

Curriculum Vitae
Caren Marzban
<http://faculty.washington.edu/marzban/>

Name: Caren Marzban

Pronouns: he/him/his

Date of Birth: January 10, 1960

Nationality: USA

Address: Dept. of Statistics, and Applied Physics Laboratory, Univ. of Washington, Box 354322, Seattle, WA 98195-4323

E-mail: marzban@stat.washington.edu

Education

Michigan State University Physics B.S. 1981

University of North Carolina Mathematical Physics Ph.D. 1988

Postdoctoral Fellowships

Inter. Center for Theoretical Physics, Trieste, Italy Physics 1988-1991

University of Oklahoma, Norman, OK Physics 1991-1994

Appointments

2004-present: Univ. of Washington, Dept. of Statistics (Part-time Lecturer)

2004-present: Applied Physics Laboratory, Univ. of Washington (Principal Physicist)

2001-2004: Univ. of Washington, Dept. of Statistics (Visiting Scientist)

1994-2001: University of Oklahoma, Dept. of Physics (Adjunct Assistant Professor)

1994-2001: University of Oklahoma, CIMMS (Research Associate)

Research Interests

Applied statistics, machine learning, verification (model selection), sensitivity analysis, experimental design, topological data analysis, string theory, field theory, mathematical physics, sensitivity analysis, and experimental design.

Awards and Patents

Editor's Award, Bulletin of the American Meteorological Society, "For providing insightful expertise and outstanding guidance on a difficult manuscript with other conflicting reviews," 2022.

Nominee for Distinguished Teaching Award, University of Washington, Seattle, WA, 2021.

Distinguished Scientific and Technological Activities Commission Award from The American Meteorological Society, "For contributions to advancing applications of machine learning to environmental science, including extreme events, and strengthening the statistical framework and assessment." (2020)

Silver Medal Award, U.S. Department of Commerce, "For developing an important prototype Warning Decision Support System for weather forecasts and making significant enhancements to the NEXRAD system, resulting in more timely and reliable warnings." (1999)

US Patent 6221170: Magnetic apparatus and method for wiping fog in a diving mask. (2001)

Synergistic Activities

ASA DataFest co-organizer, University of Washington. March 29 - 31, 2024.

ASA DataFest co-organizer, University of Washington. March 29 - 31, 2023.

Lecturer at Mathematics for Planet Earth (MPE) Virtual Summer School on Forecast Verification, June 21-25, 2021. Imperial College London and University of Reading.

Invited to the Showcase “Machine Learning in the Atmospheric and Related Sciences,” sponsored by NCAR, to discuss how to foster collaboration and innovation in Machine Learning between academia, government and the private sector. Aug. 22, 2018; Computational & Information Systems Laboratory.

Invited to Metrics, Post-processing, and Products for Subseasonal to Seasonal Workshop. Feb 28 - March 2, 2018. This workshop was tasked with making recommendations to NOAA in light of the 2017 Weather Research and Forecast Improvement Act (P.L. 115-25).

Panel Reviewer for The MacArthur Foundation (2010), and The National Science Foundation.

Reviewer for numerous journals in applied statistics, machine learning, signal processing, meteorology, and ecology.

Ex-Chair (retired Jan. 2006) of the Artificial Intelligence Applications in Environmental Sciences Committee of the American Meteorological Society.

Co-Editor and contributor (2 chapters) to the book Artificial Intelligence Methods in the Environmental Sciences (Springer-Verlag).

Developed and delivered short courses on artificial intelligence at the Annual Meeting of the American Meteorological Society, in 2002, 2004, and 2006.

Collaborators and Co-Editors

Bowling, Laura: Dept. of Agronomy, Purdue University, West Lafayette, IN

Colman, Brad: Chief Science Officer, National Weather Service, Seattle, WA

Czosnyka, Marek: University of Cambridge, Addenbrooke’s Hospital, Cambridge, UK

Doyle, James: Naval Research Lab, Monterey, CA

Drton, Mathias: Dept. of Statistics, University of Washington, Seattle, WA

Gu, Wenxiao: Amazon Inc. (Dept of Statistics MS Alumnus)

Guttorp, Peter: Dept. of Statistics, University of Washington, Seattle, WA

Hare, Steven: International Pacific Halibut Commission, Seattle, WA

Hennon, Chris: NOAA Tropical Prediction Center, Miami, FL

Hobgood, J.S.: Dept. of Geography, Ohio State University, Columbus OH

Jones, Corinne: Dept of Statistics, University of Washington, Seattle WA

Kalnay, Eugenia: Dept. of Meteorology, University of Maryland, College Park, MD

Kantowski, Ronald: Dept. of Physics, University of Oklahoma, Norman, OK

Kim, Albert: Google, Inc.

