

Justin D Vrana

software engineer | synthetic biologist



Engineer and scientist that specializes in development of software that accelerates research and makes science more accessible. Avid self-learner with breadth of knowledge spanning from chemistry, cell biology, genomics, and software development. 14 years of wetlab experience and 6 years of software development experience.

Relevant Experience

2018-2021	Researcher for DARPA Synergistic Design and Discovery (SD2)	UW-Seattle	Graduate researcher for country-wide DARPA effort to accelerate research. Built software-enabled cell construction pipeline. Integrated software tools with existing continuous integration (CI) and distributed computing infrastructure from the Texas Advanced Computing Center (TACC). Boosted yeast cell strain construction throughput by 5-fold software-aided design and planning tools.
2014-2021	Graduate Researcher	UW-Seattle	Conducted research in developing
2018	Teaching Assistant	UW-Seattle	Taught programming in C and C++ for master's level embedded systems engineering course. Developed automated testing and grading scripts for students.
2017-2018	Co-founder and software Lead	Global Impact (OLA Simple), Seattle, Washington	Co-founded small company around low-cost accessible diagnostics. Developed iPad app to guide nurses and clinical technician to perform low-cost HIV diagnostics for patients. Conducted pilot study of technology in Nairobi, Kenya.
2017-2018	Amazon Catalyst Fellow	UW-Seattle	Develop semi-automated pipelines for engineering new mammalian cell lines using CRISPR, lentivirus, and integrase technologies. Developed wetlab protocols and performed pilot experiments. Developed Ruby and JavaScript code to manage cloud laboratory.

Selected Software Projects

2019-2021	Caldera	Organism agnostic and data-driven genetic circuit designer driven by deep graph neural network and reinforcement learning. Trains on single-cell RNA-seq data and converts a behavioral specification to a genetic circuit design.
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2019-2021	Terrarium	A dynamic computer-aided process planner (CAPP) for biology designed for agile manufacturing of biological products. Converts a cell strain specifications into executable wetlab plans.
2017-2020	DASi	DASi is an automatic DNA cloning plan designer aimed for operating on small budgets by focusing on material re-use and a dead-simple user interface. Converts user-defined DNA sequences into executable molecular biology steps that builds specified sequences.
2016-2020	Aquarium	An open-source human-in-the-loop laboratory automation system that enables rapid, flexible, and reproducible workflow development and execution.

Selected Publications

2021	Aquarium: open-source laboratory software for design, execution and data management	Oxford University Press: Synthetic Biology	J Vrana, OD Lange, ..., E Klavins
2021	Implementation of an interactive mobile application to pilot a rapid assay to detect HIV drug resistance mutations in Kenya	AIDS	JD Vrana, N Panpradist, ..., IA Beck
2017	Digital logic circuits in yeast with CRISPR-dCas9 NOR gates	Nature Communications	MW Gander, JD Vrana, WE Voje, JM Carothers, E Klavins
2014	An optimized optogenetic clustering tool for probing protein interaction and function	Nature communications	A Taslimi, JD Vrana, D Chen, S Borinskaya, BJ Mayer, MJ Kennedy, CL Tucker

Education

2021 (anticipated)
PhD, Bioengineering
University of Washington-Seattle
2010
BS, Chemistry & Philosophy
University of Wisconsin-Madison
2010
Cert. of Computer Science
University of Wisconsin-Madison

Skills

Software

Languages Python (expert), Javascript, Ruby, C, C++, Java
Frameworks Ruby-on-Rails, Flask, React, Pytorch, Docker, SQL, no-SQL (mongoDB & Neo4j)
Machine Learning deep reinforcement learning, graph neural networks
Other skills discrete mathematics (networks/graphs), algorithm development

Wetlab

Mammalian lentiviral transductions, DNA transfections, cell line maintainance, microscopy, cell sorting, flow cytometry
Microbiology CRISPR cell engineering, yeast genomic integrations, plasmid construction, DNA cloning

Selected Awards

2018	DLA Piper \$2,500 Best Idea with Global Reach	A start up centered around a drug-resistance detection diagnostic automation
2018	UW Business Plan Competition (Final 16)	For business plan for OLASimple.

2017 \$100K Amazon Catalyst Grant

For cloud laboratory for genetic engineering to expand to automated mammalian cell work.