Soumyabrata Dey

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RESEARCH INTERESTS

As the current world is generating petabytes of data every day, data-driven decision-making has become something of utmost importance. My research interests cover mainly the following areas.
Computer Vision: machine learning applications for image and video data analysis such as 3D vision based moving object detection, object classification, action detection, biomedical image analysis, semantic image segmentation, and multi object tracking.
Sensor data analysis: 3D scene understanding in a multi-modal sensor environment consist of multiple instances of color, thermal, and depth cameras.
Healthcare data analysis: data driven healthcare recommendation engine, clustering and outlier detection.

EDUCATION

University of Central Florida — **Orlando, FL**
Ph.D. in Computer Science — *Dec 2014*

University of Central Florida — **Orlando, FL**
Masters in Computer Science — *May 2011*

West Bengal University of Technology — **West Bengal, India**
Bachelor of Technology in Computer Science and Engineering — *August 2005*

KEY SKILLS

Deep Learning	Computer Vision	Python
Data Analytics	3D Computer Vision	C, C++, Java
Machine Learning	Biomedical Image Analysis	MATLAB

PROFESSIONAL EXPERIENCE

Clarkson University — **Potsdam, NY, USA**
Tenure Track Assistant Professor — *Jan 2020 - till date*
- Application: Machine learning applications on multi-sensor fusion data, biomedical data, healthcare data
- Responsibilities: Independent research, student advising, teaching, writing research grants
- Technology: Python, MATLAB, C++

Clarkson University — **Potsdam, NY, USA**
Research Associate — *Dec 2018 - Jan 2020*
- Application: Machine learning applications on multi-modal sensor data
- Responsibilities: Independent research, mentoring student research projects, teaching image processing and deep learning courses
- Technology: Python, MATLAB, C++

Carl Zeiss, IMT R&D — **Bengaluru, KA, India**
Research Lead — *Nov 2017 - Nov 2018*

- Application: CT image analysis, industrial data analysis
- Responsibilities: leading Carl Zeiss, IMT research effort including project definition, customer interaction, algorithm development, team formation, and providing machine learning training
- Technology: Python, C++

Samsung Research Institute, Bangalore **Bengaluru, KA, India**
Chief Engineer *Nov 2014 - Nov 2017*

- Application: Personalized Recommendation, Healthcare Analytics, Biometric Authentication
- Responsibilities: Project conceptualization, algorithm development, leading commercialization process
- Technology: R, C++, OpenCV, Visual Studio

Acclaris Inc. **Tampa, FL, USA**
Summer Intern *May 2009 - Aug 2009*

- Responsibilities: front end interface design for data access from Oracle tables
- Technology: Oracle Form, PL/SQL

Cognizant Technology Solutions **Kolkata, WB, India**
Programmer Analyst & Developer *Oct 2005 - Jul 2008*

- Application: Insurance and Airlines software management
- Responsibilities: project design, documentation, development and testing
- Technology: Mainframe, COBOL, IMS, DB2

Funded Proposals

1. **Principal Investigator:** NSF, CITeR 2022: A Study to Benchmark Smartphone Hardware and Software for High Quality Iris Data Collection ($50,000).
2. **Principal Investigator:** NSF, CITeR 2021: Presentation Attack Detection for Noncontact Fingerprint Systems ($50,000).
3. **Co-Principal Investigator:** NSF, CITeR 2021: A Deep End-to-End Iris Matcher for Simultaneous Segmentation and Matching ($50,000).

