SHARON S. NEWMAN

Bridging computational and molecular sciences for actionable insights in health

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OVERVIEW

I build scalable solutions for generating and leveraging high-quality biological data—especially where data is scarce and complexity is high. Drawing on deep expertise in protein science and multi-omic assay development, I design algorithms, biophysical models, and infrastructure that bridge experimental rigor with practical ML requirements. Having led system-level improvements in fast-paced startup environments, I thrive in balancing rigorous scientific standards with rapid iteration to advance discovery from early research through translational applications.

EXPERIENCE

Systems Lead and Computational Scientist

b.next (start-up)

August 2025 - Present San Francisco, CA

Leading the design and scaling of computational infrastructure and automated pipelines to support distributed synthetic biology, towards robust data generation for AI-driven discovery.

Machine Learning Co-op

BigHat Biosciences

February 2025 - June 2025 San Mateo, CA

- Fine-tuned and modified ML models with large-scale multi-modal biological datasets to push the Pareto frontier of antibody developability.
- Applied statistics and protein-based insights to enhance model architecture, feature engineering, and variant ranking.
- Developed QC methods and model benchmarks to ensure reproducibility and scalability of ML pipelines.

Postdoctoral Researcher

Department of Radiology, Tom Soh, Stanford University

September 2023- April 2024 Stanford, CA

- Developed convex optimization framework and biophysics model to enable accurate and quantitative use of cross-reactive affinity reagents. [Theory: Anal. Chem., Assay: ACS Omega]
- Developed a user-friendly API to automate OT-2 liquid-handling workflows, streamlining wet-lab processes and enhancing reproducibility.

PhD Candidate

Bioengineering, Advisor Tom Soh, Stanford University

September 2017 – September 2023 Stanford, CA

- Investigated bottlenecks in molecular quantification to advance the robustness and scalability of diagnostic assays. [Thesis]
- Matured a biophysical model and tuning mechanism for multiplexed molecular assays, achieving 7+ log dynamic range in 100% serum. , with applications to high-throughput diagnostics. [Nature Comm., Patent]
- Built cloud-based, memory-efficient pipelines and statistical algorithms for large-scale single-molecule imaging (TIRF, 100+ GB) and spatial analysis (cell signaling) workflows. [Nature Comm., Adv. Mat.].
- Developed a multiplexed DNA-based assay and custom NGS pipeline for scalable small molecule quantification. [ACS Omega]

EDUCATION

Bioengineering PhD

Stanford University — Stanford, CA

Electrical Engineering M.S.

Stanford University — Stanford, CA

Bioengineering B.S.

University of Washington — Seattle, WA

SKILLS

Python Linux Git Slurm AWS h5py Optimization Computer Vision ML NGS Immunoassays Biosensors

COURSEWORK

- Linear Dynamical Systems
- Deep Learning
- AI Principles & Techniques
- Design and Analysis of Algorithms
- Probabilistic Graphical Models
- Representations & Algs. for Comp. Bio.
- Therapeutics at Chem-Bio Interface

TEACHING

- Biological Macromolecules (Stanford)
- Intro. to Systems Biology (Stanford)
- Anal. Methods in Biotech (Stanford)

AWARDS

- GRC, Bioanal. Sensors, Best Poster ’22
- NSF GRFP ’19-’22
- Stanford Graduate Fellowship ’17-’22
- U.S. Student Fulbright Scholar ’15-’16
- Whitaker International Fellow ’15-’16

* *underline indicates publication hyperlink*

Data Science Intern

BigHat Biosciences

July 2022 – September 2022 | San Mateo, CA

- Developed statistical and visualization methods that highlighted unmonitored data signal's role in antibody developability (Dash, Seaborn).
- Integrated signal into company-wide data pipeline and restructured ML infrastructure for multi-modal predictions.
- Proposed in-silico antibody designs with expected improvement in specified antibody characteristic.

ML Instructor & Curriculum Developer

Inspirit AI

May 2019 – August 2021 (part-time) | Mumbai, India and California

- Designed and taught project-based AI curriculum for high schoolers, progressing from linear regression to CNNs.
- Developed and led advanced modules on healthcare-focused AI, covering GNNs, saliency maps, and ethics.

Research Scientist

Molecular Information Systems Lab (MISL), University of Washington

August 2016 – August 2017 | Seattle, WA

- Led design of a Read Only Memory chip for DNA data storage and established a lab branch focused on digital microfluidics for DNA storage. [Nature Comm.]
- Developed electronic systems and control software for electrowetting-based automation of microscale fluidics and wet-lab protocols.

