

Suvadip Mukherjee, Ph.D

Postdoctoral Researcher,

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Professional Profile

I am a research professional trained in multidimensional data analytics, with an emphasis on image analytics for biological and biomedical applications. Presently, I am a researcher at the Bioimage Analysis Laboratory at [Institut Pasteur](#), Paris led by Prof. [Jean-Christophe Olivo-Marin](#). Previously, I was employed as a Lead Scientist in the Artificial Intelligence Image Analytics (AIIA) group at GE Global Research, Bangalore, where I led a team of data scientists for developing image analytics and machine learning solutions for different ultrasound imaging applications. My broad research interests include image and data analytics, computer vision, and machine/deep learning. Specific interests include image segmentation, variational models, bio-image informatics, and deep learning applications in medical imaging.

Skills & Abilities

More than ten years of experience in image analysis, computer vision, machine learning, deep learning both in academia and research industry. Experienced in developing novel technologies, publishing peer-reviewed research articles and mentoring graduate students. Led a team of scientists to conceptualize, develop and deploy the first AI enabled solution for GE Healthcare [\[More details\]](#).

Experience

Research Associate — Institut Pasteur, Paris, France	<i>Nov. 2018 — present</i>
Responsible for designing and implementing solutions for bio-image informatics using applied computer vision and machine learning	
Lead Scientist — General Electric Global Research, Bangalore, India	<i>2015 — 2018</i>
Designed image processing and machine learning algorithms for medical imaging problems in computed tomography (CT), ultra- sound, and digital microscopy. Presently leading a team of scientists and engineers for AI projects in ultrasound image analytics for obstetrics and gynecological applications.	
Research Assistant — University of Virginia, Charlottesville, USA	<i>2011 — 2015</i>
Designed image analytics and computer vision algorithms with an emphasis on biomedical and biological applications. Recipient of the prestigious Charles E. Brown scholarship for academic excellence during the third year of the PhD program	
Engineer — Siemens Ltd., India	<i>2008 — 2009</i>
Involved in providing industrial automation solutions for steel industries in India.	

Education

Doctor of Philosophy (Electrical Engineering)

2011-2015

Advisor: [Dr. Scott T. Acton](#)

Virginia Image and Video Analysis Lab

Charles L. Brown Department of Electrical and Computer Engineering

University of Virginia, Charlottesville, VA, USA

M.S. (Computer Science)

2009-2011

Advisor: [Dr. Bhabatosh Chanda](#)

Electronics and Communication Sciences Department

Indian Statistical Institute, Kolkata, India

B.S. (Electrical Engineering)

2004-2008

Department of Electrical Engineering

Jadavpur University, Kolkata, India

Programming skills

- Programming Languages: *Python, C/C++, Matlab, Java*
- Scientific platforms: *OpenCV, ITK, PyTorch, Keras*

Awards and Honors

- Spotlight Award for developing the first AI based application for 3D fetal ultrasound *General Electric Company, 2018*
- Charles L. Brown Graduate scholarship for academic excellence *University of Virginia, 2012*
- TCS innovation award for best M.S. dissertation *Indian Statistical Institute, 2011*
- Gold medal for scholarship in M.S. curriculum *Indian Statistical Institute, 2011*

Patent applications

1. Mukherjee, Suvadip, Gogna, Annupriya, V. Rahul, and Anzengruber, Stephan. "System and method for determining condition of fetal nervous system", US Patent Application, filed April, 2019.
2. Mukherjee, Suvadip, Roshni Bhagalia, and Xiaojie Huang. "Automated segmentation using deep learned priors." U.S. Patent.
3. Perrey, Christian Fritz, Suvadip Mukherjee, Nitin Singhal, and Rakesh Mullick. "Methods and systems for ultrasound imaging." U.S. Patent Application 15/258,099, filed February 15, 2018.
4. Singhal, Nitin, Mukherjee, Suvadip, and Krishnan, Kajoli. "System and method for measuring one or more entities in a reproductive organ", Indian Patent Application, published 11/05/2018

Publications [Journals]

1. S. Mukherjee, T. Lagache, and J-C. Olivo-Marin, "Evaluating the Stability of Spatial Keypoints via Cluster Core Correspondence Index", *to be submitted to IEEE Transactions on Image Processing*
2. S. Mukherjee, B. Condrón and S.T. Acton, "Tubularity Flow Field A Technique For Automatic Neuron Segmentation," *IEEE Transactions on Image Processing*, vol.24, no.1, pp.374,389, Jan. 2015
3. S. Mukherjee and S.T. Acton, "Region Based Segmentation in Presence of Intensity Inhomogeneity Using Legendre Polynomials," *IEEE Signal Processing Letters*, vol.22, no.3, pp.298,302, March 2015
4. R. Sarkar, S. Mukherjee and S.T. Acton, "Dictionary Learning Level Set," *IEEE Signal Processing Letters*, vol.22, no.11, pp.2034,2038, Nov. 2015
5. Slepian, Zoe, et al. "Visual attraction in Drosophila larvae develops during a critical period and is modulated by crowding conditions." *Journal of Comparative Physiology A* 201.10 (2015): 1019-1027.

