Steven Mielke, M.S., Ph.D.

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SENIOR RESEARCH SCIENTIST

Designing, implementing, and optimizing strategic solutions to challenging problems in data science. Delivering models, methods, and algorithms that derive insights and value from diverse sources of data.

Physicist with over 15 years of collaborative, interdisciplinary research experience, specializing in numerical modeling and analysis of novel datasets. Earned a reputation for delivering innovative solutions to a broad range of challenging, computational research problems, advancing basic science, yielding high-impact platforms and publications, and generating funding awards.

EXPERIENCE HIGHLIGHTS

Interdisciplinary Research: Organized and led multidisciplinary, multi-institutional research teams to deliver new computational frameworks for DNA and protein **bioinformatics**.

Innovative Problem-Solving: Training and experience in physics have honed abilities to reduce problems to essential elements; identify features integral to successful model-building; and apply first-principles knowledge to develop, test, and deploy effective methods and algorithms. Leveraging these skills, combined with unique perspectives from diverse, interdisciplinary research experiences, delivered creative, computational solutions to complex problems in biomolecular **simulation** and **data-driven structure prediction**.

Numerical Modeling and Analysis Providing Actionable Insights from Data: Implemented original, empirically-informed models, simulations, and **analytics** elucidating the biological roles of topological stress-driven structural transitions in mesoscale DNA sequences.

Developed new methods for obtaining, analyzing, and cross-correlating web-based and novel experimental datasets, providing a basis for **deep-learning** approaches to protein structure prediction, and insights of direct impact on NASA astrobiology missions. Support included a SEGRF award (Lawrence Livermore National Lab / UC Davis), a NASA Postdoctoral Program (NPP) fellowship, and two NASA Director's Discretionary Fund awards.

AREAS OF EXPERTISE

- Computational Biophysics
- Bioinformatics
- Machine Learning
- Numerical Methods, Modeling & Simulation
- Nonlinear and Statistical Analysis
- Data Visualization
- Scientific and Technical Communication
- Teaching & Mentoring

EDUCATION

University of California, Davis, Biophysics Graduate Group, Davis, CA
Ph.D. in Biophysics, Sep 2006

Dissertation: "Computational Approaches to the Structure and Dynamics of Biomolecules"

Analyzed novel DNA structural and base-sequence data from dynamic simulations. Developed new **bioinformatics** tools for estimating protein structure by correlating information from biophysical **databases**; publications facilitated subsequent **machine learning** approaches to structure prediction. (See *Career Highlights*, LLNL/UCD, SEGRF.)

University of Toledo, Department of Physics and Astronomy, Toledo, OH
M.S. in Physics, Dec 2000

Thesis: "Semi-Empirical Determination of Energy Parameters in the Argon Isoelectronic Sequence"

Performed **nonlinear least-squares estimation** of atomic parameters to compute eigenvalues and eigenvectors of an isoelectronic system. The resulting model captures known configuration interaction (state mixing) in argon, demonstrating the potential to predict subtle features of other atomic sequences. ◆ Languages: **Maple, C/C++**

Kent State University, College of Arts and Sciences, Kent, OH

M.A. in English, Aug 1994 ⬥ *B.G.S. in Integrated Life Sciences*, May 1992

PROFESSIONAL CERTIFICATION

Machine Learning

Stanford University / Coursera

Instructor: Andrew Ng
Completed: Sun, Sep 8, 2019

Languages: **MATLAB / Octave**
Environments: **Unix**, **MATLAB Online**

IBM Data Science (in progress)

IBM / Coursera

Instructor: Multiple
Completed: Fri, Nov 15, 2019

Languages: **Python**, **R**, **Scala**, **SQL, Apache Spark**
Environments: **JupyterLab, RStudio**, **Apache Zeppelin**

<u>Selected Topics / Assessed Projects</u>: Linear regression; Logistic regression; Multi-class classification; Neural networks; Regularization, bias, and variance; Support vector machines; K-means clustering; Principal component analysis; Anomaly detection; Recommender systems; Large-scale learning (map reduce, parallelism); OCR

Credential URL: <u>https://www.coursera.org/account/accomplishments/verify/6UD6LSLGTEA7</u>

PROGRAMMING SKILLS

Environments. Unix [20+ yrs], Linux [20 yrs], Windows [25+ yrs], OS X [18 yrs], MATLAB Online [11 yrs], IBM Cloud / Skills Network Labs (Data Scientist Workbench) / Watson Studio [6 mos]

