

NAME Hamid R. Eghbalnia	ADDRESS Department of Biochemistry- University of Wisconsin Madison 433 Babcock Dr. Madison, Wisconsin 53706-1544
Citizenship: U.S.	

EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
San Diego State University CA	B.S.	1982	Computer Science
San Diego State University CA	B.S.	1982	Engineering Science
University of California San Diego CA	M.S.	1985	System Science
University of Wisconsin-Madison WI	Ph.D.	2000	Mathematics

Major Fields of Interest

Applications of Mathematical and information-geometric methods to problems of molecular biology. Development of robust methods combining computational, informatics and experimental techniques to analyze and quantitate Genomic scale systems.

A. Positions and Honors.

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position

Employment / Experience

- NOSC (San Diego, CA) 1981-1982. Computational implementation of solution of Navier-Stokes equations for the turbulent flow transition region using finite difference methods.
- Calma/G.E. (San Diego, CA) 1982-1984. Development of modeling software for finite element calculation, geometric modeling of surfaces used for robotics and NC machining automation. New methods for computation of geometric properties of Non-uniform Rational B-Spline surfaces.
- Artecon (San Diego, CA) 1984-1988. Planning and development for major portions of a new workstation-based Object-Oriented engineering automation system, including development of overall design, automation model, new algorithms in computational geometry, and many systems aspects of the implementation. Development of methodologies for design of object-oriented systems. New algebraic methods for efficient and robust determination of geometric primitive operations.
- SGC (San Diego, CA) 1988-1996. Planning and development of overall architecture, design and development for an innovative Internet-based, global collaboration and communication technology with strong emphasis on flexibility and User-Interface aspects with learning and automation capability. Development of highly distributed object-oriented technologies for simultaneous push-pull updates using object database and high-performance graphics engines.
- University of Wisconsin-Madison, Madison, Research Assistant (1996-2000). Developed a Java-based front-end engine under a NIST grant for a computational back-end engine using surface evolver for energy minimization. Developed educational software and material for interdisciplinary courses both at the graduate and the undergraduate level.

Current Position

- University of Wisconsin-Madison, Madison, WI 53706, Postdoctoral Researcher (2001-present) Currently at the National Magnetic Resonance Facility (NMRFAM) and Center for Eukaryotic Structural Genomics (CESG). Research focuses on development of new mathematical and computational methods for automated and rapid structure determination of proteins using NMR data.

Honors and fellowships

Co-organizer of the annual NIPS workshop on Geometric Methods in Learning Theory (2000).
University of Wisconsin-Madison Graduate Research Assistant (1996-2000);
Technology advisory representative to MIT X consortium for development of X window system technology.
Technology advisory representative to the PEX consortium for advanced graphics and visualization.
Advisory panel for advanced applications in object-oriented technologies (ACM) (1994-1996).

REFEREED PUBLICATIONS

1. Quantum Information Processing and Learning. Eghbalnia-H; Assadi-A, (2002 – accepted for publication to be presented at SPIE quantum and molecular computing).
2. A Geometric Method for Investigating the Nonlinear Dynamics of the Human Brain from Analysis of Functional MRI Data. Assadi-A; Eghbalnia H., (2002 - accepted for publication in Neurocomputing).
3. An application of support vector machines and symmetry to computational modeling of perception through visual attention. Eghbalnia-H; Assadi-A, Neurocomputing. vol.38-40; June 2001; p.1193-201.
4. Dynamics and robustness for singular value decomposition: application to face recognition. Pasha-S; Eghbalnia-H; Assadi-A, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering, vol. 4476; 2001; p.166-74.
5. Geometric methods in nonlinear analysis of data from brain imaging. Eghbalnia-H; Assadi-AH, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.4476; 2001; p.145-53.
6. Learning optimal wavelets from overcomplete representations. Eghbalnia-H; Assadi-A, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. Wavelet Applications in Signal and Image Processing VIII, Aldroubi, Akram; Laine, Andrew F.; Unser, Michael A. (editors), vol.4119, pt.1-2; 2000; p.286-93.
7. A learning theoretic approach to perceptual geometry in natural scenes. Assadi-A; Eghbalnia-H; Palmer-S, Neurocomputing. vol.38-40; June 2001; p.1077-85.
8. Quantum neurocomputation. and signal processing. Eghbalnia-H; Assadi-A, Neural Networks for Signal Processing X. Proceedings of the 2000 IEEE Signal Processing Society Workshop. IEEE, Piscataway, NJ, USA; 2000; 2 vol. (xii+iv+944) pp. p.211-20 vol.1.
9. Recurrent probabilistic dynamics: Applications to face recognition. Assadi-A; Eghbalnia-H, Neurocomputing. vol.38-40; June 2001; p.1067-75.
10. Visual target selection employing local to global strategies for support vector machines. Eghbalnia-H; Assadi-A, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.4055; 2000; p.130-9.
11. Perception of space and geometry through visual attention and statistical learning. Assadi-A; Eghbalnia-H, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.4117; 2000; p.122-33.
12. Learning theoretic method for estimation of geometry of surfaces in natural scenes. Assadi-A; Eghbalnia-H, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.4117; 2000; p.112-21.
13. Quantum neurocomputation. Eghbalnia-H; Assadi-AH, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.4047; 2000; p.12-18.
14. Bayesian analysis of multimodal data and brain imaging. Assadi-A; Eghbalnia-H; Backonja-M; Wakai-R; Rutecki-P; Haughton-V, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.3979, pt.1-2; 2000; p.1160-7.
15. Learning theoretic approach to differential and perceptual geometry: I. Curvature and torsion are the independent components of space curves. Assadi-A; Eghbalnia-H, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.3959; 2000; p.559-65.
16. Nonlinear methods for clustering and reduction of dimensionality. Eghbalnia-H; Assadi-A; Carew-J, IJCNN'99. International Joint Conference on Neural Networks. Proceedings. IEEE, Piscataway, NJ, USA; 1999; 6 vol. lxii+4439 pp. p.1004-9 vol.2
17. Geometry of the perceptual space. Assadi-A; Palmer-S; Eghbalnia-H; Carew-J, Proceedings-of-the-SPIE --The-International-Society-for-Optical-Engineering. vol.3811; 1999; p.130-40.

