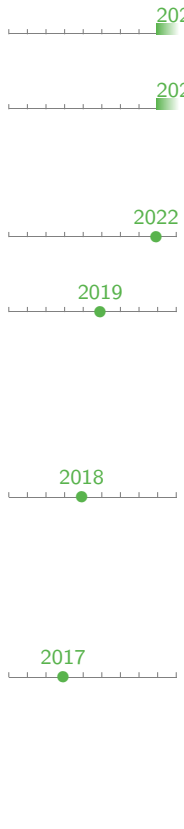


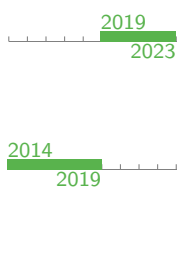
# Jeffrey Ruffolo

Berkeley, CA, USA  
jeffreyruffolo.com  
github.com/jeffreyruffolo  
linkedin.com/in/jeffreyruffolo

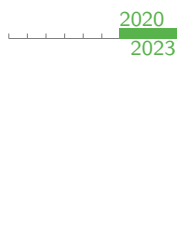
## Professional


- 
- 2022** **Profluent Bio, Machine Learning Scientist**
    - Protein design startup.
  - 2022** **Ably Bio, Founder and CEO**
    - Co-founded company to apply machine learning methods to therapeutic antibody design.
    - Won Microsoft Innovation Acceleration Award.
    - Accepted into Microsoft for Startups program.
  - 2022** **Generate:Biomedicines, Machine Learning Scientist Intern**
    - Developed diffusion models for protein complex prediction.
  - 2019** **Microsoft, Software Engineer Intern**
    - **Tech** Azure, C#, Python
    - Developed efficient process for migrating large quantities of user metadata for the Microsoft Teams product.
    - Reworked architecture of globally-distributed metadata storage service to reduce load in high-traffic regions and increase resiliency to bursts of increased demand.
  - 2018** **Microsoft, Software Engineer Intern**
    - **Tech** GraphQL, Apollo, TypeScript, Node.js
    - Developed initial implementation of GraphQL service layer, providing backend service abstraction for Microsoft Teams product.
    - Built representative metrics for analyzing performance impact resulting from additional layer between client and distributed services.
  - 2017** **IBM, Software Developer Intern**
    - **Tech** Spring, Java, Docker, Kubernetes
    - Performed exploratory analysis of Spring web framework and its compatibility with IBM Cloud platform.
    - Published ten articles on official IBM Cloud blog, aimed at providing support for Spring community and establishing IBM Cloud as a preferred choice for enterprise Java development.

## Education


- 
- 2019** **2023** **Doctor of Philosophy, Johns Hopkins University, Baltimore, MD**
    - **Program** Molecular Biophysics
    - Advised by Prof. Jeffrey Gray and Prof. Jeremias Sulam
    - Johns Hopkins-AstraZeneca Scholar
  - 2014** **2019** **Bachelor of Science, University of Missouri, Columbia, MO**
    - **Majors** Biochemistry, Computer Science
    - Minor in Mathematics
    - Summa Cum Laude (GPA 3.979)

## Research

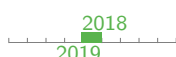
- 
- 2020** **2023** **Graduate Student, Johns Hopkins University**
    - **Adviser** Prof. Jeffrey Gray
    - Developed first deep learning methods for antibody  $F_V$  structure prediction (DeepH3, DeepAb), which significantly improved performance on the critical CDR H3 loop over prior approaches.
    - Developed antibody-specific language models for representation learning and synthetic library design.
    - Developed fast, accurate method for antibody structure prediction (IgFold), leveraging 558M natural antibody sequences.

- 


**Graduate Student, Johns Hopkins University**

  - **Adviser** Prof. Jeremias Sulam
  - Applied protein language models and weakly supervised learning to study dynamics of affinity maturation within immune repertoires.
- 

**Johns Hopkins-AstraZeneca Scholar, AstraZeneca**

  - **Adviser** Dr. Gilad Kaplan
  - Experimentally validated designed antibodies and received industry mentorship as part of joint training program between Johns Hopkins and AstraZeneca.
- 


**Undergraduate Researcher, University of Missouri**


  - **Adviser** Prof. Yi Shang
  - Developed TPCref, a method for refinement of protein contact-map predictions using the results of predictions by the same method on template structures.
- 


**Undergraduate Researcher, University of Missouri**


  - **Adviser** Prof. Andrew McClellan
  - Utilized highly-parallelized dual-annealing exploration strategy to demonstrate that diverse combinations of parameters can produce realistic neuronal behavior for a multi-compartmental neuron model.


