Saradha Venkatachalapathy

linkedin/saradhav
saradhav.io/

SUMMARY

Ph.D. student at the Mechanobiology Institute,NUS specializing in transcriptomics and computer vision. Extensive background in developing algorithms and implementing statistical models to interpret causality in highly variable processes. Experienced in leading interdisciplinary collaborative projects with biologists and mathematicians to guide the design of experiments and modeling.

EDUCATION AND WORK EXPERIENCE

Ph.D, Mechanobiology | National University of Singapore | GPA 4.7**/**5 (Sep'16-Present)
B.Tech Biotechnology (Distinction) | SASTRA University |GPA 8.1/10 (Jul'11-May'15)
Consultant, Computer Vision, Qritive (Sep-Dec'19)
Research Assistant, NUS (Sep'15 -Jul'16)

SKILLS

Statistics: Machine Learning, Linear Algebra, Regression, Diffusion maps and Pattern recognition.

Computer Vision: Segmentation, Feature generation and Particle tracking

Computational Biology: Next Gen-Sequencing analysis of Microarray, RNA-Seq and HiC data

Experimental Skills: Microscopy, Tissue engineering and mechanical manipulation of cells

Tools: R, MATLAB, Python(pandas and scikit), SQL and PyTorch

Computing and graphics: Git, LATEX and Inkscape

SELECTED RESEARCH PROJECTS

Automated feature generator for 3D images

- Built an in-house automatic image processing pipeline for segmentation and feature generation.
- Developed novel parameters that measure morphology, textural and spatial distribution of objects.
- Integrated multi-domain features such as protein expression, RNA seq and image features for deducing functional links.

Deconvolving cell variability in cancer

- Only a subset of cells are activated by cancer signals in engineered breast cancer tissue.
- Developed a linear classifier to predict cell shape with an accuracy of 95%.
- Established the existence of activation primed cell shapes using multimodal-multivariate analysis.
- Demonstrated a causal relationship between cell geometry and activation *[MBoC,2020]*.

Time series analysis of reprogramming

- Developed a novel method to reprogram fibroblasts to iPSC-like cells
- Aligned, analyzed and visualized the transcriptome during mechanically induced de-differentiation. Performed statistical tests and pathway analysis to characterize the temporal changes in the transcription profile and infer the biological relevance *[PNAS,2018].*
- Implemented pseudotemporal ordering of single cell data to identify variable trajectories during the generation of stem cells.

DNA structure informs its function

- Predicted DNA structure from integrating RNA-Seq and ChIP-Seq data and validated the robustness using experiments and HiC data *[PNAS,2017].*
- Identified latent immune cells based on image based DNA structures and clustering large single cell RNA-Seq dataset *[bioRxiv, 2019].*

Cell shape modulates cellular response to stimuli

- Aligned, analyzed, visualized and interpreted differential gene expression patterns in RNA-Seq and microarray data. Also performed statistical tests and pathway analysis.
- Demonstrated the cell shape can modulate the transcriptional response to compressive load and inflammation *[PNAS, 2017][MBoC, 2018].*

HONORS AND AWARDS

- Dean's Merit list given to the top 2-10% students in the University (2015).
- Inspirational Mentorship Award, NUS High School (2017)
- Best Oral Presentation Award, Genomes and AI: From Packing to Regulation (2019)

LEADERSHIP AND TEACHING EXPERIENCE

- Designed and instructed a workshop session-Image Analysis for dummies (May, 2015)
- Teaching Assistance for MATLAB Programming- Bootcamp for Mechanobiology (August, 2017)
- Teaching Assistance for Nuclear Mechanics and Genome Regulation (January-April, 2016)
- Supervised and mentored over 5 students in the lab towards their thesis.

CONFERENCE: TALKS AND POSTERS

- Mechanobiology of Disease, MBI-BioPhysical Society meeting (Singapore, Sep 2016)
  Poster: "Nuclear positioning and its translation dynamics is regulated by cell geometry"
- The 3rd International Symposium on Mechanobiology (Singapore, Dec 2017)
  Talk: "Role of 3D chromatin architecture in differential genome regulation"
- Nuclear Mechanogenomics, EMBO Workshop (Singapore, Apr 2018)
  Talk: Role of cell geometry and 3D chromatin structure in differential genome regulation"
- International Conference on Genomes and AI: From Packing to Regulation (Singapore, Oct 2019)
  Talk: "Multivariate analysis of fibroblast activation in engineered 3D tumor microenvironments"
- Drug Discovery 2019 – Looking Back To The Future (Liverpool, Nov 2019)
  Invited Speaker:"Mechano-Genomics: from Cell-Fate Decisions to Biomarkers"
- Annual Biophysical Society Meeting (San Diego, Feb 2020)
  Talk:"Cell Geometry Modulates the Activation of Fibroblasts in 3D Tumor Microenvironment

PEER REVIEWED PUBLICATIONS

1. **Venkatachalapathy S**, Jokhun DS, and Shivashankar GV. Multivariate analysis reveals activation-primed fibroblast geometric states in engineered 3D tumor microenvironments. Mol. Biol. Cell 2020;:mbcE19080420. [PMID: 32023167]
2. Damodaran K*, **Venkatachalapathy S***, Alisafaei F, Radhakrishnan AV, Sharma Jokhun D, Shenoy VB, and Shivashankar GV. Compressive force induces reversible chromatin condensation and cell geometry dependent transcriptional response. Mol. Biol. Cell 2018;:mbcE18040256. [PMID: 30256731](*equal contribution)
3. Roy B, **Venkatachalapathy S**, Ratna P, Wang Y, Jokhun DS, Nagarajan M, and Shivashankar GV. Laterally confined growth of cells induces nuclear reprogramming in the absence of exogenous biochemical factors. Proc. Natl. Acad. Sci. U.S.A. 2018;. [PMID: 29735717]

4. Belyaeva A, **Venkatachalapathy S**, Nagarajan M, Shivashankar GV, and Uhler C. Network analysis identifies chromosome intermingling regions as regulatory hotspots for transcription. Proc. Natl. Acad. Sci. U.S.A. 2017;. [PMID: 29229825]
5. Mitra A, **Venkatachalapathy S**, Ratna P, Wang Y, Jokhun DS, and Shivashankar GV. Cell geometry dictates TNFα-induced genome response. Proc. Natl. Acad. Sci. U.S.A. 2017;. [PMID: 28461498]
6. Radhakrishnan AV, Jokhun DS, **Venkatachalapathy S**, and Shivashankar GV. Nuclear Positioning and Its Translational Dynamics Are Regulated by Cell Geometry. Biophys. J. 2017; 112(9):1920-1928. [PMID: 28494962]

Complete List of publications: https://tinyurl.com/pulications-sv