

# Noah Flynn

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## Education

### Washington University in Saint Louis (WUSTL)

PH.D. COMPUTATIONAL & SYSTEMS BIOLOGY

GPA: 3.94/4.00

Aug. 2017 - May 2021

### University of Illinois at Urbana-Champaign (UIUC)

B.S. BIOENGINEERING, MINOR IN COMPUTER SCIENCE

GPA: 3.70/4.00

Aug 2013 - Jun 2017

## Professional Experience

### Amazon (AGI & LLMs)

RESEARCH SCIENTIST II

Cambridge, MA

Jun 2021 - Present

- Researching large language models (LLMs) regarding (1) novel reward modeling and preference optimization strategies for multilingual LLMs and (2) enabling LLMs to use tools and automate routines by invoking APIs
- Developed dynamic data selection strategy for multilingual natural language understanding, reducing data overhead by 95% and increasing ease of model expansion to support new international markets (e.g., KO, TR, NL)
- Owned 17 production model release cycles across 6 markets and 4 languages (ES, PT, JP, AR), including model development, training, evaluation, deployment, monitoring, maintenance, and patching
- Developing calibration methods to improve NLU robustness to uncertainty introduced by upstream automatic speech recognition (ASR) models

### Department of Pathology & Immunology, WUSTL

PHD CANDIDATE

St. Louis, MO

Aug 2017 - Jun 2021

- Served as core maintainer and developer of *XenoSite* and *XenoNet* prediction web services for small molecule biochemistry
- Modeled drug metabolism networks via deep learning methods, e.g. graph neural networks, to guide drug development in early stage prediction of drug toxicity, formation of reactive chemical species, and likelihood of adverse drug reactions
- Developed machine learning approaches for predicting incidence of drug-induced liver injury given electronic health records

### Merck (MSD), Modeling & Informatics

MACHINE LEARNING INTERN (GENERATIVE AI)

West Point, PA

May 2019 - Aug 2019

- Implemented and launched deep generative models for the purpose of de novo molecular generation and design
- Tuned libraries of generated molecules to desired chemical properties via reinforcement learning and integration of QSAR models
- Applied novel chemical libraries of generated molecules for use in docking and molecular dynamics simulations and to generate new structures for use in ongoing Merck chemistry projects and virtual screening

### AbbVie Inc.

SOFTWARE ENGINEER

Champaign, IL

Jan 2016 - May 2017

- Created a suite of reusable, web-based data visualization elements and deployed those elements in applications across the pharmaceutical research space to reveal novel views of data
- Programmed and launched web application for managing all bioinformatics tools that AbbVie R&D uses for drug development
- Managed Oracle database system of relations between researchers and drugs within the company's research space

### National Center for Supercomputing Applications

RESEARCH FELLOW

Urbana, IL

Aug. 2016 - May 2017

- Constructed and characterized protein-protein interaction networks, transcription factor networks, and regulatory networks, based off centrality measures, node connectivity, node degree distributions, path detection, and k-core decomposition
- Conducted analysis of biomolecular networks to differentiate between organisms of differing economy, flexibility, and robustness
- Applied preliminary framework to genetically modified organisms within the context of synthetic biology

## Publications

Noah R. Flynn, **Machine Learning for Drug Discovery**, *Manning Publications*, 2024

Noah R. Flynn, Kay Rottmann and Maria Minakova, **Target Greedy Sampling for Multilingual NLU**, *Under Review*,

Noah R. Flynn, Grover P. Miller and S. Joshua Swamidass, **Editorial: Advancements in Computational Studies of Drug Toxicity**, *Frontiers in Pharmacology*, 2023

Noah R. Flynn, S. Joshua Swamidass, **Message Passing Neural Networks Improve Prediction of Metabolite Importance**, *Journal of Chemical Information and Modeling*, 2023

Dakota L Pouncey, Dustyn A Barnette, Riley W Sinnott, Sarah J Phillips, **Noah R Flynn**, Howard P Hendrickson, S J. Swamidass and Grover P. Miller, **Discovery of Novel Reductive Elimination Pathway for 10-Hydroxywarfarin**, *Frontiers in Pharmacology*, 2022

Noah R Flynn, **Computational Approaches for Screening Drugs for Bioactivation, Reactive Metabolite Formation, and Toxicity**, *PhD Thesis*, 2021

Arghya Datta, Noah R. Flynn, S. J. Swamidass, **Cal-net: Jointly learning classification and calibration on imbalanced binary classification tasks**, *IJCNN*, 2021