## Preprints

- 

Alex Morehead, **Jeffrey A. Ruffolo**, Aadyot Bhatnagar, and Ali Madani. “Towards Joint Sequence-Structure Generation of Nucleic Acid and Protein Complexes with SE(3)-Discrete Diffusion”. In: *NeurIPS MLSB Workshop* (2023)
- 


Michael F. Chungyoun, **Jeffrey A. Ruffolo**, and Jeffrey J. Gray. “FLAb: Benchmarking deep learning methods for antibody fitness prediction”. In: *NeurIPS MLSB Workshop* (2023)
- 


Sai Pooja Mahajan, **Jeffrey A. Ruffolo**, and Jeffrey J. Gray. “Contextual protein and antibody encodings from equivariant graph transformers”. In: *bioRxiv* (2023)
- 


Lee-Shin Chu, **Jeffrey A. Ruffolo**, Ameya Harmalkar, and Jeffrey J. Gray. “Flexible Protein-Protein Docking with a Multi-Track Iterative Transformer”. In: *bioRxiv* (2023)
- 


**Jeffrey A. Ruffolo**, Jeffrey J. Gray, and Jeremias Sulam. “Deciphering antibody affinity maturation with language models and weakly supervised learning”. In: *arXiv* (2021)


## Publications


- 

Erik Nijkamp\*, **Jeffrey A. Ruffolo\***, Eli N. Weinstein, Nikhil Naik, and Ali Madani. “ProGen2: Exploring the Boundaries of Protein Language Models”. In: *Cell Systems* (2023)
- 





Richard W. Shuai\*, **Jeffrey A. Ruffolo\***, and Jeffrey J. Gray. “IgLM: infilling language modeling for antibody sequence design”. In: *Cell Systems* (2023)
- 

**Jeffrey A. Ruffolo**, Lee-Shin Chu, Sai Pooja Mahajan, and Jeffrey J. Gray. “Fast, accurate antibody structure from deep learning on massive set of natural antibodies”. In: *Nature Communications* (2023)
- 






Sai Pooja Mahajan, **Jeffrey A. Ruffolo**, Rahel Frick, and Jeffrey J. Gray. “Hallucinating structure-conditioned antibody libraries for target-specific binders”. In: *Frontiers in Immunology* (2022)
- 

Seth D. Ludwig\*, Zachart J. Bernstein\*, Christian Agatemor, Kris Dammen-Brower, **Jeffrey Ruffolo**, Jonah M. Rosas, Jeremy D. Post, Robert N. Cole, Kevin J. Yarema, and Jamie B. Spangler. “A versatile design platform for glycoengineering therapeutic antibodies”. In: *mAbs* (2022)
- 







Deniz Akpinaroglu, **Jeffrey A. Ruffolo**, Sai Pooja Mahajan, and Jeffrey J. Gray. “Simultaneous prediction of antibody backbone and side-chain conformations with deep learning”. In: *PLOS One* (2022)

- 
**Jeffrey A. Ruffolo**, Jeremias Sulam, and Jeffrey J. Gray. “Antibody structure prediction using interpretable deep learning”. In: *Patterns* (2022)
- 
**Jeffrey A. Ruffolo** and Andrew D. McClellan. “Modeling of lamprey reticulospinal neurons: multiple distinct parameter sets yield realistic simulations”. In: *Journal of Neurophysiology* (2020)
- 
**Jeffrey A. Ruffolo**, Carlos Guerra, Sai Pooja Mahajan, Jeremias Sulam, and Jeffrey J. Gray. “Geometric potentials from deep learning improve prediction of CDR H3 loop structures”. In: *Bioinformatics* (2020)
- 
**Jeffrey A. Ruffolo**, Zhaoyu Li, and Yi Shang. “MUFold-Contact and TPCref: New Methods for Protein Structure Contact Prediction and Refinement”. In: *IEEE International Conference on Bioinformatics and Biomedicine* (2019)

## Invited Talks

- 
**PEGS Europe, Lisbon, Portugal**
  - “Generative modeling for functional protein design”
  - November 15, 2023
- 
**GSK Seminar, Virtual**
  - “Harnessing immune repertoire data for antibody understanding and design”
  - February 28, 2023
- 
**iReceptor+ Seminar Series, Virtual**
  - “Language models for protein generation and fitness prediction”
  - September 22, 2022
  - Video recording
- 
**Absci Invites, Virtual**
  - “Fast, accurate antibody structure prediction from deep learning on massive set of natural antibodies”
  - May 26, 2022
  - Video recording
- 
**Boston Protein Modeling and Design Club, Virtual**
  - “Learning from natural antibodies for sequence generation and fast structure prediction”
  - March 2, 2022
  - Video recording

