Michelle Lynn Gill, Ph.D.

Biophysicist and Data Scientist

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| mlgill
| modernscientist

Current

Biophysicist turned data scientist. Part of the Summer Metis Data Science Bootcamp Cohort (June – September, 2016) in New York. Eager to apply my superb computational, statistical, and communication skills to solve challenging problems in team-focused settings.

Experience

2014–2016

National Cancer Institute, National Institutes of Health, Research Scientist
Developed robust and extremely fast methods for reconstruction of non-uniformly sampled NMR data

2008–2014

Columbia University, Department of Biochemistry and Molecular Biophysics, Postdoctoral Research Fellow

Demonstrated that conformational selection is critical in the highly concerted mechanism of AlkB
Advisor: Professor Arthur G. Palmer, III

2007–2008

University of Kansas, Department of Pharmaceutical Chemistry, Postdoctoral Research Fellow
Examined the role of dynamics in IgG and vaccine stability
Advisor: Professor C. Russell Middaugh

2006–2007

The Boston Consulting Group, Consultant
Worked with clients in the finance and pharmaceutical sectors to streamline organizational structure and identify novel investment opportunities. I was part of the case team that won the 2007 Global BCG Strategy Olympics for our work with a pharmaceutical client.

2001–2006

Yale University, Department of Molecular Biophysics and Biochemistry, Graduate Research Fellow
Studied monovalent metal binding in nucleic acids using 205Thallium NMR
Advisors: Professor J. Patrick Loria and Professor Scott A. Strobel

1997–2001

University of Kansas, Department of Pharmaceutical Chemistry, Undergraduate Research Fellow
Characterization of cationic lipid-DNA complexes for non-viral gene therapy
Advisor: Professor C. Russell Middaugh

Education

2003–2006

Yale University, New Haven, CT
Ph.D., Molecular Biophysics & Biochemistry
Advisors: J. Patrick Loria and Scott Strobel

2001–2003

Yale University, New Haven, CT
M.Phil., Molecular Biophysics & Biochemistry

1997–2001

University of Kansas, Lawrence, KS
B.S., Biochemistry, *Summa Cum Laude*

Projects

Blog

My personal blog, themodernscientist, discusses data visualization, optimization, automation, and various other computationally-related interests. Frequent posts incorporate Jupyter notebooks and shell scrips. The blog itself is created using Pelican, a Python-based static blogging engine, and the website is hosted on GitHub.

Python Book

I am co-author of an in progress, introductory book geared towards life scientists who want to learn Unix and Python. I wrote a blog post announcing the project.

NESTA-NMR

I developed and currently maintain a program, called NESTA-NMR, that enables the acquisition of experimental data to be completed up to 100X faster. This project uses a compressed sensing algorithm, called NESTA. The program is written in C, highly parallelized, and best-in-class for speed and optimization accuracy. Associated scientific (GSL and FFTW) and parallelization (pthreads) libraries were also used.

I built the website using Flask and created the documentation using Sphinx.

MFOutParser

MFOutParser is a Python library I developed during my postdoctoral research that parses a particularly challenging text format and performs preliminary analysis on the resulting data using Pandas.

Technical Skills

Python
R
C
MATLAB
Machine learning
UNIX
Git
LaTeX
Statistics

Publications

Peer Reviewed

Gill, M.L., Byrd, R.A., Palmer, A.G. "Detection of Chemical Exchange in Methyl Groups of Macromolecules", *in preparation*.

Gill, M.L., Sun, S., Byrd, R.A., "Highly Quantitative Reconstruction of Sparsely Sampled, Low Dimensionality NMR Spectra", *in preparation*.

2016

Gill, M.L., Byrd, R.A., Palmer, A.G. "Dynamics of GCN4 Facilitate DNA Interaction: A Model-Free Analysis of an Intrinsically Disordered Region", *Phys. Chem. Chem. Phys.* 2016, 18, 5839–5849. [pdf]

2015

*Sun, S., *Gill, M.L.**, Li, Y., Huang, M., Byrd, R.A. "Efficient and generalized processing of multidimensional NUS NMR Data: the NESTA algorithm and comparison of regularization terms", *J. Biomol. NMR* 2015, 62, 105–117. [pdf]
* Authors contributed equally

2014

Gill, M.L., Palmer, A.G. "Local isotropic diffusion approximation for coupled internal and overall molecular motions in NMR spin relaxation", *J. Phys. Chem. B* 2014, 118, 11120–11128. [pdf]

2014

Ergel, B., **Gill, M.L.**, Brown, L., Yu, B., Palmer, A.G., Hunt, J.F. "Protein dynamics control the progression and efficiency of the catalytic reaction cycle of AlkB", *J. Biol. Chem.* 2014, 289, 29584–29601. [pdf]

2011

Gill, M.L. and Palmer, A.G. "Multiplet-filtered and gradient-selected zero-quantum TROSY experiments for 13C1H3 methyl groups in proteins", *J. Biomol. NMR*, 2011, 51, 245–251. [pdf]