PATENTS

- V. N. Tiwari, **S. Dey**, R Narayanan, S Sahoo, A. De, “Method and mobile device for determining Ultraviolet (UV) dose using non-UV sensor”. Filing No. in 201641031912
- R. Rao, **S. Dey**, M. Shah, B. Solmaz, “Method and system for modeling and processing fMRI image data using a bag-of-words approach”. Publication No. US9072496 B2

PUBLICATIONS

1. X. Zhang, M. Li, A. Hilton, A. Pal, **S. Dey**, S. Debroy, "End-to-End Latency Optimization of Multi-view 3D Reconstruction for Disaster Response", MobileCloud 2022.
2. S. Li, S. Banerjee, N. Banerjee, **S. Dey**, "Simultaneous Prediction of Hand Gestures, Handedness, and Hand Keypoints using Thermal Images", ICDEC 2022 (Accepted).
3. M. Nguyen, J. Gately, S. Kar, **S. Dey**, S. Debroy, "DNN-based Denial of Quality of Service Attack on Software-defined Hybrid Edge-Cloud Systems", WAMICON 2022.
4. M. Babaeianjelodar, G. P. Prudhvi, S. Lorenz, K. Chen, S. Mondal, **S. Dey**, N. Kumar, "Explainable and High-Performance Hate and Offensive Speech Detection", HCII 2022.
5. J. Bellow, S. Banerjee, N. Banerjee, **S. Dey**, "Real-Time Hand Gesture Identification in Thermal Images", ICIAP 2021.
6. A. R. Rao, S. Garai, **S. Dey**, H. Peng, "PIKS: A Technique to Identify Actionable Trends for Policy-Makers Through Open Healthcare Data", SN Computer Science 2021.
7. P. Athavale, S. Dey, S. Dharmatti, A. S. Mathew, “A Novel Entropy-Based Texture Inpainting

Algorithm", Signal, Image and Video Processing – Springer, 2020 (**impact factor 2.157**).

8. A. R. Rao, S. Garai, **S. Dey**, H. Peng, "Building predictive models of healthcare costs with open healthcare data", ICHI 2020.
9. J. Gately, Y. Liang, M. K. Wright, N. Banerjee, S. Banerjee, **S. Dey**, "Automatic Material Classification using Thermal Finger Impression", MMM 2020 (**oral**).
10. A. Rao, D. Clarke, S. Garai, **S. Dey**, "A system for exploring big data: an iterative k-means searchlight for outlier detection on open health data", IJCNN 2018 (**oral, rank A**).
11. **S. Dey**, S. Sahoo, H. Agrawal, A. Mondal, T. Bhowmik, V. N. Tiwari, "Personalized Cumulative UV Tracking on Mobile & Wearables", EMBC 2017 (**rank B**).
12. S. Karmakar, **S. Dey**, S. Sahoo, "Towards Semantic Image Search", ICSC-SMM 2016.
13. **S. Dey**, R. Rao, M. Shah, "Attributed graph distance measure for automatic detection of attention deficit hyperactive disordered subjects", Frontiers in Neural Circuit June 2014 (**impact factor 3.492**).
14. **S. Dey**, R. Rao, M. Shah, "Exploiting Brain's Network Structure in Classifying ADHD", Frontiers in Systems Neuroscience Nov 2012 (**impact factor 3.289**).
15. **S. Dey**, V. Reilly, I. Saleemi, M. Shah, "Detection of Independently Moving Objects in Non-planar Scenes via Multi-Frame Monocular Epipolar Constraint", ECCV 2012 (**rank A**).
16. B. Solmaz, **S. Dey**, R. Rao, M. Shah, "ADHD Classification Using Bag of Words Approach on Network Features", SPIE 2012.
17. S. Basu, S.S. Seth, P. Sarkar, B. Das, **S. Dey**, S. Ghosh, "Development of a Multilingual Recognition Engine for Automatic Interpretation of Handwritten Form Documents", Computer Processing of Bangla 2005.

Other Research Proposals

1. **Co-Principal Investigator:** NSF, Convergence Accelerator Research 2021: D:Infrastructure Safety Monitoring (under review).
2. **Co-Principal Investigator:** NSF, Resilient Intelligent NextG Systems (RINGS): Resilient Hybrid Edge-Cloud Framework for Real-time Visual Computing Application Processing.
3. **Principal Investigator:** Clarkson, 2020 Ignite Graduate Research Fellowship (IGRF): Early Detection of Dementia using Machine Learning (selected for the final round among top 9 proposals).
4. **Co-authored:** NASA, SpaceTech-REDDI-2019 Early Stage Innovations(ESI): A Microstructure-informed Computational Model for the Prediction of Fatigue Behavior of Metals and Alloys.
5. **Co-authored:** DoD STTR, N19B-T026: Fatigue Prediction for Additive Manufactured (AM) Metallic Components.

