Saradha Venkatachalapathy

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SUMMARY

I specialize in microscopy, computer vision and genomics and have extensive experience in developing computer vision and machine learning models to interpret causal relationships in highly variable processes.

EDUCATION

Ph.D, Mechanobiology | National University of Singapore *Sep 2016 - Present*
B.Tech Biotechnology (Distinction) | SASTRA University *Jul 2011 - May 2015*

WORK EXPERIENCE

Visiting Researcher| Paul Scherrer Institute & ETH Zürich *Sep 2020 - Present*
Consultant, Computer Vision | Qritive *Sep 2019 - Dec 2019*
Research Assistant, National University of Singapore *Sep 2015 - Jul 2016*

SKILLS

Statistics: Multivariate Statistics, Linear Algebra, Diffusion maps, Pattern recognition and Machine Learning.
Computer Vision: Segmentation, Feature generation and Particle tracking
Computational Biology: Analysis of bulk and single cell Microarray, RNA-Seq and HiC data.
Experimental Skills: Microscopy, Tissue engineering and mechanical manipulation of cells.
Tools: R, ImageJ, MATLAB, Python, QuPath, Git, LaTeX and Inkscape.

SELECTED RESEARCH PROJECTS

Automated segmentation and feature generator for 3D images

- Built an automatic image processing pipelines for segmentation and feature generation that reduced the processing time by 60%.
- Engineered features for morphology, textural and spatial distribution of objects in images.
- Integrated multimodal features such as protein expression, RNA seq and image features to enable deduction of functional links.

Digital pathology platform for grading breast cancer stages at single cell resolution

- Performed instance segmentation of singe nuclei from patient tissue biopsies using U-Net based CNN and extracted geometric and textural features of nuclei.
- Built machine learning models to diagnose breast cancer stages at single cell resolution from patient breast tissue biopsies with 80% accuracy.
- Developed a single cell tumorigenesis score that characterises tumor progression.
- Identified regions of tissue tension using spatial statistics of nuclear images.

Deconvolving cell variability in cancer

- Developed a 3D in-vitro organoid tissue model for cancer progression amenable to high-resolution imaging.
- Implemented a classifier to predict cell shape with an accuracy of 95% and used the latent feature vectors along with regression models to show that cell shape is coupled to its function.
- Demonstrated a causal relationship between cell shape and activation by cancer cells using multimodal-multivariate analysis.
- Established the use of tissue model to assay the treatment efficacy of radiotherapy.

Trajectory inference to accelerate reprogramming of skin cells to stem cells

- Developed a novel technique to reprogram skin cells to stem cells with high efficiency.
- Performed statistical tests and pathway analysis on RNA seq data to characterize the temporal changes in the transcription profile during reprogramming.
- Modeled trajectories of reprogramming cells using clustering and diffusion models of single cell image features.
- Identified sources of low efficiency in large noisy image data which were experimentally validated to accelerate stem cell generation.

Complete list of publications here