2009

Ramsey, J.D., **Gill, M.L.**, Kamerzell, T.J., Price, E.S., Joshi, S.B., Bishop, S.M., Oliver, C.N., Middaugh, C.R. "Using empirical phase diagrams to understand the role of intramolecular dynamics in immunoglobulin G stability", *J. Pharm. Sci.* 2009, 98, 2432–2447. [pdf]

2006

Gill, M.L., Strobel, S.A., and Loria, J.P. "Crystallization and characterization of the thallium form of the *Oxytricha nova* G-quadruplex", *Nucleic Acids Res.* 2006, 34, 4506–4514. [pdf]

2005

Gill, M.L., Strobel, S.A., and Loria, J.P. "205Tl NMR methods for the study of monovalent metal binding sites in nucleic acids", *J. Am. Chem. Soc.* 2005, 127, 16723–16732. [pdf]

2005

Beach, H., Cole, R., **Gill, M.L.**, and Loria, J.P. "Conservation of μs-ms enzyme motions in the apo- and substrate-mimicked state", *J. Am. Chem. Soc.* 2005, 127, 9167–9176. [pdf]

2004

Adams, P.L., Stahley, M.R., **Gill, M.L.**, Kosek, A.B., Wang, J., and Strobel, S.A. "Crystal structure of a group I intron splicing intermediate", *RNA* 2004, 12, 1867–1887. [pdf]

2003

Wiethoff, C.M., **Gill, M.L.**, Koe, G.S., Koe, J.G., and Middaugh, C.R. "A fluorescence study of the structure and accessibility of plasmid DNA condensed with cationic gene delivery vehicles", *J. Pharm. Sci.* 2003, 92, 1272–1285. [pdf]

2002

Wiethoff, C.M., **Gill, M.L.**, Koe, G.S., Koe, J.G., and Middaugh, C.R. "The structural organization of cationic lipid-DNA complexes", *J. Biol. Chem.* 2002, 277, 44980–44987. [pdf]

2000

Silchenko, S., **Sippel, M.L.**, Kuchment, O., Benson, D.R., Mauk, A.G., Altuve, A., and Rivera, M. "Hemin is kinetically trapped in cytochrome b5 from rat outer mitochondrial membrane", *Biochem. Biophys. Res. Commun.* 2000, 273, 467–472. [pdf]
* M.L. Gill is formerly M.L. Sippel

Other   **2014**

Gill, M.L., Byrd, R.A. "Dynamic activation of apoptosis: conformational ensembles of cIAP1 are linked to a spring-loaded mechanism", *Nat. Struct. Mol. Biol* 2014, 21, 1022–1023. [pdf]

Teaching   **2003**

Yale University, Graduate Teaching Fellow
Course: Medical Impact of Basic Science
Role: Led discussion sessions where

undergraduates discussed primary scientific literature, helped them develop and write research proposals based on topics covered

2002–2003

Yale University, Graduate Teaching Fellow
Course: Biochemistry II
Role: Led discussion sessions and reviews, designed quizzes and homework questions

Selected Conference Presentations

2015

Gill, M.L., Sun, S., Li, Y., Huang, M., Byrd, R.A. "NESTA-NMR: efficient and generalized processing of multidimensional NUS NMR data", Poster, 56th Experimental Nuclear Magnetic Resonance Conference, 2015, Monterrey, CA.

2014

Gill, M.L., Byrd, R.A., Palmer, A.G. "The role of GCN4 conformational dynamics in DNA binding and recognition", Poster, International Conference of Magnetic Resonance in Biological Sciences, 2014, Dallas, TX.

2012

Gill, M.L., Ergel, B., Brown, L., Yu, B., Palmer, A.G., Hunt, J.F., "Protein dynamics control the progression and efficiency of the catalytic reaction cycle of AlkB", Poster, International Conference of Magnetic Resonance in Biological Sciences, 2012, Lyon, France.

2011

Gill, M.L., and Palmer, A.G., "Gradient-selected zero-quantum experiments for the study of 1H—13C correlations in protonated methyl groups", Poster, 52nd Experimental Nuclear Magnetic Resonance Conference, 2011, Monterrey, CA.

2005

Gill, M.L., Strobel, S.A., and Loria, J.P., "Direct study of 205Tl binding to a G-quadruplex by detection of 1H–205Tl scalar couplings", Selected Oral Presentation, 46th Experimental Nuclear Magnetic Resonance Conference, 2005, Providence, RI.

Awards   2009–2012

NIH Postdoctoral Research Fellowship (F32 GM089047)

2007

Global BCG Strategy Olympics Winning Team

2002–2006

NSF Graduate Research Fellowship

2003

Outstanding Graduate Teaching Assistant

2000–2001

Barry M. Goldwater Scholar

2001

Outstanding Undergraduate Honors Research Thesis

1997–2001

Kansas Board of Regents Full Tuition Scholarship

Continuing Education

In-Person 2016

Member of the Summer 2016 Metis Data Science Bootcamp Cohort

Online

Only machine learning and statistics courses are listed. A comprehensive list is also available.

Machine Learning
Mathematical Biostatistics Bootcamp I
Statistical Inference
Regression Models
Practical Machine Learning
Foundations of Machine Learning
Regression

Links

michelle@michellelynngill.com
mlgill
modernscientist
michelle-gill
linkedin

References

Available on request.