

List of Publications
Hrushikesh Narhar Mhaskar

Books:

1. Weighted Polynomial Approximation, World Scientific, Singapore, 1996.
2. Guest Editor : Mathematical Aspects of Neural Networks, Special Issue of Advances in Computational Mathematics, **5** (1996) (With C. A. Micchelli).
3. Fundamentals of Approximation Theory, Narosa Publishing Co., Delhi, 2000 (With D. V. Pai).
4. Local analysis of spectral and scattered data; in preparation, to be published by Atlantis Publications (Springer Verlag).
5. Representation of Functions on Big Data, in preparation, Atlantis Press (Springer Verlag) (With C. K. Chui).
6. Co-Editor: Wavelet Analysis and Applications, Proceedings of the international workshop in Delhi, 1999, Narosa Publishing Co., Delhi, 2001. (With P. K. Jain, M. Krishnan, J. Prestin, and D. Singh).
7. Co-Editor: Frontiers in interpolation and approximation, Dedicated to the memory of Ambikeshwar Sharma, Chapman and Hall/CRC, Boca Raton, Florida, 2006 (With N. K. Govil, R. N. Mohapatra, Z. Nashed, and J. Szabados).
8. Co-Editor: Special volumes of **Journal of Approximation Theory** in memory of George G. Lorentz, Volumes 158, 159 (two issues each), Elsevier, 2009 (With C. K. Chui)

Articles:

1. Weighted polynomial approximation in rearrangement invariant Banach function spaces on the whole real line; Indian J. Math., **22** (3)(1980), 209-224 (with G. Freud).
2. K -functionals and moduli of continuity in weighted polynomial approximation; Arkiv for Mat., **21** (1983), 145-161 (with G. Freud).
3. Weighted analogues of Nikolskii-type inequalities and their applications; in Proc. Conference on Harmonic Analysis in Honor of A. Zygmund (Becker, et al., eds.), Vol. II (1983), Wadsworth International: Belmont, 783-801.
4. Weighted polynomial approximation of entire functions, I; J. of Approximation Theo., **35** (1982), 203-213.
5. Weighted polynomial approximation of entire functions, II; J. of Approximation Theo., **33** (1981), 59-68.
6. Comonotone approximation by splines of piecewise monotone functions: J. of Approximation Theo. **35** (1982) 364-369 (with D. Leviatan).
7. The rate of monotone spline approximation in the L_p -norm; SIAM J. of Math. Anal., **13**(5) 1982, 866-874 (with D. Leviatan).
8. On a problem of G. Freud; J. of Math, Anal. and Appl., **96** (1983), 395-404.
9. On the domain of convergence of expansions in polynomials orthogonal with respect to general weight functions on the whole real line; Acta. Math. Acad. Sci. Hungar., **44**(3-4) (1984), 223-227.
10. Extremal problems associated with polynomials with exponential weights; Trans. Amer. Math. Soc., **285** (1984), 223-234 (with E.B. Saff).
11. Extremal problems for polynomials with Laguerre weights; in Approximation Theory, IV; College Station Texas, 1983, (Chui, et. al. eds.), Academic Press, 1983, 619-624 (with E.B. Saff).

12. Polynomials with Laguerre weights in L_p ; in Proc. Conf. Rational approximation and interpolation, Tampa, Florida, 1983, (Graves-Morris, et. al. eds.) 511-523 (with E.B. Saff).
13. On the smoothness of Fourier transform; in the Proc. International Symposium on Interpolation spaces, Lund. Sweden, 1983 (Cwickel, Peetre, eds.), Lecture Notes, 1070, Springer Verlag, Berlin, 1984, 202-207.
14. A trace theorem for caloric functions; International Journal of Math and Mathematical Sciences, B(1) (1985), 29-35.
15. Extensions of Dirichlet-Jordan convergence criterion to a general class of orthogonal polynomial expansions; J. of Approx. Theo., **42** (1984), 138-148.
16. Where does the sup norm of a weighted polynomial live? (A Generalization of incomplete polynomials); Constructive Approximation, **1** (1985), 71-91 (with E.B. Saff).
17. Weighted polynomials on finite and infinite intervals; A unified approach; Bulletin American Mathematical Society **11** (1984), 351-354 (with E.B. Saff).
18. Weighted polynomial approximation; J. of Approx. Theo., **46** (1986), 100-110 (invited survey paper).
19. A Weierstrass-type theorem for certain weighted polynomials; in Approximation Theory and Applications (S.P. Singh ed.), Pitman, Boston, 1985, 115-123 (with E.B. Saff).
20. A quantitative Dirichlet-Jordan type theorem for orthogonal polynomial expansions; SIAM J. of Math., Anal., **19** (1988), 484-492.
21. Where does the L_p -norm of weighted polynomial live?, Trans. Amer. Math. Soc., **303** (1987), 109-124, Errata: **308** (1988), 431. (with E.B. Saff).
22. Freud's conjecture for exponential weights, Bull. Amer. Math. Soc., **15** (1986), 217-221 (with D.S. Lubinsky and E.B. Saff).
23. A proof of Freud's conjecture for exponential weights, Const. Approx. **4** (1988), 65-83. (With D.S. Lubinsky and E.B. Saff).
24. A weighted transfinite diameter, in Approximation Theory V (Chui et. al. eds.), Academic Press, 1986, 479-481.
25. A rate of convergence theorem for expansions in Freud polynomials, J. Approx. Theo. **55** (1988), 150-171.
26. Some Discrepancy theorems; in "Approximation Theory, Tampa" (E.B. Saff ed.) Vol. 1287, Lecture Notes in Mathematics, Springer Verlag, Berlin, 1987, 117-131.
27. Weighted analogue of capacity, transfinite diameter and Chebyshev constant; Constr. Approx., **8** (1991), 105-124. (with E.B. Saff)
28. The distribution of zeros of asymptotically extremal polynomials; J. Approx. Theo. **65** (1991), 279-300 (with E.B.Saff).
29. The convergence of Fourier series and a K -functional; J. Math. Anal. Appl., **154** (1991), 134-141.
30. Approximation in certain intermediate spaces; J. Approx. Theory, **62** (1990), 110-132.
31. On the distribution of zeros of polynomials orthogonal on the unit circle; J. Approx. Theory, **63** (1990), 30-38. (with E.B. Saff).
32. Bounds for certain Freud polynomials; J. Approx. Theory, **63** (1990), 238-254.