Lettenmaier, Dennis: Dept. of Civil Engineering, University of Washington, Seattle, WA

Lyons, Hillary: Zillo, Inc (Dept of Statistics Ph.D. Alumnus)

Mantua, Nathan: JISAO, University of Washington, Seattle, WA

Meila, Marina: Dept of Statistics, University of Washington WA

Miller, Arthur J: Scripps Institution of Oceanography, La Jolla, CA

Mourad, Pierre: Department of Neurology, University of Washington, Bothell, WA

Ng, Jack Y: Dept. of Physics, University of North Carolina, Chapel Hill, NC

Percival, Donald: Applied Physics Lab., and Dept. of statistics, UW
Richman, Michael: University of Oklahoma, Norman, OK.
Sandgathe, Scott: APL, University of Washington, Seattle, WA.
Schaefer, Joseph: Storm Prediction Center, Norman, OK
Stuetzle, Werner: Department of Statistics, UW
Tardiff, Robert: Department of Atmospheric Sciences, UW
Viswanathan, Raju: Technome, LLC, 8107 Colmar Drive, Clayton, MO
Whiting, Bernard: Dept. of Physics, University of Florida, Gainesville, FL
Yurtsever, Ulvi: Lockheed Martin
Wang, Ranran: Allen Analytics, LLC (Dept of Statistics Ph.D. Alumna)

Current and Pending Research Funding

None.

Teaching

2004-present: Dept. of statistics, U. of Washington: STAT 220, 311, 390, 394-5, 421, 427, 509, 599
1993-1994: Department of physics, U. of Oklahoma: Physics 105.
1993: Department of physics, Central Oklahoma Univ: Physics for non-majors

Consulting

I have provided consultation to professionals ranging from attorneys to researchers at universities, and companies ranging in size from small to Lockheed-Martin. I have also co-taught (with professor Paul Sampson) a “consulting course” at the university of Washington (<https://www.stat.washington.edu/consulting/>)

Publications

57. Marzban, C., U. Yurtsever, M. Richman, 2024: Principal Component Analysis for Equation Discovery. Submitted to *Journal of Atmospheric Sciences*.
56. Marzban, C., J. Liu, P. Tissot, 2022: On Variability due to Local Minima and K-fold Cross-validation. *Artificial Intelligence for Earth Systems*, **1** (4), 1-9.
55. Haupt, S. E., D. J. Gagne, W. Hsieh, V. Krasnopolsky, V. Lakshmanan, A. McGovern, C. Marzban, W. Monager, P. Tissot, J. Williams, 2022: The History and Practice of AI in the Environmental Sciences. *Bulletin of the American Meteorological Society*. In press.
54. Marzban, C., R. Tardif, S. Sandgathe, 2020: A Sensitivity Analysis of Two Mesoscale Models: COAMPS and WRF. *Monthly Weather Review*, 148(7), 2997-3014.
53. Marzban, C., R. Tardif, S. Sandgathe, 2020: Sensitivity Analysis of Spatial Structure of Forecasts in Mesoscale Models; Noncontinuous Model Parameters. *Monthly Weather Review*, **148** (4), 1717-1735.
52. Marzban, C., R. Tardif, S. Sandgathe, N. Hryniw, 2018: A Methodology for Sensitivity Analysis of Spatial Features in Forecasts: The Stochastic Kinetic Energy Backscatter Scheme (SKEBS). *Meteorological Applications*, **26**, 454-467.
51. Marzban, C., X. Du, S. Sandgathe, J. D. Doyle, Y. Jin, N. C. Lederer 2018: Sensitivity Analysis of the Spatial Structure of Forecasts in Mesoscale Models: Continuous Model Parameters. *Mon. Wea. Rev.*, (**146**), 967-983.