18. Local-to-global topological methods in data analysis and applications to fMRI of human brain. Assadi-A; Eghbalnia-H; Carew-J, IJCNN'99. International Joint Conference on Neural Networks. Proceedings. IEEE, Piscataway, NJ, USA; 1999; 6 vol. lxii+4439 pp. p.1010-15 vol.2.
19. A method for the investigating the nonlinear dynamics of the human brain from analysis of functional MRI data. Carew-J; Eghbalnia-H; Assadi-A, IJCNN'99. International Joint Conference on Neural Networks. Proceedings. IEEE, Piscataway, NJ, USA; 1999; 6 vol. lxii+4439 pp. p.1004-9 vol.2
20. Learning Gestalt of surfaces in natural scenes. Assadi-A; Palmer-S; Eghbalnia-H, Neural Networks for Signal Processing IX: Proceedings of the 1999 IEEE Signal Processing Society Workshop. IEEE, Piscataway, NJ, USA; 1999; ix+566 pp. p.380-9.
21. Informatics of Pain: Applications to Basic and Clinical Research. Assadi-A; Fallahati-D; Backonja-M, Eghbalnia-H, In: Proceedings of The First International Symposium in Neuroinformatics, September 2001, Vienna, Austria, to appear.
22. Dynamic PCA for Network Feature Extraction in Multi-electrode Recording of Neurophysiological Data in Cortical Substrates of Pain, Assadi-A; Fallahati-D; Backonja-M, Eghbalnia-H, Neurocomputing, (in press).
23. Dynamical Models for Nonlinear Feature Extraction and applications to Face Recognition, Assadi-A; Pasha-S, Eghbalnia-H, 2002; Neurocomputing (accepted).
24. Image Processing of Natural Scenes with Over-complete Wavelet Representations. In: Signal Processing, Coding and Analysis, Proceedings of International Conference in Signal Processing Applications and Technology, Dallas, TX. (Electronic form and CD-ROM publication only.)
25. Image Processing in the Presence of Symmetry and Visual Perception of Surfaces. In: Image Understanding and Restoration, Proceedings of International Conference in Signal Processing Applications and Technology, Dallas, TX. (Electronic form and CD- ROM publication only.)
26. Saccades and Perceptual Geometry: Symmetry Detection through Entropy Minimization. In: Proceedings of the Third Annual Bridges Conference 2000, Winfield, Kansas, Reza Sarhangi (editor), pp. 369-378.
27. Towards Visual Perception of Periodic Tilings: A Computational Model. In: Proceedings of the Second Annual Bridges Conference 1999, Winfield, Kansas, Reza Sarhangi (editor).
28. Resting-state Functional Connectivity Study using Independent Component Analysis. In: Proceedings of the International Society for Magnetic Resonance in Medicine Conference (ISMRM 1999).
29. Resting-state functional connectivity study using independent component analysis. Proceedings of the International Society for Magnetic Resonance in Medicine Conference (ISMRM '99).