## Presentations

- 
**Computational Design and Modeling of Biomolecules, Poster**
  - “Harnessing immune repertoire data for antibody understanding and design”
  - **Jeffrey A. Ruffolo**, Richard W. Shuai, Jeremias Sulam, Jeffrey J. Gray
- 
**Summer Rosetta Conference, Oral**
  - “Language models for protein generation and fitness prediction”
  - **Jeffrey A. Ruffolo**
- 
**Biophysical Society Annual Meeting, Oral**
  - “Fast, accurate antibody structure prediction from deep learning on massive set of natural antibodies”
  - **Jeffrey A. Ruffolo** and Jeffrey J. Gray
- 
**Antibody Engineering & Therapeutics (The Antibody Society), Poster**
  - “Antibody structure prediction using interpretable deep learning”
  - **Jeffrey A. Ruffolo**, Jeremias Sulam, and Jeffrey J. Gray
- 
**Machine Learning for Structural Biology (NeurIPS workshop), Oral**
  - “Deciphering antibody affinity maturation with language models and weakly supervised learning”
  - **Jeffrey A. Ruffolo**, Jeffrey J. Gray, and Jeremias Sulam
  - Video recording
- 
**Machine Learning for Structural Biology (NeurIPS workshop), Poster**
  - “Generative language modeling for antibody design”
  - Richard Shuai, **Jeffrey A. Ruffolo**, and Jeffrey J. Gray

2021

### Winter Rosetta Conference, *Poster*

- "Improved antibody structure prediction using repertoire sequence data and neural attention"
- Jeffrey A. Ruffolo, Jeremias Sulam, and Jeffrey J. Gray

2020

### Computational Drug Discovery & Development for Biologics Summit, *Poster*

- "Deep learning improves prediction of antibody CDR H3 loop structures"
- Jeffrey A. Ruffolo, Sai Pooja Mahajan, Jeremias Sulam, and Jeffrey J. Gray

2020

### Summer Rosetta Conference, *Oral*

- "Geometric potentials from deep learning improve prediction of CDR H3 Loop structures"
- Jeffrey A. Ruffolo, Carlos Guerra, Sai Pooja Mahajan, Jeremias Sulam, and Jeffrey J. Gray

2020

### Intelligent Systems for Molecular Biology, *Oral*

- "Geometric potentials from deep learning improve prediction of CDR H3 Loop structures"
- Jeffrey A. Ruffolo, Carlos Guerra, Sai Pooja Mahajan, Jeremias Sulam, and Jeffrey J. Gray

2017

### MU Undergraduate Research Forum, *Poster*

- "Computer model of reticulospinal neurons in the lamprey"
- Jeffrey A. Ruffolo and Andrew D. McClellan

2016

### MU Undergraduate Research Forum, *Poster*

- "User-friendly computer model of reticulospinal neurons in the lamprey"
- Jeffrey A. Ruffolo and Andrew D. McClellan

## Software

2022

### IgFold

- Fast, accurate antibody structure prediction from deep learning on massive set of natural antibodies.
- <https://github.com/Graylab/IgFold>

2021

### AntiBERTy

- Masked language model for natural antibody sequences.
- <https://github.com/jeffreyruffolo/AntiBERTy>

2021

### IgLM

- Infilling language model for antibody sequence generation.
- <https://github.com/Graylab/IgLM>

2021

### DeepAb

- Deep learning models and structure realization scripts for the DeepAb antibody structure prediction method.
- <https://github.com/RosettaCommons/DeepAb>

## Honors and Awards

2021

### Johns Hopkins-AstraZeneca Scholar

- Funded joint PhD training program by JHU and AstraZeneca

2016

### Life Sciences Undergraduate Research Opportunity Program

- Fellowship at the University of Missouri providing funding for research in the life sciences and an opportunity to present findings in a poster session, with twenty participants chosen each year.

2015

### Discovery Fellow

- Funded research fellowship in the Honors College at the University of Missouri, with participants nominated by the dean of their college, with twenty-three participants chosen each year.

2014

### Engineering Entrepreneur Award

- Scholarship for aspiring entrepreneurs within the University of Missouri College of Engineering, with two recipients chosen.

2014

### Show-Me Scholar

- Award for high-achieving students entering the University of Missouri as freshmen, with thirty scholars chosen each year.

## Service and Outreach

2020

**Manuscript Review**

- PNAS, Nature Machine Intelligence, Bioinformatics, PLoS Computational Biology, PROTEINS

2019

**Phi Beta Kappa, *Member***

- Alpha of Missouri Chapter

2018

**Mizzou Computing Association, *President***

- Served as President of largest computer science student organization at the University of Missouri, with over 100 members

2017

**Upsilon Pi Epsilon, *Community Outreach Leader***

- Gamma Chapter