Harihara Subrahmaniam Muralidharan

CONTACT

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EDUCATION

University of Maryland, College Park, USA — Aug 2018 - Present
Doctor of Philosophy, Computer Science.
Advisor: Prof. Mihai Pop

University of Maryland, College Park, USA — Aug 2018 - May 2023
Master of Science, Computer Science. — GPA:3.83/4
Advisor: Prof. Mihai Pop

SASTRA University, India — Jul 2011 - Jun 2015
Bachelor of Technology, Computer Science and Engineering. — GPA:8.96/10

RESEARCH EXPERIENCE

Graduate Research Assistant at Poplab, Center for Bioinformatics and Computational Biology(CBCB), University of Maryland, College park. (Jan 2019 - Present)
Research Areas: Computational Genomics, Metagenomics
Developed algorithms, methods, pipelines using NGS data (illumina short read, ONT and pacbio long reads) to,

- characterize structural variants from metagenomic assembly graphs and developed pipelines such as `PIRATE` (Phage Identification fRom Assembly-graph varianT Elements) and `ANCHOR` (vAriant Normalization by Coverage and deptH Of Reads).
- bin metagenomic samples using a combination of coverage and assembly graph features with Binnacle (`https://github.com/marbl/binnacle`)
- cluster large 16S rRNA gene sequence datasets using `SCRAPT` (`https://github.com/hsmurali/SCRAPT`)
- study the impact of transitive annotations on taxonomic classifiers
- characterize the variants in *Synechococcus spp* in the Yellow stone national park microbial mats using reference genomes.

Researcher at Tata Consultancy Services Ltd. (TCS) Innovation labs, IIT Madras Research Park, India. (Aug 2015 - Aug 2018)
Research Areas: Machine Learning, Cyberphysical Systems, Optimization
Analytics for Cyberphysical Systems. Identify suitable models using an ensemble of data driven methods and domain physics to analyze real time sensory signals from large scale engineering systems such as VCRS(Vapor Compression Refrigeration Systems), chillers, and, wind turbines.

Semester Abroad at Universitat Politècnica de Catalunya (UPC), Barcelona, Spain. (Feb 2015 - Jun 2015)
Research Areas : Learning Analytics, Measurement of Intangibles, Information Modeling
Thesis titled "Enhancing Learning Analytics Platform for Secondary Schools: Design and Development of Indicators". Designed algorithms to extract indicators of motivation from the digital footprints of students' MOODLE logs

PUBLICATIONS

*-Denotes equal Contribution, #- Authors listed alphabetically

1. Harihara Subrahmaniam Muralidharan, Noam. Y Fox, Mihai Pop, The impact of transitive annotation on the training of taxonomic classifiers, Frontiers in Microbiology, 2023; `https://doi.org/10.3389/fmicb.2023.1240957`.
2. Harihara Subrahmaniam Muralidharan*, Tu Luan*, Marwan Alshehri, Ipsa Mittra, Mihai Pop, `SCRAPT`: an iterative algorithm for clustering large 16S rRNA gene data sets, Nucleic Acids Research, 2023;, gkad158, `https://doi.org/10.1093/nar/gkad158`.

3. Harihara Subrahmaniam Muralidharan*, Nidhi Shah*, Jacquelyn S Meisel, Mihai Pop. Binnacle: Using Scaffolds to Improve the Contiguity and Quality of Metagenomic Bins. Frontiers in Microbiology, 2021; `https://doi.org/10.3389/fmicb.2021.638561`.
4. Gabriel Birzu, Harihara Subrahmaniam Muralidharan, Danielle Goudeau, Rex Malmstrom, Daniel S Fisher, Devaki Bhaya, Hybridization breaks species barriers in long-term coevolution of a cyanobacterial population. eLife, 2023. `https://doi.org/10.7554/eLife.90849.1`
5. Srinarayana Nagarathinam, Harihara Subrahmaniam Muralidharan, Arunchandar Vasan, Venkatesh Sarangan, Sermisha Narayana, Anand Sivasubramaniam. One for all, All for one: a scalable decision-making framework for demand response with a district cooling plant. International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation(Buildsys'19), 2019; `https://doi.org/10.1145/3360322.3360850`.

Manuscripts under review

1. Seth Commichaux, Tu Luan, Harihara Subrahmaniam Muralidharan#, Mihai Pop. Database size positively correlates with the loss of species-level taxonomic resolution for the 16S rRNA and other prokaryotic marker genes, bioRxiv, 2023; `https://doi.org/10.1101/2023.12.13.571439`.

Manuscripts in preparation

1. Assembly graph-based variant discovery reveals novel dynamics in the human microbiome.
2. Comparative Metagenomic Genome Analysis of *Synechococcus spp.* in Microbial Mats Across a Temperature Gradient in Hot Springs From Yellowstone National Park.

TALKS & POSTER PRESENTATIONS

$-Poster presentation, #- Talk

1. One for all, All for one: a scalable decision-making framework for demand response with a district cooling plant. [Buildsys '19]#
2. Binnacle: Using Scaffolds to Improve the Contiguity and Quality of Metagenomic Bins. [ISMB'20, CSHL Microbiome Workshops'20, ASM Microbe'22]$
3. PIRATE: Phage Identification fRom Assembly-graph varianT Elements. [ISMB'20, CSHL Microbiome Workshops'20]#$
4. Comparative Metagenomic Genome Analysis of *Synechococcus spp.* in Microbial Mats Across a Temperature Gradient in Hot Springs From Yellowstone National Park. [CSHL Genome Informatics'21, ASM Microbe'22]$
5. `SCRAPT`: An Iterative Algorithm to Cluster Large 16S Gene Datasets. [ISMB'22]#$

GRADUATE COURSEWORK

Machine Learning, Advanced Numerical Optimization, Computational Geometry, Computational Linguistics-II, Computational Genomics, Unsupervised Learning, Biological Networks Across Scales, Data Structures Algorithms and Inference for High-Throughput Genomics, Algorithmic Evolutionary Biology, Randomized Algorithms.

PROGRAMMING SKILLS

Languages-Python, C++, Java, R, shell

Python Machine Learning-Scikit sklearn, Keras, Numpy, PyTorch, TensorFlow

Bioinformatics Tools - SAMtools, BEDtools for sequence alignment arithmetic. BowTie, BWAMEM, BLAST, Minimap2 for sequence alignments. Have worked extensively with metagenomic assembly, metagenomic binning and OTU analysis with amplicon sequencing data.

Others-MATLAB, EnergyPlus, SLURM for HPC Environment

VOLUNTARY SERVICE

External reviewer for IEEE CDC (2018), WABI (2020), ISMB (2021), ISMB(2022), WABI(2022), RECOMB Seq (2023), ESA (2023), Subreviewed an article for Nature methods.

TEACHING EXPERIENCE

1. Teaching Assistant for Introduction to Data science (python) (Fall 2018)
2. Teaching Assistant for Introduction to Data science (R) (Spring 2019)
3. Teaching Assistant for Introduction to Algorithms (Fall 2019)

MISCELLANEOUS

1. Dean's List Merit Scholarship for outstanding academic performance in all 4 years of undergraduate. (2011 - 2015)
2. Deshvidesh Scholarship to do Bachelor's Thesis at Universitat Politècnica de Catalunya (UPC), Barcelona. (2015)
3. Colwell Travel Fellowship to attend ISMB 2022. (2022)