50. Marzban, C., C. Jones, N. Li, S. Sandgathe 2018: On the effect of model parameters on forecast objects: COAMPS. *Geoscientific Model Development*, **(11)**, 1-14.
49. Marzban, C., W. Gu, P. D. Mourad 2016: Mixture Models for estimating maximum blood flow velocity. *Journal of Ultrasound in Medicine*, **35(1)**, 93-101.
48. Marzban, Ethan P, C. Marzban 2016: On the usage of musical keys: A descriptive statistical perspective. *The Journal of Experimental Secondary Science*. **3(3)**. ISSN#2162-8092.
47. Marzban, C., S. Sandgathe, James D. Doyle 2014: Model tuning with canonical correlation analysis. *Monthly Weather Review*, **142(5)**, 2018-2027.
46. Marzban, C., R. Viswanathan, U. Yurtsever 2014: Earth before Life. *Biology Direct*, **9:1**. doi:10.1186/1745-6150-9-1. (2014 Top Cited Article).
45. Marzban, C., Scott Sandgathe, James D. Doyle, Nicholas C. Lederer 2014: Variance-based sensitivity analysis: Preliminary results in COAMPS. *Monthly Weather Review*, **142**, 2028-2042.
44. Marzban, C., R. Illian, D. Morison, P. D. Mourad 2013: A double-gaussian, percentile-based method for estimating maximum blood flow velocity. *Journal of Ultrasound in Medicine*, **32(11)**, 1913-1920.
43. Marzban, C. 2013: Variance-based Sensitivity analysis: An illustration on the Lorenz '63 model. *Monthly Weather Review*, **141(11)**, 4069-4079.
42. Marzban, C., R. Illian, D. Morison, A. Moore, M. Kliot, M. Czosnyka, P. D. Mourad 2012: A method for estimating zero-flow pressure and intracranial pressure. *Journal of Neurosurgical Anaesthesiology*, **25**, 25-32.
41. Marzban, C. 2012: Displaying economic value. *Weather and Forecasting*. **27**, 1604-1612.
40. Yurtsever, U., C. Marzban, M. Meila, 2011: On the gravitational inverse problem. *Applied Mathematical Sciences*, **5(57)**, 2839-2854.
39. Marzban, C. and S. Sandgathe 2010: Optical Flow for verification. *Wea. Forecasting*, **25 (5)**, 1479-1494.
38. Marzban, C., R. Wang, F. Kong, S. Leyton 2010: On the effect of correlations on Rank Histograms: Temperature and wind-speed forecasts from Fine-scale Ensemble Reforecasts. *Monthly Weather Review*, **139(1)**, 295-31.
37. Mourad, P. D., C. Marzban, and M. Kliot 2009: Towards predicting intracranial pressure using transcranial Doppler and arterial blood pressure data. *J. Acoust. Soc. Am.*, **125**, 2514.
36. Marzban, C., S. Sandgathe, H. Lyons, N. Lederer 2009: Three Spatial Verification Techniques: Cluster Analysis, Variogram, and Optical Flow. *Wea. Forecasting*, **24(6)**, 1457-1471; Special Collection on Spatial Forecast Verification Methods.
35. Kim, A. Y., C. Marzban, D. Percival, W. Stuetzle 2009: Using labeled Data to evaluate change detectors in a multivariate streaming environment. *Signal Processing*, **89(12)**, 2529-2536; doi:10.1016/j.sigpro.2009.04.011.
34. Marzban, C. and S. Sandgathe 2009: Verification with variograms. *Wea. Forecasting*, **24(4)**, 1102-1120.
33. Marzban, C., S. Sandgathe, and H. Lyons 2008: An Object-oriented Verification of Three NWP Model Formulations via Cluster Analysis: An objective and a subjective analysis. *Monthly Weather Review*, **136(9)**, 3392-3407.