33. On the n -width for weighted approximation of entire functions; in Approximation Theory VI, (Chui et al eds.), Academic Press, 1989, 429-432. (With C.A. Micchelli.)
34. Hermite interpolation at the zeros of Freud polynomials; Acta Math. Hung., **60** (1992), 225-240 (With Y. Xu).
35. The rate of convergence of a Hermite interpolation process; in Approximation Theory VI, (Chui et al eds.), Academic Press, 1989, 433-436. (With Y. Xu)
36. A general study of maximal robust stability regions; Circuits, Systems, and Signal Processing, **10** (1991), 15-30 (With C.K. Chui).
37. The mean convergence of expansions in Freud-type orthogonal polynomials; SIAM J. Math. Anal., **22** (1991), 847-855 (With Y. Xu).
38. On multivariate robust stability; SIAM J. Control and Optimization, **30** (1992), 1190-1199 (With C.K. Chui).
39. General Markov-Bernstein and Nikolskii-type inequalities; Approximation Theory and its Applications, **6:4** (1990), 107-117.
40. Finite-infinite range inequalities in the complex plane; Int. J. Math. and Math. Sci., **14** (1991), 625-638.
41. Weighted polynomials, radial basis functions and potentials in locally compact spaces; Num. Funct. Anal. and Optimization, **11** (9& 10), 1990-91, 987-1017.
42. A general discrepancy theorem; Arkiv för Matematik, **31** (1993), 219-246 (With H.-P. Blatt).
43. Detection of singularities using segment approximation; Mathematics of Computation, **59** (1992), 533-540 (With R. Grothmann).
44. On trigonometric wavelets; Constr. Approx., **9** (1993), 167-190 (With C.K. Chui).
45. Approximation by superposition of a sigmoidal function and radial basis functions; Advances in Applied Mathematics, **13** (1992), 350-373 (With C.A. Micchelli).
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50. Dimension-independent bounds on approximation by neural networks; IBM J. of Research and Development, **38** (1994), 277-284 (With C. A. Micchelli).
51. How to choose an activation function; in "Neural Information Processing Systems, 6", (J. D. Cowan, G. Tesauro, J. Alspector Eds.), Morgan Kaufmann Publishers, San Fransisco, 1993, pp. 319-326 (With C. A. Micchelli).
52. A discrepancy theorem concerning polynomials of best approximation in $L_w^p[-1, 1]$; Monatshafte Mathematik, **120** (1995), 91-103. (With H.-P. Blatt).
53. Approximation of real functions using neural networks; in "Proc. of Int. Conf. on Computational Mathematics, New Delhi, India, 1993", (C. A. Micchelli ed.), World Scientific, 1994, pp. 267-278.