RESEARCH EXPERIENCE

Hand Gesture Classification from Thermal Data, Clarkson University *Jan 2020 - Present*

- End-to-end pipeline for hand detection, segmentation, handedness detection, hand gesture classification, and hand keypoints localization.
- Novel deep-learning-based solution for real-time video processing.
- Interesting applications include human-computer-interaction for gaming and smart home environments.
- Mentored 2 graduate students resulting in 2 conference papers, and a journal paper in the pipeline.

Natural Surface Interaction using Thermal Imaging, Clarkson University *Dec 2018 - Dec 2019*

- Developed a methodology to detect, segment, and classify pressure of finger swipes on natural surfaces.
- Proposed a novel method of material classification based on user's thermal signature on a surface. The method will allow to perform material specific swipe pressure classification improving the classification accuracy.
- The system can have multiple applications such as an alternative interface with mobile device, interactive classroom etc.
- Mentored 3 undergraduate students resulting in a conference paper.

Defect Segmentation in Industrial Parts, Carl Zeiss *Dec 2017 – Nov 2018*

- Developed an deep learning based solution to segment defect region in industrial parts.
- The method can be used for automatic quality control of parts after production.
- Led a team for problem definition through customers interaction, data collection and preparation, and algorithm development.

Personalized UV exposure tracking and recommendation, Samsung Research *Jan 2015 – May 2015*

- Led a multidisciplinary team of a doctor, a statistician, and engineers to develop a system to track UV exposure of Samsung mobile users.
- The mobile application can automatically detect if the user is indoor or outdoor and estimate their cumulative UV exposure level to provide personalized recommendations. The recommendations help to maintain an optimum vitamin D dosage and protect the skin from overexposure to UV.
- This resulted in a paper and a global patent.

Automatic detection of brain functional disorder using imaging data, UCF *Sep 2010 – Nov 2014*

- This work is performed in collaboration with Dr. Ravi Rao, IBM T. J. Watson Lab.
- Developed a machine learning algorithm that can detect Attention Deficit Hyperactive Disordered subjects given the patient's brain functional magnetic resonance imaging and structural magnetic resonance imaging data.
- This resulted in two journal papers, a conference paper, and my PhD thesis.

Brain tumor segmentation using MRI data, UCF *June 2012 – Oct 2012*

- Accurate measurement of tumor volume is important to analyse the effectiveness of treatment procedure.
- A software system is developed to segment tumor volume and estimate its size from 3D brain MRI images.
- The software was developed using ITK, VTK, FLTK libraries.

Moving object detection in non-planar scenes from moving cameras, UCF *Aug 2009 – Dec 2010*

- The work was funded by Harris Corporation and it is very important for surveillance from a UAV.
- A variation of epipolar constraint is used for automatic detection of independently moving object.
- The work resulted in a conference paper and a project for Harris Corporation.

AWARDS AND ACHIEVEMENTS

- Teaching Excellence Recognition, Clarkson University, Spring 2022
- ADHD-200 Competition, NITRC, 2012: Ranked 12 out of 50 teams
- Excel Award, Cognizant Technology Solutions, 2008
- Excel Award, Cognizant Technology Solutions, 2007

TEACHING

At Clarkson University:
CS242: Advanced Programming Concepts in Java - Fall 2022
CS670: Advanced Topics in Deep Learning - Spring 2022
CS470/CS570: Deep Learning - Fall 2019, 2020, 2021, 2022
CS412/CS612: Image Understanding - Spring 2019, 2020, 2021, 2022

