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UNIVERSITY OF WISCONSIN-MADISON
Madison, Wisconsin
ST. JOHN'S UNIVERSITY
Collegeville, Minnesota

William J. Capecchi

PhD Physicist with over 10 years in private industry and plasma fusion energy research. Strong background in data driven research, scientific diagnostic design, modeling, and statistics. 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 data insights and solutions.

EDUCATION

2017 Ph.D. Plasma Physics

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

2009 B.A. Physics & Mathematics

EXPERIENCE

Present **Principal Investigator**

[Princeton Plasma Physics Lab, Lithium Tokamak Experiment-β \(LTX-β\)](#)

- Led research collaboration between UW Madison and PPPL, managing \$1.7M DOE Grant
- Coordinated hiring and mentoring of team of interns and students accelerating advanced modeling and hands-on research
- Developed new scientific diagnostic from design through construction and testing to development of advanced analytics tools and models, filling crucial knowledge gap in performance of neutral beam
- Routinely writes up scientific findings for publication in scientific journals and at conferences

May 2023

Research Associate

[Princeton Plasma Physics Lab, Lithium Tokamak Experiment-β \(LTX-β\)](#)

- Achieved first measurement of beam heating in low-recycling plasmas through optimization and implementation of technical upgrades to 700 kW neutral beam injector (NBI) on LTX-β device
- Performed cross-model analysis, including a self-developed first principles code, of NBI in LTX-β leading to engineering upgrade that improved beam coupling by 100%
- Designed and coordinated experimental tests and data analysis of plasma data to proactively identify research opportunities and recommend solutions to technical problems

Sept 2019

Sr. Simulation Engineer

[Donaldson Inc.](#)

- Technical lead on collaboration with University of MN project to develop liquid filtration model
- Led creation of experimental facility utilizing laser distance transducer technology to provide validation data to dust loading algorithm improvement
- Developed first principles dust loading algorithm to improve accuracy of filter life model
- Improved physics of filtration efficiency modeling through simulation of particle trajectories in flow

Aug 2017

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 statistical analysis of 72 GB 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
- Identified opportunity to improve data mining in MST group and developed a visualization program to search and intuitively display data from MST's 9 TB 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/Simulation
Python/SQL/VBA	• Team Management
Diagnostic Development	• Data Visualization
Problem Solving	• Statistics
Science Communication	• CAD Design



HOBBIES

Ultramarathons	• Triathlons
Backpacking/Hiking	• Rock Climbing
Road Cycling	• Canoe Building
Invasive Species Management	• Trail Building



PRESENTATIONS & PUBLICATIONS



W. Capecchi, et al. "A tensioned 2D wire calorimeter for neutral beam profile measurements on LTX- θ " [poster] Proceedings of the 25th Topical Conference on High Temperature Plasma Diagnostics. Asheville, NC (2024).

W. Capecchi, et al. "Improved neutral beam injection and diagnostics on LTX- θ " [poster] Proceedings of the 66th Annual Meeting of the APS Division of Plasma Physics Conference. Atlanta, GA (2024).

D.P. Boyle, W. Capecchi, et al. "Extending the low-recycling, flat temperature profile regime in the lithium tokamak experiment- θ (LTX- θ) with ohmic and neutral beam heating" Nucl. Fusion **63**, 056020 (2023).

W. Capecchi, et al. "Neutral beam heating of flat-temperature profile plasmas in LTX- θ " [poster] Proceedings of the 64th Annual Meeting of the APS Division of Plasma Physics Conference. Spokane, WA (2022).

W. Capecchi, et al. "Neutral beam prompt loss in LTX- θ " Nucl. Fusion **61**, 126014 (2021).

W. Capecchi, et al. "Neutral beam prompt loss in LTX- θ " [poster] Proceedings of the 63rd Annual Meeting of the APS Division of Plasma Physics Conference. Pittsburgh, PA (2021).

P.E. Hughes, W. Capecchi, et al. "Toroidal plasma acceleration due to NBI fast ion losses in LTX- θ " Plasma Phys. Control. Fusion **63**, 085020 (2021).

W. Capecchi, et al. "A Measure of Fast Ion Beta at Marginal Stability in the Reversed Field Pinch" Nuclear Fusion **59**, 086026 (2019).

W. Capecchi, et al. "A collimated neutron detector for RFP plasmas in MST" Rev Sci Instrum **87**, 11D826 (2016).

[Full publications list](#)