54. Degree of approximation by neural and translation networks with a single hidden layer, *Advances in Applied Mathematics*, **16** (1995), 151-183. (With C. A. Micchelli).
55. Neural networks for optimal approximation of smooth and analytic functions; *Neural Computation*, **8** (1996), 164- 177.
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57. Some discrepancy theorems in the theory of weighted polynomial approximation; *Journal of Mathematical Analysis and Applications*, **219** (1998), 312–330 (With H.–P. Blatt).
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63. Bounded quasi-interpolatory polynomial operators; *Journal of Approximation Theory*, **96** (1999), 67–85. (With J. Prestin).
64. On Marcinkiewicz-Zygmund-Type Inequalities; in “*Approximation theory: in memory of A. K. Varma*”, (N. K. Govil, R. N. Mohapatra, Z. Nashed, A. Sharma, and J. Szabados Eds.), Marcel Dekker, 1998, pp.389–404. (With J. Prestin)
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66. Neural beam-steering and direction finding; in *Neural Networks in Engineering Systems*, (A. B. Bulsari and S. Kallio Eds.), Royal Institute of Technology, Stockholm, 1997, pp. 269-272. (With H. Southall)
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72. Approximation Properties of Zonal Function Networks Using Scattered Data on the Sphere; *Advances in Computational Mathematics*, **11** (1999), 121–137 (With F. J. Narcowich and J. D. Ward).
73. Representing and analyzing scattered data on the sphere; in “Multivariate approximation and applications” (A. Pinkus, D. Leviatan, N. Dyn, and D. Levin Eds.), Cambridge University Press, Cambridge, 2001, pp. 44–72. (With F. J. Narcowich and J. D. Ward).
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81. A local discrepancy theorem; *Indagationes Math.*, **12**(1), (2001), 23–39. (With V. V. Andrievskii and H.-P. Blatt).
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86. Local quadrature formulas on the sphere; *Journal of Complexity*, **20** (2004), 753–772 (**Among the top 25 most downloaded articles, October–December 2004**)).
87. A tribute to Géza Freud; *Journal of Approximation Theory*, **126** (2004), 1–15. (Invited paper).
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91. Polynomial operators and local smoothness classes on the unit interval; *Journal of Approximation Theory*, **131**(2004), 243-267.
92. On the representation of smooth functions on the sphere using finitely many bits; *Applied and Computational Harmonic Analysis* **18**, Issue 3 , May 2005, Pages 215-233 (**Among the top 25 most downloaded articles, April-September 2005**)..
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94. Polynomial frames: a fast tour; in “Approximation Theory XI, Gatlinburg, 2004” (C. K. Chui, M. Neamtu, and L. Schumaker Eds.), Nashboro Press, Brentwood, 2005, 287–318. (With J. Prestin) (Invited paper).
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96. Matrix-free interpolation on the sphere; *SIAM J. Numer. Analysis* **44** (3) (2006), pp. 1314–1331. (With M. Ganesh).
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101. Polynomial operators for spectral approximation of piecewise analytic functions; *Appl. Comput. Harmon. Anal.* **26** (2009) 121–142 (With J. Prestin).
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105. On a filter for exponentially localized kernels based on Jacobi polynomials; *Journal of Approximation Theory* **160** (2009), pp. 256-280 (With F. Filbir and J. Prestin)
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111. Minimum Sobolev Norm schemes and applications in image processing. In *IS&T/SPIE Electronic Imaging, International Society for Optics and Photonics*, (2010, February), pp. 753507-753507 (with Chandrasekaran, S., Jayaraman, K. R., Moffitt, J., and Pauli, S.).
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114. Wiener type theorems for Jacobi series with nonnegative coefficients; *Proceedings of the American Mathematical Society*, **140**(3) (2012), 977–986 (With S. Tikhonov).
115. Marcinkiewicz–Zygmund measures on manifolds; *Journal of Complexity*, **27** (2011), 568–596 (With F. Filbir).
116. On the problem of parameter estimation in exponential sums; *Constructive Approximation* **35** (3)(2012), 323–343 (With F. Filbir and J. Prestin).
117. Learning Biomedical Data Locally using Diffusion Geometry Techniques; in *Proceeding (771) Imaging and Signal Processing in Health Care and Technology / 772: Human–Computer Interaction / 773: Communication, Internet and Information Technology – 2012*, (R. Merrell, D.-G. Shin, M.H. Hamza Eds) Baltimore, 2012, pp. 125–131. (With M. Ehler, F. Filbir)
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119. Locally learning biomedical data using diffusion frames; *Journal of Computational Biology*, **19**, (11) (2012), 1251–1264 DOI: 10.1089/cmb.2012.0187 (With M. Ehler, F. Filbir).
120. Smooth function extension based on high dimensional unstructured data; *Mathematics of Computation*, **290**(83)(2014), 2865–2891 (With C. K. Chui).
121. Applications of classical approximation theory to RBF networks and computational harmonic analysis; *Bull. Math. Sci.* 3 (2013), 485–549 (With P. Nevai and E. Shvarts).
122. Legendre filters for numerical differentiation at boundary point; *Applied Mathematics and Computation* 224 (2013) 835–847 (With Valeriya Naumova and Sergei V. Pereverzyev)
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124. Local numerical integration on the sphere; *Int. J. Geomath* 5 (2014),143–162 (with J. Beckman and J. Prestin).
125. A minimum Sobolev norm technique for the numerical discretization of PDEs; Submitted for publication (with S. Chandrasekaran).

126. Signal decomposition and analysis via extraction of frequencies; Applied and Computational Harmonic Analysis, Published online, January 13, 2015 (with C. K. Chui).