Fulbright Scholar and Whitaker Fellow

Laboratory for Biomedical Microtechnology (IMTEK), University of Freiburg - Thomas Stieglitz

August 2015 – July 2016 | Freiburg, Germany

- Redesigned thin-film neuroprosthetic electrodes to minimize mechanical stress and increase chronic stability [IEEE].
- Manufactured thin-film electrodes in ISO 4-7 cleanrooms.
- Characterized electrodes via accelerated aging tests, SEM, EIS, pulse tests, and electric field analysis.

Research Scientist

Biorobotics Lab, University of Washington

January 2012 – June 2015 | Seattle, WA

- Automated surgical robot for sensory feedback mapping (Senior capstone thesis).
- Developed 3D models for surgical training of microtia congenital ear surgeries (Seattle Children's Hospital).

Research Engineer Intern - Taiwan Tech Trek Scholar

Industrial Technology Research Institute (ITRI)

June 2013 - August 2013 | Hsinchu, Taiwan

- Built upon a sensory-motor fusion system to estimate human intention for control of a lower extremity exoskeleton robot. Analyzed central pattern generators and integrated ODEs and PDEs in MATLAB to the robot feedback system.
- Redesigned the exoskeleton user interface to be more intuitive
- Extensively used Solidworks to create 500+ component assembly diagrams.

PUBLICATIONS AND PATENTS

1. **Newman S.S.***, Hein L.A.*, et al. *Theoretical Framework and Experimental Validation of Multiplexed Analyte Quantification Using Cross-Reactive Affinity Reagents*. Anal. Chem. 97, 35, 18896–18906 (2025)
2. **Newman S.S.**, Wilson B., Zheng L., Soh H.T. *Multiplexed Assay for Small-Molecule Quantification via Photo-cross-linking of Structure Switching Aptamers*. ACS Omega 9 43785-43792 (2024).
3. **Newman S.S.** *Re-Imagining and Expanding the Diagnostic Toolbox: Towards Robust and Scalable Molecular Quantification* Stanford University ProQuest Dissertations & Theses, 31194559 (2023).
4. Park C.H., Thompson I.A.P., **Newman, S.S.**, et al. *Real-Time Spatiotemporal Measurement of Extracellular Signaling Molecules Using an Aptamer Switch-Conjugated Hydrogel Matrix*, Advanced Materials. 2306704 (2023).
5. **Newman S.S.***, Wilson B.*, Mamerow D.*, et al. *Extending the dynamic range of biomarker quantification through molecular equalization.* Nat. Comm. 14, 4192 (2023).
6. Soh H.*, Wilson B.*, **Newman S.S.***, Mamerow D.*, *A tunable proximity assay that can overcome dilutional non-linearity*. PCT Patent App PCT/ US2023/ 062463.
7. Hariri, A.A.*, **Newman, S.S.*** , Tan, S.* et al. *Improved immunoassay sensitivity and specificity using single-molecule colocalization.* Nat. Comm. 13, 5359 (2022).
8. Stephenson A., Willsey M., McBride J., **Newman, S.S.**, Nguyen B., Takahashi C., Strauss K., Ceze L., *PurpleDrop: A digital microfluidics-based platform for hybrid molecular-electronics applications* IEEE Micro 40-5, 76-86 (2020).
9. **Newman S.S.**, Stephenson A., Willsey M., Nguyen B., Takahashi C., Strauss K., Ceze L., *High Density DNA data storage library via dehydration with digital microfluidics retrieval*. Nat. Comm. 10 1706 (2019).
10. Willsey M., Stephenson A., Takahashi C., Vaid P., Nguyen B., Piszczek M., Betts C., **Newman, S.S.**, Joshi S., Strauss K., Ceze L., *Puddle: A dynamic, error-correcting, full-stack microfluidics platform* Proc 24th In Conf on Architectural Support 183-197 (2019).
11. Organick L., Ang S., Chen Y., Lopez R., Yekhanin S., Makarychev K., Racz M., Kamath G., Gopalan P., Nguyen B., Takahashi C., **Newman S.**, ... , Strauss K., *Random access in large-scale DNA data storage* Nat. Biotechnology 36, 242-248 (2018).
12. Berens A., **Newman S.**, Bhrany A., Murakami C., Sie K., Zopf D., *Computer-aided design and 3D printing to produce a costal cartilage model for simulation of auricular reconstruction* Otolaryngology-Head and Neck Surgery 155. 356-359 (2016).