Noah R Flynn, Michael D Ward, Mary A. Schleiff, Corentine M. C. Laurin, Stuart J. J. Conway, Gunnar Boysen, S. Joshua Swamidass, Grover P. Miller, **Bioactivation of isoxazole-containing bromodomain and extra terminal domain (BET) inhibitors**, *Metabolites*, 2021

Arghya Datta\*, Noah R. Flynn\*, Na Le Dang, S. Joshua Swamidass, **Machine Learning on Liver-Injuring Drug Interactions with NSAIDs from Hospitalization Data**, *PLOS Computational Biology*, 2021. \*Equal contribution as first-authors

Tyler B. Hughes\*, Noah Flynn\*, Na Le Dang, S. Joshua Swamidass, **Modeling the Bioactivation and Subsequent Reactivity of Drugs**, *Chemical Research in Toxicology*, 2021. \*Equal contribution as first-authors

Mary A. Schleiff, Noah R Flynn, Sasin Payakachat, Benjamin Schleiff, Anna Pinson, Dennis Province, S. Joshua Swamidass, Gunnar Boysen, Grover Miller, **Significance of Multiple Bioactivation Pathways for Meclofenamate as Revealed through Modeling and Reaction Kinetics**, *Drug Metabolism and Disposition*, 2020

Dustyn A. Barnette, Mary A. Schleiff, Arghya Datta, Noah Flynn, S. Joshua Swamidass, Grover P. Miller, **Meloxicam methyl group determines enzyme specificity for thiazole bioactivation compared to sudoxicam**, *Toxicology Letters*, 2020

Tyler Hughes, Na Le Dang, Ayush Kumar, Noah R Flynn, S. Joshua Swamidass, **The Metabolic Forest: Predicting the Diverse Structures of Drug Metabolites**, *Journal of Chemical Information and Modeling*, 2020

Noah R Flynn, Na Le Dang, Michael D. Ward, S. Joshua Swamidass, **XenoNet: Inference and Likelihood of Intermediate Metabolite Formation**, *Journal of Chemical Information and Modeling*, 2020

Dustyn A. Barnette, Mary A. Schleiff, Laura R. Osborn, Noah Flynn, Matthew Matlock, S. Joshua Swamidass, and Grover P. Miller, **Dual mechanisms suppress meloxicam bioactivation relative to sudoxicam**, *Toxicology*, 2020

Dustyn A. Barnette, Mary A. Davis, Noah Flynn, Anirudh S. Pidugu, S. Joshua Swamidass, and Grover P. Miller, **Comprehensive kinetic and modeling analyses revealed CYP2C9 and 3A4 determine terbinafine metabolic clearance and bioactivation**, *Biochemical Pharmacology*, 2019

Mary A. Davis, Dustyn A. Barnette, Noah R. Flynn, Anirudh S. Pidugu, S. Joshua Swamidass, Gunnar Boysen, and Grover P. Miller, **CYP2C19 and 3A4 Dominate Metabolic Clearance and Bioactivation of Terbinafine Based on Computational and Experimental Approaches**, *Chemical Research in Toxicology*, 2019

## Skills

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**Proficient** Docker, Git, JavaScript (D3, React), Python (Flask, Numpy, Pandas, Scikit-Learn), PyTorch, RDKit, SQL

**Have Used** AWS, C++ (CUDA), JAVA, JAX, MatLab, Neo4j, R, Spark, TensorFlow, Wolfram Language

## Leadership & Recognition

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2022	<b>1st Place</b> , Boston University New Venture Competition	Boston, MA
2017	<b>Director</b> , Engineering Open House (Educational Non-Profit)	Champaign, IL
2016	<b>Most Valuable Intern</b> , Research Park	Champaign, IL
2015	<b>Silver Medal</b> , International Genetically Engineered Machines Competition, Biological Computing Division	Boston, MA
2014	<b>Presenter on Youth STEM Initiatives</b> , U.S. House of Representatives	Washington, D.C.
2014	<b>Scholarship Recipient</b> , Levi, Ray, and Shoup Computer Science Award	Champaign, IL

## Services

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<b>Conference, Journal Reviewer</b>	AISTATS, ACS, Frontiers in Pharmacology, ICLR, PSB, Springer Nature
<b>Technical Book Reviewer</b>	Engineering Deep Learning Systems, Ensemble Methods for ML, Fast Python for Data Science
<b>Course Developer, Instructor</b>	Algorithms for Computational Biology, Bioinstrumentation Lab, Intro to Computer Science (Honors)
<b>Resident Project Advisor (RA)</b>	Illinois Engineering First-Year Experience @ UIUC Summer Scholars Program