32. Marzban, C., S. Sandgathe, 2008: Cluster Analysis for Object-Oriented Verification of Fields: A Variation. *Monthly Weather Review*, **136**(9), 3392-3407.
31. Marzban, C., S. Leyton, and B. Colman, 2007: Ceiling & Visibility forecasts via Neural Nets. *Wea. Forecasting*, **22**, 466-479.
30. Marzban, C., S. Sandgathe, 2006: Cluster analysis for verification of precipitation fields. *Wea. Forecasting*, **21**, No. 5, 824-838.
29. Marzban, C., S. Sandgathe, E. Kalnay, 2005: MOS, Perfect Prog, and Reanalysis Data. *Monthly Weather Review*, **134**, No. 2, 657-663.
28. Trites, A. W. et al, 2004: Bottom-up forcing and the decline of Steller sea lions in Alaska: Assessing the ocean climate hypothesis. *Fisheries Oceanography*, doi:10.1111/j.1365-2419.2006.00408.
27. Hennon, C., C. Marzban, J. S. Hobgood, 2004: Improving tropical cyclogenesis statistical model forecasts through the application of a neural network classifier. *Wea. Forecasting*, **20**, No. 6, 1073-1083.
26. Marzban, C. 2004: The ROC Curve and the Area Under it as a Performance Measure. *Wea. Forecasting*, **19**, No. 6, 1106-1114.
25. Marzban, C., 2003: A Neural Network for Post-processing Model Output: ARPS. *Monthly Weather Review*, **131**, No. 6., pp. 1103-1111.
24. Drton, M., Marzban, C., P. Guttorp, & J. T. Schaefer, 2003: A Markov Chain Model of Tornadic Activity. *Monthly Weather Review*, **131**, No. 12, 2941-2953.
23. Marzban, C., and A. Witt, 2001: A Bayesian Neural Network for Hail Size Prediction. *Wea. Forecasting*, **16**, No. 5, pp. 600-610.
22. Marzban, C., and J. Schaefer, 2001: The Correlation Between U.S. Tornadoes and Pacific Sea Surface Temperature. *Monthly Weather Review*, **129**, No. 4, 884-895.
21. Marzban, C. 2000: A neural network for tornado diagnosis. *Neural Computing and Applications*, **9** (2), 133-141.
20. Marzban, C., E. D. Mitchell, G. Stumpf, 1999: The notion of "best predictors:" An application to tornado prediction. *Wea. Forecasting*, **14**, No. 6, 1007-1016.
19. Marzban, C., V. Lakshmanan, 1999: On the uniqueness of Gandin and Murphy's equitable performance measures. *Monthly Weather Review*, **127**, No.6, 1134-1136.
18. Marzban, C., G. J. Stumpf, 1998: A Neural Network for Tornado and/or Damaging Wind Prediction Based on Doppler Radar-derived Attributes. *Microcomputer Applications*, **17**, 21-28.
17. Marzban, C., G. J. Stumpf, 1998: A neural network for damaging wind prediction. *Wea. Forecasting*, **13**, No.1, 151-163.
16. Marzban, C. 1998: Scalar measures of performance in rare-event situations. *Wea. Forecasting*, **13**, 753-763.
15. Marzban, C. 1998: Bayesian probability and scalar performance measures in gaussian models. *Journal of Applied Meteorology*, **37**, 72-82.
14. Marzban, C., H. Paik, and G. Stumpf, 1997: Neural networks vs. gaussian discriminant analysis. *AI Applications*, **10**, No.1, 49-58.
13. Marzban, C., G. J. Stumpf, 1996: A neural network for tornado prediction based on Doppler Radar. *Journal of Applied Meteorology*, **35**, 617.

12. Kantowski, R., C. Marzban, 1995: A Neural Network for Locating the Primary Vertex in a Pixel Detector. *Nuclear Instruments and Methods in Physics Research*, **A 355**, 582.
11. Paik, H., C. Marzban, 1995: Predicting Television Extreme-viewer vs. Non-viewer: A Neural Network Analysis. *Human Communication Research*, **22**, 284.
10. Marzban, C., R. Viswanathan, 1994: Stochastic Neural Networks with the Weighted Hebb Rule. *Physics Letters A*, **191**, 127.
9. Kantowski, R., C. Marzban, 1992: One-loop Vilkovisky-DeWitt Counterterms for Two-dimensional Gravity Plus Scalar Field Theory. *Phys. Rev. D*, **46**.
8. Marzban, C., R. Viswanathan, 1992: Matrix Models With $\gamma_{string} > 0$. *Physics Letters*, **B277**, 289.
7. Marzban, C., R. Viswanathan, 1991: Matrix Models With Non-even Potentials. *Int. Journ. of Mod. Phys.*, **A6**, 2559.
6. Marzban, C., 1990: Morse Theory Applied to N=1 and 2 Superconformal Theories. *Physics Letters*, **B238**, 257.
5. Marzban, C., 1990: Remarks on the Landau-Ginzburg Potential and RG-flow for SU(2)-coset Models. *Physics letters*, **B236**, 298.
4. Marzban, C., B. F. Whiting, H. Van Dam, 1989: Hamiltonian Reduction for Massive Fields Coupled to Sources. *Jour. Math. Phys.*, **30**, 1877.
3. Kikuchi, Y., C. Marzban, 1987: Two-loop Modular Invariance and Proper Spin-Statistics Projection for General Boundary Conditions. *Phys. Rev.*, **D36**, 2583.
2. Kikuchi, Y., C. Marzban, 1987: Low-energy Effective Lagrangian of Heterotic String Theory. *Phys. Rev.*, **D35**, 1400.
1. Kikuchi, Y., C. Marzban, Y. J. Ng, 1986: Heterotic String Modifications of Einstein's and Yang-Mills' Actions. *Phys. Lett.*, **B176**, 57.

