Dileep Kishore — CV

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Education

Boston University — **Boston, USA**
Ph.D. in Bioinformatics, GPA – 4.00/4.00 — *2016–present*
Advisor: Prof. Daniel Segrè

Indian Institute of Technology – Madras — **Chennai, India**
B.Tech (Honors) and M.Tech (Dual Degree) in Biotechnology, GPA – 9.23/10.00 — *2011–2016*
Advisor: Prof. Karthik Raman

Experience

Graduate Student Researcher: Boston University — *2016 – Present*

- Developed ReLearn, a reinforcement learning framework for optimal control of microbial communities in bioreactors
- Created MiCoNE, a 16S sequencing data analysis pipeline for the inference of co-occurrence networks
- Constructed a pipeline to estimate binding affinities of microbial metabolites with the AHR
- Formulated a mathematical model of the AHR regulatory pathway to study its implications in cancer progression
- Assisted in the development of MIND, a database and web interface for the visualization and analysis of microbial interaction networks
- Initiated the analysis of metagenomics data from the gut microbiome of ultra centenarians and its inference into co-occurrence networks
- Advanced the development of pipeliner, a nextflow pipeline for the analysis of bulk RNA sequencing data

Software developer: Open-source software — *2018 – Present*

- Developed cayenne, a Python package for performing stochastic simulations with a Cython backend
- Developed a dashboard for calculating daily carbon footprint using the Julia language
- Developed mace, a web application to calculate total carbon emissions of sourcing recipe ingredients

Research Engineer Intern: Biocon Limited — *Summer 2014*

- Optimized impeller and sparger designs for optimal culture growth in large-scale industrial bioreactors

Undergraduate Student Researcher: Indian Institute of Technology – Madras — *2015 – 2016*

- Developed an algorithm for an unbiased search using GPUs to find network topologies capable of oscillations

Technical Skills

Statistics: Hypothesis testing, linear/logistic regression, generalized linear models

Machine Learning: supervised (classification/regression), unsupervised, random forest, XGBoost, PCA, network inference

Deep Learning: CNNs, RNNs

Reinforcement Learning: off-policy (DQN), on-policy (A2C, PPO)

Mathematical Modeling: differential equations, stochastic processes, constraint-based modeling

Optimization: global, non-linear, linear programming, combinatorial optimization (network traversal, flow algorithms)

Computer Skills

Bioinformatics and pipelines: nextflow, snakemake, QIIME2, HUMAnN, cobrapy

Python: NumPy, pandas, scikit-learn, SciPy, Keras, pytorch, Numba, PyCUDA, dash, dask

Julia: JuMP.jl, Plots.jl, DataFrames.jl, Pluto.jl, Distributions.jl

R: RSTAN, dplyr, ggplot2, igraph, ggraph

Web and Database: HTML/CSS, React, Typescript, Flask, Django, PostgreSQL, MySQL

Cloud: Docker, Singularity, AWS, Linode

Other: Linux, git, C, C++, LaTeX

Publications

Peer-reviewed publications

Anthony Federico, Tanya Karagiannis, Kritika Karri, Dileep Kishore, Yusuke Koga, Joshua D. Campbell, and Stefano Monti. Pipeliner: A Nextflow-Based Framework for the Definition of Sequencing Data Processing Pipelines. 10. URL: `https://www.frontiersin.org/articles/10.3389/fgene.2019.00614/full`, `doi:10.3389/fgene.2019.00614`.

Alan R. Pacheco, Charlie Pauvert, Dileep Kishore, and Daniel Segrè. Toward FAIR Representations of Microbial Interactions. 0(0):e00659–22. URL: `https://journals.asm.org/doi/10.1128/msystems.00659-22`, `doi:10.1128/msystems.00659-22`.

Preprints on bioRxiv

Dileep Kishore, Gabriel Birzu, Zhenjun Hu, Charles DeLisi, Kirill S. Korolev, and Daniel Segrè. Inferring microbial co-occurrence networks from amplicon data: A systematic evaluation. page 2020.09.23.309781. URL: `https://www.biorxiv.org/content/10.1101/2020.09.23.309781v1`, `doi:10.1101/2020.09.23.309781`.

