

☎ (651) 343-7519

✉ william.capecchi@gmail.com

📍 2754 NE Pierce St. Apt 2
Minneapolis, MN 55418

🌐 williamcapecchi.com

William J. Capecchi

Physicist with 7+ years in plasma fusion energy research and data analysis with strong statistical, data modeling, and problem solving skills. Able to develop effective analytics on large datasets and make complex subjects relatable and actionable. Seeking to apply drive and dedication to provide innovative and robust business data insights and solutions.



EDUCATION

UNIVERSITY OF
WISCONSIN- MADISON
Madison, Wisconsin

2017 Ph.D. Plasma Physics
Dissertation: *A Critical Fast Ion Beta in the Madison Symmetric Torus Reversed Field Pinch*

ST. JOHN'S UNIVERSITY
Collegeville, Minnesota

2009 B.A. Physics & Mathematics



EXPERIENCE

Freelance Data Scientist

Upwork

- Engineered machine-learning features reducing mean-square error 12% using Jupyter, Scikit-learn
- Optimized MACD time-series parameters resulting in 51.9% increase in ROI on out-sample data
- Built Python GUI for SQL database management and ETL functionality
- Developed interactive world map of air quality database using Python, d3.js, Mapbox
- Wrote Microsoft VBA macros to automate Excel spreadsheet processes

Jan
2017

PhD Candidate/Research Assistant

UW Madison, Madison Symmetric Torus (MST) Group

- Achieved first measurement of fast-ion pressure in an RFP through experimental concept development, prototyping, model validation, testing, and analysis of 72GB of experimental data
- Created custom 2D linear regression algorithm with chi-squared statistical analysis to improve agreement between Abel inverted data and modeled plasma pressure
- Coded Monte Carlo model to generate knowledge of neutron energy spectrum to assess product performance, validated against industry standard neutron model with confidence interval testing
- Developed fast-ion orbit model from first principles to give phase-space information to MST diagnostics, validated with existing experimental data, integrated into MST standard software
- Presented research at national conferences, articulating research issues and proposing solutions
- Identified opportunity to improve data mining in MST group and developed a visualization program to search and intuitively display data from MST's 9TB database, increasing scientist efficiency

May
2012

Research/Teaching Assistant

UW Madison, ECE & Columbia University, Applied Physics

- Developed optical lens with reversed chromatic aberration through full EM wave phase/attenuation modeling, using least-squares regression optimization and reduced chi-squared statistic
- Developed a team of researchers at Columbia University to move research into lab testing
- Led physics discussion and laboratory sessions, managing three classes of 24 students

Sept
2009

Team Leader/Infantryman

MN Army National Guard

- Led infantry team on 30+ missions on deployment in support of Operation Iraqi Freedom
- Decorated Bronze Star for service for effectively reducing hostile action in high conflict area of Iraq
- Awarded Army Commendation Medal for aid rendered to foreign military on deployment to Kosovo



SKILLS

Data Analysis • Modeling
Python/SQL/VBA • Team Management
Problem Solving • Data Visualization
Science Communication • Statistics



HOBBIES

Backpacking/Hiking • Triathlons
Marathons (10+) • Rock Climbing
Road Cycling • Trail Running



PRESENTATIONS



PUBLICATIONS

Invited Talk: *Energetic Particle Physics in MST
Reversed Field Pinch*
US Transport Task Force Workshop. Salem, MA

*Fast ion beta limit measurements by collimated
neutron detection in MST plasmas*
57th APS DPP Meeting. Savannah, GA

*Fast ion beta limit measurements by collimated
neutron detection in the MST*
Exploratory Plasma Research Workshop.
Madison, WI

*Fast ion beta limit measurements by collimated
neutron detection in the MST*
56th APS DPP Meeting. New Orleans, LA.

Investigation of the fast ion beta limit in MST
55th APS DPP Meeting. Denver, CO

*Multi-frequency reflectometer for edge density
profile and fluctuation measurements on MST*
54th APS DPP Meeting. Providence, RI

*Reverse chromatic aberration and its numerical
optimization in a metamaterial lens*
19th Topical Conference on High-Temperature
Plasma Diagnostics. Monterey, CA

2016

W. Capecchi, *et al.*

*"A Critical Fast Ion Beta in the Madison Symmetric Torus
Reversed Field Pinch"*

In preparation, Phys. Plasmas 2017

J.K. Anderson, J. Kim, P. J. Bonfigli, W. Capecchi, S.
Eilerman, M. D. Nornberg, J. S. Sarff, S. H. Sears
*"Dynamics of a reconnection-driven runaway ion tail in a
reversed field pinch plasma"*
Phys. Plasmas **23**, 055702 (2016)

2015

J.K. Anderson, W. Capecchi, S. Eilerman, J.J. Kollner, M.D.
Nornberg, J.A. Reusch

*"Fast ion confinement in the three-dimensional helical
reversed-field pinch"*

Plasma Phys. Control. Fusion **56** (9) 094006 Aug. 2014

L. Lin, J.K. Anderson, D.L. Brower, W. Capecchi, W.X.
Ding, S. Eilerman, *et al.*

*"Energetic-particle-driven instabilities and induced fast-ion
transport in the RFP"*

Phys. Plasmas **22** (5) 056104 Apr. 2014

2014

K.C. Hammond, W. Capecchi, S.D. Massidda, F.A. Volpe

*"Metamaterial lens of specifiable frequency-dependent
focus and adjustable aperture for electron cyclotron
emission in the DIII-D tokamak"*

Journal of Infrared, Millimeter, and Terahertz Waves **34**,
437 (2013)

2013

W. Capecchi, N. Behdad, F. A. Volpe

*"Reverse chromatic aberration and its numerical
optimization in a metamaterial lens"*

Optics Express **20** (8) pp. 8761-8769 (2012)

W. Capecchi, T.Q. Sibley

"When the trivial is nontrivial"

Pi Mu Epsilon Journal **13** (6) pp. 333-336 (2012)