

Md Abdul Kader Sagar

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Objective

Developing novel computational approaches to enhance microscopy techniques to gain better understanding of biological systems. Interested in exploring new microscopy and computational to augment existing techniques to develop multidisciplinary approaches to visualize intrinsic cellular signal.

Education

Ph.D. in Biomedical Engineering (2015-Fall 2019)
University of Wisconsin-Madison, WI, USA (Advisor: Dr. Kevin Eliceiri)
M.S. in Electrical Engineering, (Graduated 2015)
University of Wisconsin-Madison, WI, USA
B.S. in Electrical and Electronic Engineering (2011)
Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

Experience

Research Assistant (Aug-2013 to present)

*Laboratory for Optical and Computational Instrumentation (LOCI),
University of Wisconsin Madison*

Developing optical and quantitative approaches based on multiphoton microscopy focusing on Fluorescence Lifetime Imaging Microscopy (FLIM) to understand and interpret intrinsic cellular metabolism.

Key accomplishments:

- Developed technique to find metabolic fingerprint of microglia cell using FLIM and machine learning algorithm.
- Developed label-free FLIM based technique to differentiate between microglia functional state.
- Machine learning approaches (ANN) for the development of microglia identification using FLIM data.
- Convolutional Neural Network (CNN) based approach to differentiate between microglia cell state.
- A novel hardware technique to identify and extract spectral and lifetime signal simultaneously using simple optical fiber add-on to a multiphoton fluorescence lifetime microscope.
- Development of functionality for SLIM Curve, which is a Fiji (Java based image processing tool) plugin that utilizes exponential curve fitting library to analyze lifetime image. Detail at http://fiji.sc/SLIM_Curve
- Full acquisition code for time domain FLIM acquisition using Becker and Hickl Board which is part of LOCI's homebuilt C++ based multiphoton acquisition software *WiscScan*.
- Developed the FLIM acquisition code for open source laser scanning software, *OpenScan*

- Collaborated on several projects involving FLIM based autofluorescence imaging and multiphoton imaging. Detail in my [researchgate](#).

Software Engineer (Mar 2011- Feb 2013)

Samsung R&D Institute Bangladesh, Samsung Electronics

- Developed dynamic mode selection algorithm for prediction-based image/video encoding, such as **H.264**, **WebP**, **WebM** which reduced mode prediction time 30-40%.
- Developed the decoder software for the PC application and optimized using Intel's **Streaming SIMD Extension 2(SSE2)**.
- Developed, optimized and ported algorithm for removal of unwanted object from a captured image. Also worked on image stabilization.

Skills

Programming: C, C++, Java, MATLAB, Verilog, R, Python

Simulation: MATLAB, LabVIEW

Microscopy: Multiphoton fluorescence imaging, FLIM, SHG imaging

Version management: Github

Publications

Book chapter

- 1) Keikhosravi, Adib, Jeremy S. Bredfeldt, **Md Abdul Kader Sagar**, and Kevin W. Eliceiri. "Second-harmonic generation imaging of cancer." In *Methods in cell biology*, vol. 123, pp. 531-546. Academic Press, 2014.
- 2) Jenu Varghese Chacko*, **Md Abdul Kader Sagar***, Kevin Eliceiri, "Chapter 10: Fluorescence Lifetime" for "Imaging from cells to animals in vivo" for TAYLOR & FRANCIS-CRC PRESS. Editors, Xavier Intes, Ph.D. Margarida Barroso, PhD (Accepted, waiting for final publication)

Conference

- 1) **Md Abdul Kader Sagar**, Kevin P. Cheng, Jonathan Ouellette, Justin C. Williams, Jyoti J. Watters, Kevin Eliceiri, "Fluorescence lifetime-based intrinsic metabolic signatures of microglia cell", *SPIE Optics + Photonics*, (Aug 13, 2019 presentation)

Selected Journal

- 1) (Manuscript in review) *Optical fiber-based dispersion for spectral discrimination in fluorescence lifetime imaging systems*, **Md Abdul Kader Sagar**, Bing Dai, Jenu V. Chacko, Joshua J. Weber, Andreas Velten, Scott T Sanders, John G White, Kevin W Eliceiri
- 2) (Manuscript in review), *Machine learning methods for fluorescence lifetime imaging (FLIM) based label-free detection of microglia*, **Md Abdul Kader Sagar**, Kevin P. Cheng, Jonathan N. Ouellette, Justin C. Williams, Jyoti J. Watters, Kevin W. Eliceiri
- 3) (Manuscript in revision) *Label free visualization of microglia and their activation via Fluorescence Lifetime Imaging Microscopy*, **Md Abdul Kader Sagar**, Kevin P. Cheng, Jonathan N. Ouellette, Justin C. Williams, Jyoti J. Watters, Kevin W. Eliceiri
- 4) Kenny, T. C., Peter Hart, Moira Ragazzi, Madhavika Sersinghe, Jerry Chipuk, **Md Abdul Kader Sagar**, Kevin W. Eliceiri et al. "Selected mitochondrial DNA landscapes activate the SIRT3 axis of the UPR mt to promote metastasis." *Oncogene* 36, no. 31 (2017): 4393.

- 5) Ghanbari, L., Carter, R.E., Rynes, M.L., Dominguez, J., Chen, G., Naik, A., Hu, J., **Sagar, M.A.K.**, Haltom, L., Mossazghi, N. and Gray, M.M., 2019. *Cortex-wide neural interfacing via transparent polymer skulls.* **Nature Communications**, 10(1), p.1500.
- 6) Lee, Jongho, Jenu Varghese Chacko, Bing Dai, Syed Azer Reza, **Abdul Kader Sagar**, Kevin W. Eliceiri, Andreas Velten, and Mohit Gupta. "Coding Scheme Optimization for Fast Fluorescence Lifetime Imaging." **ACM Transactions on Graphics** (TOG) 38, no. 3 (2019): 26.
- 7) Wang, Shulei, Jenu V. Chacko, **Abdul K. Sagar**, Kevin W. Eliceiri, and Ming Yuan. "Nonparametric empirical Bayesian framework for fluorescence-lifetime imaging microscopy." **Biomedical Optics Express** 10, no. 11 (2019): 5497-5517.
- 8) (Manuscript in preparation) *BioMedical Engineering OnLine*, "Extensible Laser Scanning Microscopy in Micro-Manager, Bing Dai, Bin Li, Rui Xu, **Md Abdul Kader Sagar**¹, Xiaoyang Gong¹, Adib Keikhosravi¹, Michael A. Pinkert, Jenu V. Chacko, Mark A. Tsuchida and Kevin W. Eliceiri

Leadership

- 1) Vice President, SPIE-OSA student chapter, University of Wisconsin Madison (2016-17)
- 2) Member, SPIE-OSA student chapter, University of Wisconsin Madison (2013-present)
- 3) Founder and former President, Bangladesh Student Organization- University of Wisconsin-Madison (2016-17)
- 4) Have participated, volunteered in several science outreach events in Wisconsin