PAPERS, ABSTRACTS AND PRESENTATIONS

30. Information metric on the torsion angle configuration space and applications to NMR structure determination. Eghbalnia H; Assadi A; Doreleijers J; Markley J, ENC 2002.
31. Minimally Dependent Microarray Data Clustering. Eghbalnia H; Assadi S; Assadi A, International Conference on Computational Nanoscience/MSM 2001.
32. Poincare' Maps Of Gene Structures: A Dynamic Approach To Genomics. Assadi S; Eghbalnia H, Assadi A, International Conference on Computational Nanoscience/MSM 2001.
33. Quadratic Estimates In Microarray Gene Expression Informatics. Assadi A; Eghbalnia H; Assadi S, International Conference on Computational Nanoscience/MSM 2001.
34. Oncogene Protein Expression Discovery through Dynamic search in Microarray Data. Assadi A, Eghbalnia H, Proceedings of Am. Assoc. Cancer Research Feb 2001.
35. Nonlinear Methods in Cluster Analysis For Oncogene Protein Expression In Microarray Data. Assadi A, Eghbalnia H. (submitted).
36. Geometric Methods for Quantifying the Nonlinear Dynamics of the Human Brain from Analysis of Neuronal data. Assadi A, Eghbalnia H, SFN 2000 – The annual meeting of the society for Neuroscience.
37. An Information Geometric Analog of Saccadic Search in Large Data Spaces. Eghbalnia H, Assadi A, Second international conference on Data Mining 2000, Cambridge UK.
38. Symmetries, Wavelets, and face recognition. Eghbalnia H. NIPS 2000 workshop 2000.
39. New Methods For Bayesian Analysis Of Massive Multi-modal Neuronal Data. Human Brain Project/ Neuroinformatics 2000.

40. Probabilistic Methods in Analysis of Multi-modal Neuronal Data and Imaging. Assadi A; Eghbalnia H, Published as Conference Abstract In: Dynamical Neuroscience VII: Integration Across Multiple Imaging Modalities -- October 21-22, 1999.
41. Mathematical Methods in Cognitive and Computational Neuroscience. Assadi A; Eghbalnia H, Abstracts of SFN '99 The Annual Meeting of Society for Neuroscience 1999.
42. Support Vectors and Saccadic Target Selection in Visual Search. Eghbalnia H; Assadi A, Abstracts of SFN '99 The Annual Meeting of Society for Neuroscience 1999.
43. Making Products Using Object-Oriented Programming. Eghbalnia H, (Workshop with J. Uebbing and J. Waite and T. Lanning and R. Raghavan and C. Nelson and A. Schiller), , in Addendum to the Proceedings OOPSLA-87: Object-Oriented Programming Systems, Languages and Applications, 1988, pp:105-111;
44. Object-Oriented Programming for Product Development. Eghbalnia H, Bob Wilhelm, Peggy Poggio, Evelyn Van Orden, Richard Jones, Hamid Eghbalnia, Tom Love: Workshop OOPSLA 1986: pp: 505.
45. Solder Joints, Geometry, Computation and Collaboration. Eghbalnia H; Assadi A, Proceedings of Fifth US National Congress on Computational Mechanics, Symposium on Computational Advances in Modeling Composites 1999.

WORK IN PROGRESS

46. The natural geometry of protein fragments. (With Amir Assadi, John Markley).
47. The geometry of the distribution of protein fragments and its information content (With Jurgen Doreleijers, Amir Assadi, John Markley)
48. Do propensities for disorder imply disorder? (With Fariba Assadi, Jurgen Doreleijers, Milo Westler, Amir Assadi, John Markley).
49. Sampling the structure space of proteins – Molecular Mechanics vs. database statistics (With Milo Westler, Jurgen Doreleijers, Amir Assadi, John Markley).
50. Checking for bias in the sampling of structure space.(With Jurgen Doreleijers, Amir Assadi, John Markley)
51. Spectral estimation by signal deformation. (With Amir Assadi, John Markley)
52. Application of signal deformation to NMR. (With Amir Assadi, Fariba Porter-Assadi, John Markley)
53. Calculus Of Oracles: Contributions To Modeling Complex Systems. (With Amir Assadi).
54. Learning Principal Subspaces In Information Geometry. In Preparation. (With Amir Assadi).
55. The hidden subgroup problem and Grover's search algorithm in Quantum Computation (With Amir Assadi)
56. A Differential Topological Approach to Nonlinear Feature Identification in Massive Data Sets. In Preparation. (With Amir Assadi).
57. Statistical Linearization In Information Geometry. In Preparation. (With Amir Assadi). Geometry Of Multi-Scale Multi-Resolution Information Processing In Massive Data Sets. In Preparation. (With Amir Assadi).

TECHNICAL REPORTS

58. Architectural Framework for Global Collaborative Environments; SGC Technical Report (1994) – Project Internet TeamSolutions.
59. Cognitive issues of collaboration; Technical Memo and Presentation SGC 1995
60. User Interfaces for Global Collaborative Communication: Beyond the Model-View-Controller; SGC Internal document (1993) – Project Internet TeamExchange.
61. Architecture for an object-oriented, distributed, multi-client/server collaborative application. SGC Internal document (1992) – Project Internet TeamExchange.
62. Tutorial: object oriented thinking, object-oriented programming – SGC Technical Report 1991.
63. Efficient Computation of Lighting/Shading effects on surfaces. SGC Technical Report – Project Phoenix 1990.
64. High performance pipelined graphics systems architecture models – Advantages/Trade offs. SGC Technical Report 1991.
65. Numerically stable methods of finding intersections of Non-uniform Rational B-spline Surfaces. Artecon Tech. Rep. – Project IAE 87.
66. Implementation of surface and volume mesh generation for Finite Element and Boundary element Modeling. GE/Calma internal report. – 1993.