At Carl Zeiss, India:
Machine Learning Fundamentals - June 2018 - Nov 2018

TALKS

The 5th International Conference on Computational Intelligence and Networks, keynote speaker: Sensor, Data, and Intelligence: Shaping a Better Future World, December 2022.
International Conference on Data, Electronics and Computing Simultaneous Prediction of Hand Gestures, Handedness, and Hand Keypoints using Thermal Images, September 2022.
Mastercard AI Garage, guest speaker: Automatic Detection of Brain Functional Disorder using

Imaging Data, September 2020.
International Conference on MultiMedia Modeling: Automatic Material Classification using Thermal Finger Impression, January 2020.
Clarkson University, colloquium: Automatic Detection of Brain Functional Disorder from Brain Imaging Data, March 2019.

STUDENTS ADVISED

GRADUATE

At Clarkson University:
Yue Pan (Fall 2022 - ongoing), PhD, Computer Science
Yu Liu (Spring 2022 - ongoing), PhD, Computer Science
Houchao Gan (Spring 2022 - ongoing), PhD, Computer Science
Marzieh Babaeianjelodar (Fall 2021), PhD, Computer Science - **graduated**
Sichao Li (Spring 2021 - ongoing), PhD, Computer Science
Benjamin Moeller (Fall 2020), MS, Computer Science - **graduated**
Mingjun Li (Fall 2020 - Fall 2021), PhD, Computer Science
James Ballow (Spring 2020 - Spring 2022), MS, Computer Science - **graduated**

UNDERGRADUATE

At Clarkson University:
Collin Jamieson (Fall 2022), Computer Engineering
Reed Freer (Fall 2022), Electrical Engineering
Brian Williams (Spring 2020), Computer Science
Andrew Hilton (Spring 2020), Computer Science
Peter-John King (Spring 2020), Computer Science Honors Program
Chris Undercoffer (Fall 2019, Spring 2020), Computer Science
Matthew Kolessar Wright (Summer 2019), pre-frosh student
Ying Liang (Summer 2019), Civil Engineering, McNair Scholar Program
Jacob Gatley (Spring 2019, Summer 2019, Fall 2019), Computer Science
Sarah Inzerillo (Spring 2019, Spring 2020), Computer Science

At University of Central Florida:
Arjun Watane (Summer 2014 - Fall 2014), Computer Science, Research Experience for Undergraduates (REU)

STUDENT AWARDS ACHIEVEMENT

Sarah Inzerillo, REU, University of Southern California, 2020
Arjun Watane: 1'st place, UCF Showcase of Undergraduate Research Excellence, 2015

SERVICE

Thesis Committee Member:
Chinmay Sahu, PhD in Electrical and Computer Engineering, Clarkson University, July 2021
Yijun Jiang, PhD in Computer Science, Clarkson University, February 2021
Ahmed Anu Wahab, PhD in Electrical and Computer Engineering, Clarkson University, January 2021

Simon Khan, PhD Electrical and Computer Engineering, Clarkson University, September 2020
Maggie Stark, M.S. Interdisciplinary Sciences and Biotechnology, Clarkson University, July, 2020
Hannah DeFazio, Honors Program in Computer Science, Clarkson University, May, 2020
Marzieh Babaeianjelodar, PhD in Computer Science, Clarkson University, May, 2019
Damon Gwinn, MS in Computer Science, Clarkson University, May, 2020
Shashikant Ingale, MS in Basic Science, Clarkson University, August, 2019

Reviewer:
Community Mental Health Journal
Signal, Image and Video Processing (Journal)
IEEE Access (Journal)
Demo Session, IEEE International Conference on Data Mining 2019
Neurocomputing Journal, Elsevier, 2015

Technical Programme Committee (TPC) Member:
2nd International Conference on Frontiers in Computing and Systems (COMSYS-2021)

Session Judge:
RAPS Conference, Clarkson University, August 2, 2019

Interviewer: Honors Program, Clarkson University, 2020

Walsh Seminar Committee: Clarkson University, August,2022 - present
CS PhD Program Evaluation Committee: Clarkson University, March,2021
Graduate Committee Member: Clarkson University, Feb,2020 - present