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Education

Ph.D in Physics, University of Illinois at Urbana-Champaign (Champaign, IL) *Aug 2018 - Aug 2023*

- Center for Physics of Living Cells Fellow (*2018 - 2020*)

B.S in Green Energy Science, Hong Kong Baptist University (Hong Kong) *Sep 2014 – July 2018*

- Hong Kong Special Administrative Region Government Scholarship (*2015 - 2018*)
- Scholastic Award (*2018*)

Research and Professional Experience

BillionToOne, Senior Bioinformatics Scientist, Oncology (CA) *Aug 2023 - Present*

- Led the oncology bioinformatics team to support the CLIA laboratory operation for BillionToOne liquid biopsy assays, Northstar Select and Northstar Response.
- Worked with the cross-functional CLIA laboratory team to perform custom clinical NGS sequencing data analysis in AWS, performe quality control, and troubleshoot wet-lab processes
- Improved the AWS-based bioinformatic pipeline efficiency by 3x and reduced turnaround time by 1 day.
- Developed noval algorithms to drastically improve assay performance (5x sensitivity improvement for Northstar Response, specificity improvement in Northstar Select MSI calling)
- Worked with key stakeholders in decision-making, facilitating commercial growth, and delivering accurate results to patients

Seppe Kuehn lab (University of Chicago / UIUC), Research Assistant (IL) *July 2019 - July 2023*

- Designed and optimized experiments to assay carbon utilization for more than 100 bacterial strains
- Used machine learning to achieve state-of-the-art prediction of microbial carbon utilization, combining experimental data and large-scale web-scrapped datasets with over 4000 bacterial genomes
- Built custom bioinformatic pipelines (Snakemake) on high-performance computing clusters to analyze over 10TBs of multi-omics NGS data spanning more than 1000 samples
- Extracted DNA and conducted whole-genome shotgun sequencing on soil-isolated microbes
- Created accurate mathematical models for two systems (microbial respiration/photosynthesis and buffering capacity of complex biological media) and validated the models in experiments
- Constructed microcontroller-based (Raspberry Pi) experimental devices and troubleshot Python-based software to interface sensors, PID controllers, and other electronic components

Upward Farms, Microbial Research Associate (Brooklyn, NY) *May 2022 - Aug 2022*

- Led an innovative experiment to improve hydroponic crop yields by manipulating plant microbiome. Used statistical modeling and 16S sequencing to identify potential plant growth-promoting bacteria
- Built and unit-tested two production-level software prototypes in AWS: a Snakemake pipeline to streamline NGS sequencing data analysis and a web-based R&D experiment management portal
- Performed Nanopore long-read sequencing with the R&D team to profile hydroponic metagenome
- Contributed to other R&D experiments in crop phenotyping and sample collection

Hong Kong Baptist University, Research Assistant (Hong Kong) *July 2015 - June 2018*

- Designed novel machine learning models based on biological neural networks and principles in non-equilibrium statistical physics to conduct computation of input signals
- Implemented novel optimization algorithms in C++ and Python to model *C. elegans* neurons
- Collaborated in three data-driven projects with interdisciplinary teams spanning four research labs

Skills

Data analysis: Machine learning, statistics, data collection and cleaning, visualization, deep learning

Software: AWS, REST APIs, unit-testing, Git, Bash, dashboard (Dash/Plotly), project management

Bioinformatics: Nextflow, NGS (amplicon-based, enrichment-based, 16S, metagenome), databases

Wet lab: Next-generation sequencing, DNA extraction, library prep, common wet lab assays, microcontrollers (Arduino, Raspberry Pi), Oxford Nanopore long-read sequencing

Computational biology: Cancer Biology, computational neuroscience, signal analysis, image analysis, dynamical systems, numerical simulation, statistical physics

Programing languages: Python, Postgresql, R, Bash, Java, Groovy, JavaScript, LaTeX

Other Experience

The Abdus Salam International Centre for Theoretical Physics *Mar 2018*
Spring College on the Physics of Complex Systems (Trieste, Italy)

- Completed graduate-level courses in reinforcement learning, statistical physics, and biophysics

Iowa State University, Exchange Student (Ames, Iowa, United States) *August 2016 - December 2016*

- Completed coursework in physics, mathematics, and computer science.

Hong Kong Baptist University, Teaching Assistant (Hong Kong) *July 2016 - June 2018*

- Taught discussion sessions of Introduction to Physics for two semesters

Publications

Xavier Bower, Jan Wignall, Joyce Zhu, Michael O'Sullivan, Naomi E. Searle, Lenny K. Hong, Matthew G. Varga, Tiffany E. Farmer, Emilio Rosas-Linhard, **Zeqian Li**, Jason Luong, Esther Lin, Marie Erica Simon, David S. Tsao, John R. ten Bosch, Gary Palmer MD, Ajeet Gajra MD, Chanh Huynh MD, Wen Zhou "Validation of a liquid biopsy assay with increased sensitivity for clinical comprehensive genomic profiling." *Manuscript submitted for publication.* (2024)

Angela Hsiao, Brian Woodward, Patrick Ye, Matthew G Varga, Ghaith Altaie, Kevin Lu, Naomi Searle, Robb Viens, Sydne Langpap, **Zeqian Li**, Gary Palmer, Hatim Husain. "Brief Report: Methylation-Based ctDNA Serial Monitoring Correlates with Therapeutic Response in Lung Cancer." *Manuscript submitted for publication.* (2024)

Zeqian Li, Ahmed Selim, Seppe Kuehn. "Statistical prediction of microbial metabolic traits from genomes." *PLOS Computational Biology* 19.12 (2023): e1011705.

Kyle Crocker, Milena Chakraverti-Wuerthwein, **Zeqian Li**, Madhav Mani, Karna Gowda, Seppe Kuehn. (in press). "Genomics patterns in the global soil microbiome emerge from microbial interactions." *Nature Microbiolog* (2024)

Chandana Gopalakrishnappa, **Zeqian Li**, Seppe Kuehn. (in press). "Environmental modulators of algae-bacteria interactions at scale." *Cell Systems* (2024)

Luis Miguel de Jesús Astacio*, Kaumudi H. Prabhakara*, **Zeqian Li**, Harry Mickalide, Seppe Kuehn. "Closed microbial communities self-organize to persistently cycle carbon." *Proceedings of the National Academy of Sciences* 118, no. 45 (2021): e2013564118.

Selected conference presentations

Speaker: Microbiome Research Symposium, The University of Chicago, "Machine learning predicts microbial metabolic traits from genomes." (2023)

Speaker: The Yellowstone Hot Spring Microbial Mats Symposium, Carnegie Institution for Science, "Co-expression constrains genome organization in an extensively recombined microbial population." (2022)

Speaker: The American Physical Society March Meeting, "Unique functional structure of the Yellowstone hot spring microbial mats revealed by multi-omics studies." (2022)