John M. Dusel, Ph.D.

CONTACT INFORMATION

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SUMMARY

Applied mathematician with six years experience doing quantitative research and software development in national defense and ten years of experience in academia. Recognized for leading critical R&D efforts, being a key contributor in tactical signals intelligence and operational testing projects, actively collaborating on interdisciplinary teams, and distilling complex information for consumption by non-experts.
Security Clearance: Top Secret (active)

EDUCATION

Ph.D. Mathematics (2015), *University of California, Riverside*

B.A. Mathematics, minor Computer Science (2006), *San Diego State University*

Digital Signal Processing Specialization Certificate (2024), *École Polytechnique Fédérale de Lausanne, through Coursera*

SKILLS

Research-related. Quantitative research and software development in Bayesian methods (decision theory, data analysis, sequential inference), digital signal processing, AI/ML (deep learning, clustering), computational geometry (locally adaptive Voronoi tessellation), complex adaptive systems. Research in pure and applied mathematics, including mathematical modeling in cognitive psychology, connections between applied category theory and systems dynamics, and algebraic combinatorics and representation theory of Lie algebras.

Technical. Software development in Python, Javascript (React, Node.js), R, Java, Mathematica, Octave and MATLAB. Expertise using Docker, Git, SDR (GNU Radio, REDHAWK/TOA), System administration in Ubuntu, Fedora, CentOS, RHEL, Mac OS.

PROFESSIONAL EXPERIENCE

Research Scientist (2019 – 2025)
Advanced Data Analytics Division, Metron, Inc., Reston, Virginia
August 2019 – August 2024 (Research Scientist I)
August 2024 – July 2025 (Research Scientist II)

Job description: Develop mathematical models and algorithms. Develop and demonstrate prototype software, and participate in operational analysis related to technical work. Interact with clients, gather requirements and data. Write and present memoranda and briefings, and contribute to the development of Metron tools. Work in small interdisciplinary teams from the initial system concept, through software and algorithm design, to implementation and demonstration.

Responsibilities, duties, accomplishments:

- Task lead for Operational Suitability feature in Metron's Dynamo decision-aid for Bayesian testing & evaluation of complex systems. Collaborated with military testing and evaluation subject-matter experts to develop scenarios, metrics, and models.
- Task lead for methodology, algorithm, and test cases for a Cost-Aware Sequential Probability Ratio Test for Dynamo, to determine when to stop testing a system.
- Lead software developer for a multi-year project on AI/ML for tactical signals intelligence. Responsible party for software demos/deliverables to stakeholders, and for integration into a U.S. Government owned software framework. Managed a team of research scientists and engineers.

- Contributed prototype Bayesian computer-vision and classification models (PyTorch) and experimental framework for countering deception attempts. Developed end-to-end processing pipeline for dealing with client-provided data and interpretation of model predictions.
- Won an award for "demonstrating impressive persistence to 'do what must be done' to get a software defined radio (SDR) system up and running for a field demonstration ... and leading the way to timely impact."

Visiting Assistant Professor (2017 – 2019)
Department of Mathematics and Computer Science, Mount St. Mary's University (Emmitsburg, Maryland)

Job description: Taught undergraduate courses on calculus, geometry, and general problem-solving. Conducted independent research and involved students in research projects. Engaged in service to the University. Participated, with voting privileges, in department and general faculty meetings.

Responsibilities, duties, accomplishments:
- Led an independent study course in mathematical logic for senior Philosophy students.
- Advisor for student chapter of the Mathematical Association of America.
- Average teaching evaluation 4.1/5

Visiting Assistant Professor (2015 – 1017)
Department of Mathematics and Computer Science, Whittier College (Whittier, California)

Job description: Taught undergraduate courses on statistics, calculus, linear algebra, precalculus. Engaged in independent research. Engaged in service to the department, college, and profession. Participated, with voting privileges, in department and general faculty meetings.

Responsibilities, duties, accomplishments:
- Won a faculty research grant that supported a project leading to a peer-reviewed publication and conference presentations.
- Advisor and member of grading committee for senior mathematics theses.
- Participated in recruitment committee for Visiting Assistant Professor position.
- Average teaching evaluation 4.6/5.

Other Activities

SciPy Contributor (2025)
Matrix variate t distribution for `stats` *module*

Research matrix variate t distribution and implement from scratch (due to licensing restrictions). Write documentation, unit tests, benchmarks following Scientific Python guidelines. Create a pull request and respond to feedback.

