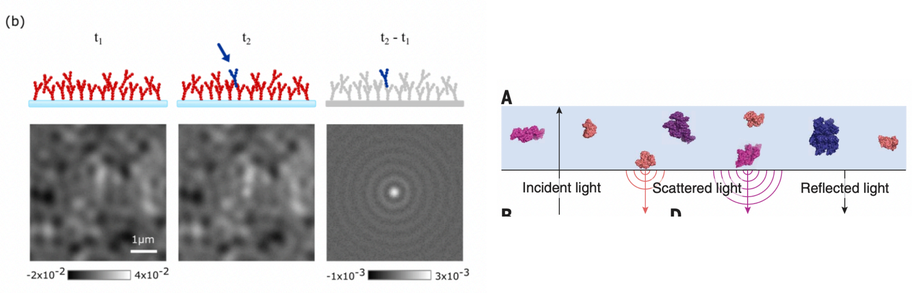
Dynamic window sizes for contrast estimation in interferometric scattering

Ishan Taneja
Scripps Research

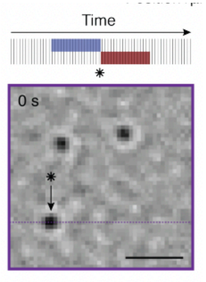
Motivation

- Interferometric scattering microscopy is a label-free technique that can detect the mass of proteins by measuring their scattering contrast upon binding to a microscope coverslip
- This technique is very sensitive to background noise, and the ability to remove it is fundamental to making accurate measurements



Related Work

- Construction of a ratiometric image stack [2]



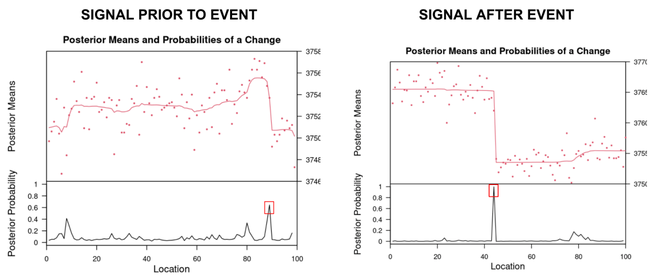
$$R_{w,i} = I_{i:i+w-1} / I_{i+w:i+2w-1} - 1$$

References

1. Reza Gholami Mahmoodabadi et. al. 2020. “The Point Spread Function in Interferometric Scattering Microscopy (iSCAT). I. Aberrations in Defocusing and Axial Localization.” *arXiv*.
2. Gavin Young et al. 2018. “Quantitative Mass Imaging of Single Biological Macromolecules.” *Science*.
3. Richard W. Taylor et. al 2018. “Interferometric Scattering (iSCAT) Microscopy & Related Techniques.” *arXiv*.

New Technique

- A dynamic window size that is dependent on the data may be more effective than a fixed window size. We used changepoint detection to determine the optimal window sizes.



Experimental Results

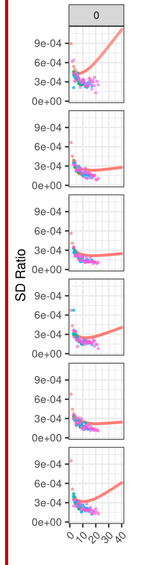


Fig. 1

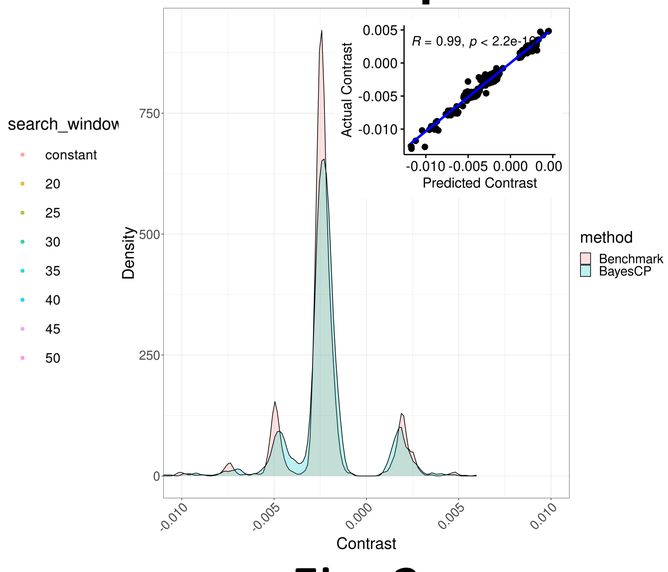


Fig. 2

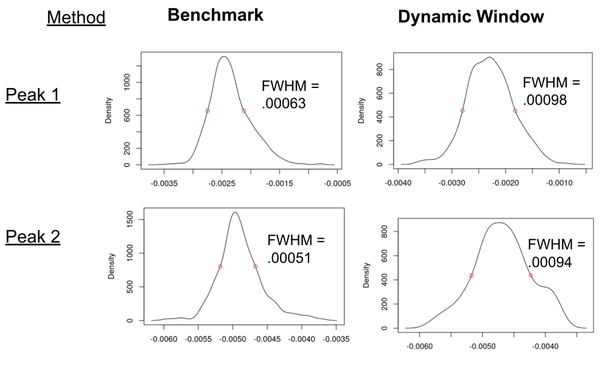


Fig. 3