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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 data 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
- Designed experiment and aggregated 72GB of experimental data to assess fast-ion pressure
- 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 predict neutron energy spectrum with confidence interval testing to ensure statistical significance, validated against industry standard neutron model
- Developed fast-ion orbit model to give phase-space information to numerous MST research groups, model validated using existing experimental data, routine is now part of 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
- Python/SQL/VBA
- Problem Solving
- Science Communication
- Modeling
- Team Management
- Data Visualization
- Statistics

HOBBIES

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

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PRESENTATIONS

PUBLICATIONS

2016

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

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. Bonofiglo, 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

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.

J.K. Anderson, W. Capecchi, S. Eilerman, J.J. Koliner, 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

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

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

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

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)