Books and Book Chapters

- *Artificial Intelligence Methods in the Environmental Sciences*, 2008; Springer-Verlag. Co-editor, and contributor to 2 chapters.
- *Habitability of the Universe Before Earth: Astrobiology*, 2018; A. Sharov and R. Gordon (Eds). Chapter 12. Academic Press.

Selected Conference Papers

- Marzban, C., and R. Viswanathan, 2017: On the Complexity of Neural-Network-Learned Functions. Paper presented at the 15th Conference on Artificial Intelligence, at the 97th American Meteorological Society Annual Meeting, Seattle, Jan. 22-26.
- Marzban, C., and U. Yurtsever, 2017: On the Shape of Data. Paper presented at the 15th Conference on Artificial Intelligence, at the 97th American Meteorological Society Annual Meeting, Seattle, Jan. 22-26.
- Marzban, C., and U. Yurtsever 2011: Baby Morse theory in data analysis. Paper at the workshop on Knowledge Discovery, Modeling and Simulation (KDMS), held in conjunction with the 17th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, San Diego, CA., August 21-24.

- Marzban, C. 2008: Quantile Regression. Invited paper presented at the joint session between AI and Prob & Stats Conference. 88th American Meteorological Society Annual Meeting, New Orleans, Jan. 20-24.
- Marzban, C. 2004: Probabilistic Forecasts in Meteorology. Talk presented at a Neural Information Processing Systems (NIPS), 2004, workshop on Calibration and Probabilistic Prediction in Supervised Learning. Whistler, Canada.
- Marzban, C., G. J. Stumpf, 1996: A Neural Network for Tornado and/or Severe Weather Prediction Based on Doppler Radar-derived Attributes. 10th Annual Mid-American Symposium on Emerging Computer Technologies, University of Oklahoma, October 28-29. (Top-paper Award.)
- Marzban, C., R. Viswanathan, 1993: Stochastic Neural Networks and the Weighted Hebb Rule. Proceedings of the International Joint Conference on Neural Networks, Nagoya, Japan.

Technical Reports and Unpublished Works

- Marzban, C., Hoi Yi Ng, Corinne Jones, and Hassan Nasif, 2021: R Supplement to Applied Statistics For Engineers and Scientists, by Devore, Farnum, and Doi.
- Marzban, C., Wenxiao Gu, P. D. Mourad 2014: A robust noninvasive estimator of Intracranial pressure.
- Marzban, C., R. Illian, D. Morison, P. D. Mourad 2012: Within-group and between-group correlation: Illustration on noninvasive estimation of intracranial pressure.
- Marzban, C., U. Yurtsever, 2011: Baby Morse theory for statistical inference from point cloud data.
- Stuetzle, W., D. Percival, and C. Marzban 2010: Targeted event detection.
- Kim, A., C. Marzban, D. B. Percival, and W. Stuetzle, Using Labeled Data to Evaluate Change Detectors in a Multivariate Streaming Environment, 2008.
- Marzban, C., N. Mantua, S. Hare, 2004: Retrospective study of climate impact on Alaska Stellar Sea Lionr.
- Marzban, C., D. Lettenmaier, and L. Bowling, 2004: Trends in Extreme Precipitation and Streamflow.
- Marzban, C. 1997: Local minima in Bootstrapping.