SELECTED PRESENTATIONS AND POSTERS

- Newman S., Hein L., 'Multiplexed Analyte Quantification with Cross-Reactive Affinity Reagents.' DNA29, Japan, 2023
- Newman S., 'Extending the dynamic range of biomarker quantification through molecular equalization'. IEEE MNMC, HI, 2022
- Newman S., 'Tuning Mechanisms for Simultaneous Quantification of fM and high nM Proteins'. Gordon Research Conference (GRC) Bioanalytical Sensors, Poster and Presentation, 2022. *Best Poster Award*
- Newman S., Chen R., Noyola T., 'Prediction of partially structured DNA aptamer libraries', Stanford CS221 Project. 2019.
- Newman S., Persson T., 'White Blood Cell Differential Counting in Blood Smears via Tiny YOLO', Stanford CS230 Project. 2018.

SELECTED PROJECT BASED COURSEWORK

- Developed statistical inference and regression models for heart disease mortality rate as a function of demographics and health indicators (Stanford MSE 226 Fundamentals of Data Science). 2022.
- Charpignon M., Cersosimo M., Lenk A., **Newman S.**, Rastogi C., Gimenez J., Zou J. *Improving Posterior Estimation of COVID-19 Policy Effects With Synthetic Control Guided Compartmental Models*. Stanford CS 471 Data Science and AI for COVID19. (2020).
- Designed baseline regression, SVM, and clustering models with various sequence encodings for discovering binding motifs in aptamer design (Stanford CS221 Artificial Intelligence: Principles and Techniques). 2019.
- Implemented Tiny YOLO and Fast R-CNN for white blood cell differential counting in blood smears. Preprocessing of data with image augmentation and updated loss functions for improved classification (Stanford CS230 Deep Learning). 2018.

TEACHING AND LEADERSHIP EXPERIENCE

Graduate Teaching Assistant

BIOC 241 Biological Macromolecules, Stanford University - Rhiju Das

2019 | Stanford, CA

- Reshaped course for Online Learning. Flipped classroom, developed, and led sections.
- Topics covered include: thermodynamics and statistical mechanics of macromolecular folding, kinetics of enzymatic processes, and bistable systems using fixed point analysis.

Graduate Teaching Assistant

BIOE101/201 Introduction to Systems Biology, Stanford University - Markus Covert

2019 | Stanford, CA

- Led recitations ranging from fixed point analysis and stochastic simulation to cellular signal transduction, and metabolism.
- Designed and graded homework's and exams for 50 undergraduate and graduate students, held office hours.

Graduate Teaching Assistant

EE 235 Analytical Methods in Biotechnology, Stanford University - Tom Soh

2019 | Stanford, CA

- Taught and revamped curriculum. Instigated and taught mini-lectures during down time ranging from DNA/protein structure and dynamics to details on Nanopore sequencing.
- Led lab modules covering topics on restriction enzymes, immunoassays, bacterial transformation, and sequencing.

Lead CS Mentor

Girls Teach Girls to Code

2018-2020 | Stanford, CA

- Leading teams of undergraduate female students to develop EE/CS workshops for high school girls
- Organize mentors to brainstorm, propose, and develop workshop curriculum
- Held a workshop (Code Camp) for 200+ high school girls to learn about Arduino based programming and basic circuits
- Mentoring undergraduate team and high school girls on engagement as females in STEM

STEM Instructor and Coordinator

Self-Employed

2017 | Hualien, Taiwan

- Instigated STEM program for indigenous and underrepresented Taiwanese 5th-12th grade students
- Mission is to create self-sustaining program by triage—teaching teachers to further teach.
- Wrote curriculum for teaching Scratch including course modules and approaches to teaching computer science.
- Organized and led a workshop in 2017 for 22 teachers to further develop curriculum and gain program traction.

Bioengineering Outreach Program Lead

University of Washington

2013-2015 | Seattle, WA

- Initiated and headed team to develop hands-on K-12 biotechnology modules.
- Launched elementary school fairs and presented modules to 240+ students.
- A few of our models were: Prosthetics, Cardiovascular Systems, Immunology, and Microfluidics.
- Led drug delivery module in Yakima Valley Science and Engineering Festival to 2,000+ K-12 students.