Languages. C/C++ [20+ yrs], Perl [18 yrs], MATLAB / Octave [11 yrs], Python [1 yr], R [6 mos], Maple [20+ yrs]

CAREER HIGHLIGHTS

University of Mary Hardin-Baylor / Texas Lutheran University

Dept. of Computer Science, Engineering & Physics, Belton, TX / Dept. of Physics, Seguin, TX

Visiting Assistant Professor, 2016 – 2019

Developed and taught lower- and upper-division lecture and laboratory courses for physics and applied physics majors, and service courses for non-majors (topics included scientific inquiry and climate change). Physics courses included *Computational Applied Science*, emphasizing student projects offering hands-on exposure to **MATLAB, Python / SciPy**, **Arduino**, and other **data processing, visualization, and analysis** platforms.

Mentored student projects emphasizing scientific and technical writing, and applied **C/C++**.

Rockefeller University

Laboratory of Photobiology, New York, NY

Research Associate, 2011 – 2015

In connection with research at NASA GISS (see following), designed and implemented experimental methods and **numerical models** for acquisition and **nonlinear analysis** of novel efficiency datasets relevant to the optimization of biomimetic energy-storage technologies. Interrelated projects at NASA GISS and Rockefeller received two <u>NASA Director's Discretionary Fund awards</u> (2008, 2009).

Languages: **MATLAB, Perl, C/C++**

NASA Goddard Institute for Space Studies (GISS)

New York, NY

Scientific Programmer / Analyst, NPP Fellow, 2008 – 2011

Used database-derived structural information to build **homology models** of novel proteins; employed **coupled-rates** and **Monte Carlo** strategies to investigate kinetics and redox properties of electron transport in oxygenic photochemistry. Results impact NASA astrobiology projects and missions by constraining potential target systems in habitable planet / extrasolar life searches.

Languages: **MATLAB, Perl, C/C++**

University of California, Davis
Bioinformatics Group, UC Davis Genome Center, Davis, CA

Postdoctoral Scholar, 2006 – 2008

Performed **statistical mechanical calculations** that successfully predict regions of localized destabilization in genomic DNA. Developed and implemented original models and algorithms to generate **time-series data** from **dynamic simulations** of *in vivo* DNA. Analyses provided insight into the biological roles of stress-driven DNA structural transitions. This work received a National Research Service Award, National Cancer Institute, NIH, 2008.

Languages: **Perl, Python, C/C++**

Lawrence Livermore National Laboratory (LLNL) / UC Davis
Biology and Biotechnology Research Program, Livermore, CA / Biophysics Graduate Group, Davis, CA

Student Employee Graduate Research Fellow (SEGRF), 2002 – 2006

Delivered new methodology for high-throughput structural characterization of proteins, predicated on **data mining** to correlate information from NMR spectroscopy with that from structural classification schemes. This effort laid the groundwork for subsequent—e.g., **deep learning**—approaches to data-driven protein structure prediction.

Languages: **Perl, R, C/C++**

HONORS AND AWARDS

NASA Postdoctoral Program (NPP) Fellowship, 2008 – 2011
NASA Goddard Institute for Space Studies, New York, NY

NASA Astrobiology Institute Director's Discretionary Fund Grant, 2009 – 2011

Ruth L. Kirschstein National Research Service Award (NRSA, F32), 2008
National Cancer Institute, National Institutes of Health, Bethesda, MD

Student Employee Graduate Research Fellowship (SEGRF), 2002 – 2006
Biology and Biotechnology Research Program, Lawrence Livermore National Lab, Livermore, CA

American Association for the Advancement of Science (AAAS) Mass Media Fellowship, 2000
Science and Technology Features Unit, Cable News Network, Atlanta, GA

Sigma Pi Sigma, National Physics Honor Society, 1998

PROFESSIONAL MEMBERSHIPS & AFFILIATIONS

Biophysical Society, Member, 2003 – Present

American Association for the Advancement of Science (AAAS), Member, 2000 – Present

American Association of Physics Teachers, Member, 2016 – 2019

Rockefeller University, New York, NY
Adjunct Faculty, 2014 – 2015

City College of New York, Department of Physics, New York, NY
Visiting Scientist, 2009 – 2014

Columbia University, Center for Climate Systems Research, New York, NY
Visiting Scholar, 2009 – 2011

SELECTED PUBLICATIONS

https://drive.google.com/drive/folders/1TZ4ss-ERzo1YHOW-av2YTiWIvbYCB6nT?usp=sharing

REFERENCES

Available upon request.