Yang and D. Anastassiou, "Development of a prognostic model for breast cancer survival in an open challenge environment," *Science Translational Medicine*, Vol. 5, Issue 181, p. 181ra50, April 2013.
66. G.H. Jajamovich, A. Iliadis, D. Anastassiou and X. Wang, "Maximum-parsimony haplotype frequencies inference based on a joint constrained sparse representation of pooled DNA," *BMC Bioinformatics*, Vol. 14, Issue 270, September 2013.
67. S.L. Hernandez, D. Banerjee, A. Garcia, T. Kangsamaksin, W.Y. Cheng, D. Anastassiou, Y. Funahashi, A. Kadenhe-Chiweshe, C.J. Shawber, J.K. Kitajewski, J.J. Kandel and D.J. Yamashiro, "Notch and VEGF pathways play distinct but complementary roles in tumor angiogenesis," *Vascular Cell*, Vol. 5, Issue 1, p. 17, September 2013.
68. C.P. Miller, J.D. Thorpe, A.N. Kortum, C.M. Coy, W.Y. Cheng, T.S. Ou Yang, D. Anastassiou, J. D. Beatty, N.D. Urban and C.A. Blau, "JAK2 Expression is Associated with Tumor-Infiltrating Lymphocytes and Improved Breast Cancer Outcomes: Implications for Evaluating JAK2 Inhibitors," *Cancer Immunology Research*, Vol. 2, Issue 4, April 2014.

69. A. Iliadis, D. Anastassiou and X. Wang, "A Sequential Monte Carlo framework for haplotype inference in CNV/SNP genotype data," *EURASIP Journal on Bioinformatics and Systems Biology*, *EURASIP Journal on Bioinformatics and Systems Biology*, Vol. 7, April 2014.
70. T.S. Ou Yang, W.Y. Cheng, T. Zheng, M.A. Maurer and D. Anastassiou, "Breast Cancer Prognostic Biomarker Using Attractor Metagenes and the FGD3-SUSD3 Metagene," *Cancer Epidemiology, Biomarkers & Prevention*, Vol. 23, Issue 12, pp. 2850-6, December 2014.
71. A. Elmas, T.H Ou Yang, X. Wang and D. Anastassiou, "Discovering Genome-Wide Tag SNPs Based on the Mutual Information of the Variants," *PLOS ONE*, Vol. 11, Issue 12, e0167994. December 2016
72. D. Anastassiou, "Comment on A COL11A1-correlated pan-cancer gene signature of activated fibroblasts for the prioritization of therapeutic targets," *Cancer Letters*, Vol. 393, pp. 125-126, May 2017.
73. V. Thorsson, ..., D. Anastassiou, ... and L. Shmulevich, "The Immune Landscape of Cancer," *Immunity*, Vol. 48, No. 4, pp. 812-830, April 2018.

#### **Issued U.S. Patents:**

1. D. Anastassiou and J.L. Mitchell, "Gray Scale Image Data Compression with Code Words a Function of Image History," U.S. Patent 4,369,463, issued on January 18, 1983.
2. D. Anastassiou and W.B. Pennebaker, "Non-linear Filtering for Smoothing of Gray-Scale Images," U.S. Patent 4,504, 864, issued on March 12, 1985
3. D. Anastassiou, "Data Compression Method for Graphics Images," U.S. Patent 4,546,385, issued on October 8, 1985.
4. D. Anastassiou and W.B. Pennebaker, "Correction of Shading Effects in Video Images," U.S. Patent 4,695,884, issued on September 22, 1987.
5. D. Anastassiou, "Analog to Digital Conversion using Correlated Quantization and Collective Optimization," U.S. Patent 4,926,180, issued on May 15, 1990.
6. F.M. Wang, D. Anastassiou and A.N. Netravali, "Time-Recursive Deinterlace Processing for Television-type Signals," U.S. Patent 5,134,480, issued on July 28, 1992.

7. K. Jensen and D. Anastassiou, "Digitally Assisted Motion Compensated Deinterlacing for Enhanced Definition Television," U.S. Patent 5,305,104, issued on April 19, 1994.
8. F.M. Wang and D. Anastassiou, "Systems and Methods for Coding Even Fields of Interlaced Video Sequences," U.S. Patent 5,193,004, issued on March 9, 1993, re-issue no. 35,093 on Nov. 21, 1995.
9. B. Tseng and D. Anastassiou, "Multi-Viewpoint Digital Video Coder/Decoder and Method," U.S. Patent 5,617,334, issued on April 1, 1997.
10. K. Ramchandran, Y. -B. Yu, M. Vetterli, and D. Anastassiou, "JPEG/MPEG Decoder-Compatible Optimized Thresholding for Image and Video Signal Compression," U.S. Patent 5,734,755, issued on March 31, 1998.
11. A. Eleftheriadis, D. Anastassiou, S.-F. Chang and S. Nayar, "Methods and Apparatus for Performing Digital Image and Video Segmentation and Compression Using 3-D Depth Information," U.S. Patent 6,055,330, issued on April 25, 2000.
12. D. Anastassiou and J. Watkinson, "Method of selecting genes from continuous gene expression data based on synergistic interactions among genes," U.S. Patent 8,086,409, issued on December 27, 2011.
13. D. Anastassiou and V. Varadan, "Method of selecting genes from gene expression data based on synergistic interactions among the genes," U.S. Patent 8,234,077, issued on July 31, 2012.
14. D. Anastassiou and V. Varadan, "System and method for multiple-factor selection," U.S. Patent 8,290,715, issued on October 16, 2012.