Dileep Kishore and Srikiran Chandrasekaran. Introducing and benchmarking the accuracy of cayenne: A Python package for stochastic simulations. page 2020.10.10.334623. URL: `https://www.biorxiv.org/content/10.1101/2020.10.10.334623v1`, `doi:10.1101/2020.10.10.334623`.

Zhenjun Hu, Dileep Kishore, Yan Wang, Gabriel Birzu, Charles DeLisi, Kirill Korolev, and Daniel Segrè. A resource for the comparison and integration of heterogeneous microbiome networks. URL: `http://biorxiv.org/lookup/doi/10.1101/2022.08.07.503059`, `doi:10.1101/2022.08.07.503059`.

Selected posters and talks

(*presenter)

- *Dileep Kishore, Pankaj Mehta, Daniel Segrè. *Using deep-RL to control bioreactors: The ReLearn framework*. Talk. Kilachand fellowship presentation sponsored by the Multicellular Design Program (May 2022).
- *Dileep Kishore, Gabriel Birzu, Zhenjun Hu, Charles DeLisi, Kirill S. Korolev, and Daniel Segrè. *Inferring microbial co-occurrence networks from 16S data: A systematic evaluation*. Talk and poster. Intelligent Systems for Molecular Biology 2019 (ISMB 2019).

- *Dileep Kishore, Gabriel Birzu, Zhenjun Hu, Charles DeLisi, Kirill S. Korolev, and Daniel Segrè. *MIND: The Microbial Interaction Network Database*. Talk and poster presentation. International Workshop on Bioinformatics and Systems Biology 2018 (IBSB 2018).
- *Tanya Karagiannis, *Kritika Karri, *Dileep Kishore, Joshua D. Campbell, and Stefano Monti. *Pipeliner: A flexible high-throughput sequencing data analysis framework*. Poster presentation. Intelligent Systems for Molecular Biology 2017 (ISMB 2017).
- *Dileep Kishore and Jennifer Reed. *Wild type flux predictions from RB-TnSeq data*. Poster presentation. Student symposium for Khorana, S. N. Bose and Viterbi-India programs 2015.

Teaching and leadership experience

Boston University

Organizing committee
BU Bioinformatics Student Organized Symposium *2019*
Helped organize the annual symposium hosted by the Boston University bioinformatics program. Responsibilities included contacting leading researchers to coordinate talks at the symposium, introducing the speakers, organizing the poster session, and advertising the event to the broader scientific community in Boston.

Teaching assistant and recitation instructor
BF550: Foundations of Programming, Data Analytics, and Machine Learning in Python *2019*
Assisted in teaching programming and machine learning concepts to graduate students.

Organizing committee and instructor
Bioinformatics Programming Workshops *2018–2019*
Organized a series of workshops that taught basic programming concepts, bioinformatics tools, and tools that help facilitate reproducible research.

Instructor
Bioinformatics Research and Interdisciplinary Training Experience *2018–2022*
Organized a series of workshops to introduce basic bioinformatics research to undergraduate researchers and to provide mentorship.

Organizing committee and instructor
Bioinformatics in the Cloud Workshop *2018*
Organized a series of workshops that taught deployment of large data and complex algorithms to the cloud using the Amazon Web Services platform.

Indian Institute of Technology – Madras

Teaching assistant
Data Structures and Algorithms for Biology *2015*
Assisted in teaching basic bioinformatics data structures and algorithms to undergraduate students.

Teaching assistant
Computational Systems Biology *2015*
Assisted in teaching computational biology, network biology and synthetic biology to undergraduate and graduate students.

Awards

Academic Fellowship: Kilachand fellowship sponsored by the multicellular design program *2021*

Academic best record: Indian Institute of Technology – Madras, Biotechnology *2016*