Publications [Peer reviewed conferences]

1. S. Mukherjee, S. Jain, L. Danglot, and J.-C. Olivo-Marin "Morphological Reconstruction of Detached Dendritic Spines via Geodesic Path Prediction", *IEEE ISBI 2020*.
2. S. Mukherjee, C. Gonzalez, L. Danglot, J.-C. Olivo-Marin, and T. Lagache. "Leveraging Level Set for the Statistical Analysis of Objects' Spatial Coupling in Bioimaging" *IEEE ISBI 2020*
3. R. Sarkar, S. Mukherjee, E. Labruyere, and J.-C. Olivo-Marin. "Learning to Segment Clustered Amoeboid Cells from Brightfield Microscopy via Multi-Task Learning with Adaptive Weight Selection", *IEEE ISBI 2020*
4. S. Mukherjee, X. Huang, and R. R. Bhagalia. "Lung nodule segmentation using deep learned prior based graph cut." *IEEE ISBI 2017*
5. Singhal, Nitin, Suvadip Mukherjee, and Christian Perrey. "Automated assessment of endometrium from transvaginal ultrasound using Deep Learned Snake." *IEEE ISBI 2017*
6. S. Mukherjee and S.T. Acton, "Oriented filters for vessel contrast enhancement with local directional evidence." *IEEE ISBI*, 2015.
7. M. Consylman, S. Mukherjee, D.P. Mukherjee, B. Condrón and Scott T. Acton, "Social behavior analysis of Drosophila larvae via motion activity recognition", *IEEE SSIAI* 2014.
8. S. Mukherjee et al. "Neuron segmentation with level sets", *ACSSC* 2013:1078-1082
9. R. Sarkar, S. Mukherjee and S. T. Acton, "Shape descriptors based on compressed sensing with application to neuron matching", *ACSSC* 2013: 970-974
10. S. Mukherjee and S. T. Acton, "Vector field convolution medialness applied to neuron tracing," *IEEE ICIP* 2013: 665-669
11. S. Mukherjee, B. Condrón and S. T. Acton, "Chasing the neurome: Segmentation and comparison of neurons," *EUSIPCO* 2013: 1-4

12. S. Mukherjee et al., "Tree2Tree2: Neuron tracing in 3D," *IEEE ISBI* 2013: 448-451
13. S. Mukherjee et al. "A geometric-statistical approach toward neuron matching", *IEEE ISBI* 2012: 772-775.
14. S. Mukherjee and B. Chanda. "A Robust Human Iris Verification Using a Novel Combination of Features." *NCVPRIPG*, 2011.
15. S. Mukherjee, et al. "Tracking sunflower circumnutation using affine parametric active contours." *IEEE SSLAI*, 2014.

Key Technical Projects: Academia & Industry

Statistical colocalization

This ongoing project aims at developing a robust statistical toolkit to detect and quantify colocalization of protein markers from fluorescent microscopy, or to analyze inter-molecular interaction via super-resolution microscopy. The developed theory is also applicable to the traditional computer vision application to measure stability of feature detectors.

Researcher, Institut Pasteur, 2018-present

AI based automated fetal ultrasound

Developed the first AI based solution to automatically identify scan plane parameters for 3D fetal ultrasound. Led a team of researchers to develop the prototype, and deliver the technological solution for product deployment. [details]

Technical lead, GE Research, 2016-18

Ultrasound image analytics for OB/GYN

Designed a deep learning based algorithm for measurement, visualization, and tracking of the endometrium cavity from 3D transvaginal ultrasound. We introduced a novel active contour cost function combined with a deep fully convolutional layer to enhance the detection and segmentation accuracy of the endometrial cavity.

Member of technical staff, GE Research, 2015-17

Automated lung cancer screening via LDCT

Designed a deep learning based solution for robust segmentation of lung nodules from 3D low dose computed tomography images of the lung. The hybrid technique provides a novel way to incorporate a fully convolutional network in a graph-cut paradigm which significantly enhances nodule segmentation efficacy. This work has resulted in one conference publication, and one US patent application.

Member of technical staff, GE Research, 2015-16

Segmentation and analysis of neurons in 3D

A complete understanding of an organism's brain's functionality requires extensive study of the behavior of its neurons. However, visual assessment of such images for qualitative assessment of neuronal morphology can be prone to error, and increases the processing time significantly as more images are obtained. In this collaborative effort between engineering and biology, we have developed two novel neuron segmentation tools (Tree2Tree and TuFF) to trace *Drosophila* neurons in 3D.

Graduate student, University of Virginia, 2011-15

Deformable model based segmentation

Object segmentation has been traditionally performed by detecting the its boundaries or edges. However, in many imaging scenarios (viz. microscopy, ultrasound etc.) where noise and clutter is predominant, an edge independent approach is preferred. This work involves development of an edge independent framework for object segmentation. Our algorithm, Legendre Level Set generalizes the popular segmentation method due to Chan and Vese by using a set of smooth polynomial basis functions for low dimensional signal approximation.

Graduate student, University of Virginia, 2011-15

Invited talks

- “New frontiers in bio-image informatics”, Indian Statistical Institute, Kolkata, October 2019.

- “Artificial intelligence in biomedical imaging”, PES Institute of Technology, Bangalore, India, 2018
- “Chasing the neurome: Segmentation and comparison of neurons” in *European Signal Processing Conference (EUSIPCO)*, 2013, Marrakech, Morocco

Professional activities

- **Member of technical committee**, Indian Conference on Vision, Graphics, and Image Processing, 2016, Mandi, India
- **Invited session chair**, 9th International Conference on Advances in Pattern Recognition (ICAPR), 2017, Bangalore, India
- **Reviewer of technical articles** for *IEEE Transactions on Image Processing*, *IEEE Transactions on Medical Imaging*, *IEEE Signal Processing Letters*, *IEEE Transactions on Circuits, Systems and Video*, *IEEE International Conference on Image Processing (ICIP)*, *IEEE International Symposium on Biomedical Imaging (ISBI)*

References

Available on request