Editorial Board Member (2015 – present)
PUMP Journal of Undergraduate Research

Job description: Oversee the review process for submitted papers. Select referees, ensure timely turnaround of their reviews, evaluate reviews. Make the final decision to accept or reject. Write and summarize constructive feedback for student authors.

Chair of Contributed Paper Session on Associative and Nonassociative Rings and Algebras, Category Theory, and Homological Algebra. (2017) Joint Mathematics Meetings, Atlanta, Georgia.

Publications

Submitted

- M. B. Moreland, **J. M. Dusel**, Speed and Accuracy Instructions Invert Effects of Stimulus Class on 2AFC Recognition. Source code for available on GitHub.

In preparation

- **J. M. Dusel** and L. D. Stone, Bayesian Cost Aware Sequential Probability Ratio Test.

Published

- J. D. Foley, S. Breiner, E. Subrahmanian, **J. M. Dusel**, Operads for complex system design specification, analysis and synthesis. Proceedings of the Royal Society A., 2021. Available on ResearchGate.
- **J. M. Dusel**, Structural folding and multi-highest-weight subcrystals of $B(\infty)$. Algebras and Representation Theory, 2019. Available on ResearchGate.
- **J. M. Dusel**, Balanced parabolic quotients and branching rules for Demazure crystals. Journal of Algebraic Combinatorics, 2016. Available on ResearchGate.

Presentations

- **John M. Dusel**, John D. Foley, Community-based Modeling with Compositional Foundations. Finalist brief to Metron Innovation Fund Committee, 2023.
- James P. Ferry, **John M. Dusel**, Ian Herbert, AI/ML-based Motion Prediction. Metron Brown Bag series, 2023.
- John D. Foley, **John M. Dusel**, Radio Frequency Signal Correlation: ML Technology for tactical SIGINT. Metron Inc. Annual R&D Conference, 2023.
- **J. M. Dusel**, Combinatorial generation of multi-highest-weight crystals. Iowa State University Representation Theory Seminar, 2017.
- **J. M. Dusel**, Crystal folding. Joint Mathematics Meetings, Atlanta, Georgia, 2017.
- **J. M. Dusel**, Balanced parabolic quotients and branching rules for Demazure crystals. American Mathematical Society Western Sectional Meeting, University of Nevada at Las Vegas, 2015.
- **J. M. Dusel**, A self-similar forest and the symmetric group. Mathematics Colloquium, California State University, San Bernardino, 2015.
- **J. M. Dusel**, Self-similar forests and Fibonacci numbers. Mathematical Association of America, Southern California-Nevada Sectional Meeting, Pomona College, 2014

Other Experience

Doctoral Student - Research, Teaching, and Coursework (2008 – 2015)
University of California, Riverside

Job description: Research and coursework in pure mathematics under the supervision of Dr. Jacob Greenstein. Taught undergraduate courses in calculus, linear algebra, discrete mathematics.

Responsibilities, duties, accomplishments

- Conducted independent research in algebraic combinatorics and combinatorial number theory leading to conference presentations and per-reviewed publications.
- Chosen by Mathematics department faculty to lead the PhD-level qualifying exam preparation seminar in Algebra.
- Chosen by Mathematics department faculty to serve as a Mentor Teaching Assistant.
- University Teaching Certificate (2012). Program to prepare graduate students for teaching duties in an academic career.
- Awards/fellowships/scholarships: J. W. and Ida M. Jameson Scholarship (2014), Kramer Memorial Service Award (2014), Graduate Research Mentorship Fellowship (2011 – 2012), Gordon E. Hein Scholarship (2009 – 2012), Outstanding Teaching Assistant Award (2011), Graduate Division Fellowship (2008 – 2010)

Faculty Services Coordinator (June 2008 – September 2008)
Department of Mathematics, University of California, San Diego

Job description: Assisted faculty members with preparation and submission of research articles.

Graduate Student, Teaching Assistant (2007 – 2008)
University of Florida

Job description: Coursework in mathematical logic. Led discussion sections for undergraduate courses in precalculus.

Computer Resource Specialist, Webmaster (2006–2007)
Department of Radiology, School of Medicine, University of California, San Diego

Job description: Webmaster for official Department of Radiology homepage. General IT system administration/maintenance duties for department staff, nurses, physicians.

Responsibilities, duties, accomplishments:
- Rebuilt web app used to schedule radiologists across hospitals in the UCSD healthcare system.
- Worked on-call to diagnose and repair hardware/software issues with physicians, nurses, research staff, and administrative staff across multiple facilities.
- Area of responsibility covered two hospitals and several satellite facilities in the greater San Diego region.