BIO-DATA

1 Name:

Subhashis Banerjee

2 Present Address:

Professor
Department of Computer Science
Ashoka University
Plot No. 2, Rajiv Gandhi Education City,
National Capital Region, Sonepat Haryana 131029

3 Academic Qualifications:

Ph.D Thesis: On Stochastic Relaxation Paradigms for Computational Vision
Electrical Engineering
Indian Institute of Science, Bangalore
1989

ME Electrical Engineering
Indian Institute of Science, Bangalore
1984

BE Electrical Engineering
Jadavpur University, Calcutta
1982

4 Details of Employment

Professor
Department of Computer Science
Ashoka University
From September 2023 till date
From June 2021 to May 2023 (on leave from IIT Delhi)

Founding head of the Centre of Digitalization, AI, and Society at Ashoka University
Member, Board of Management, Ashoka University

Professor
Department of Computer Science and Engineering
Indian Institute of Technology Delhi
From January 2000 to August 2023

Ministry of Urban Development Chair Professor, 2015-2020.
Microsoft Chair Professor, 2010-2013.
Naren Gupta Chair Professor, 2004-2006.
Head, Computer Services Center, from 2009-2012
Head, Department of Computer Science and Engineering, 2004-2007.

Associate Professor
Department of Computer Science and Engineering
Indian Institute of Technology Delhi
From August 1997 to January 2000

Assistant Professor
Department of Computer Science and Engineering
Indian Institute of Technology Delhi
From April 1990 to August, 1997

Lecturer
Department of Computer Science and Engineering
Indian Institute of Technology Delhi
From December 1989 to March 1990

5 Academic visits

Oxford, IISc, UIUC, EPFL, Hebrew University and several others.

6 Field of Specialization

- Computer vision and machine learning.
- Recent interest in
  - Digital identity, data infrastructure, privacy and data protection, electronic voting.
  - Predictability, reliability and fairness in machine learning.

7 Awards/Recognition

1. IIT Delhi Teaching excellence award, 2011.
2. Ministry of Urban Development Chair Professorship, Department of Computer Science and Engineering, IIT Delhi, 2015-2020.
3. Microsoft Chair Professorship, Department of Computer Science and Engineering, IIT Delhi, 2010-2013.
4. Naren Gupta Chair Professorship, Department of Computer Science and Engineering, IIT Delhi, 2004-2006.

5. Best paper of the year (July 94 -June 95) award for the paper " Real Time Vision System for Collision Detection" with Alok Mittal, Aditya Vailaya and M. Balakrishnan, in Journal of Computer Science and Informatics, Special Issue on Robotics and Automation, 25(1), pp. 174-208, March 1995.

6. Young Scientist award of the Department of Atomic Energy, 1994.

8 Ph.D. guided/on-going

- Smriti Parsheera, Aadhaar's policy-making processes: role of institutions, ideas, and interests (ongoing)
- Prashant Agrawal, Securing democracies: building trust in large public elections (2024)
- Krithika Rangarajan, Utility of Deep Learning in breast cancer imaging in India (2024)
- Britty Baby, Computer Vision-based neuro-endoscopic surgical video analysis and evaluation systems, 2022.
- Suvam Patra, 3D registration and reconstruction from multi-modal data, 2018
- Brojeshwar Bhowmick, Dense and large scale 3D reconstruction, 2017
- Chetan Arora, On Graph-cut algorithms in Computer Vision, 2013
- Tanveer Faruquie, Novel Space-time Activity Modelling Techniques for Video Surveillance, 2012
- Ayesha Choudhary, Detection of unusual activities in Videos, 2011
- Uma Mudenagudi, Markov Random Field Models for Super Resolution in Space and Time, 2007
- Subhajit Sanyal, Interactive Image-Based Modeling and Walkthrough Planning,, 2006
- Parag Chaudhuri, A Framework for View-Dependent Character Animation, 2005
- Shoma Chatterjee, Vision Based Motion Image Compression, 2002
- Sumantra Dutta Roy, Active Object Recognition through Next View Planning, 2000
- Navin Rajpal, Development of Object Recognition Systems using Invariant Feature based Indexing, 1998
- G. Sudhir, Relaxation Algorithms for Computer Vision, 1994.

9 Courses taught

- Quantitative Reasoning and Mathematical Thinking
- Introduction to Computers and Programming
- Introduction to Computer Science

- Data Structures
- Discrete Structures
- Numerical Algorithms
- Design Practices in Computer Science
- Operating Systems
- Algorithms
- Computer Graphics
- Pattern Recognition and Image Processing
- Digital Image Analysis
- Mathematical Foundations of Computer Science
- Logic and Functional Programming
- Computer Vision
- Neural Networks and Machine Learning
- Quantum Computation and Information Theory
- Machine Learning and Data Mining
- Simultaneous localization and mapping
- Deep Learning
- Digital infrastructure, identity, online data and privacy (special module)
- Trustworthy AI/Fairness and reliability of Machine Learning
- Digitalization and Privacy

10 Some important sponsored research projects

1. AIIMS-IITD Centre of Excellence for Neuro-engineering, ongoing since, DBT, 2017.
2. Use of Artificial Intelligence to Detect Breast Cancer on Mammogram and its use in the Indian Population, DBT, ongoing since 2019-2023.
3. Four problems related to ADAS, Continental Automotive, 2016-2017.
4. Evaluation of development of neurosurgery skills by hands-on skills training and interactive virtual training (with AIIMS), DST
5. IIT Delhi as Repository Centre for Archival transmission and Computing of neurosurgery data (with AIIMS), DST

6. Creation of central cloud computing infrastructure for universities, MHRD (NMEICT), 2012-2016.

7. Research group on computer graphics and vision, Indo-German Max Planck Centre for Computer Science, DST, Bundesministerium fur Bildung und Forschung (BMBF, Federal Ministry of Education and Research) and the Max-Planck-Gesellschaft (MPG, Max Planck Society), 2010-2015.

8. Similarity measures and their optimization for video analysis and editing, DST (Indo-Israel Project), 2012-2014.

9. Acquisition, Representation, Processing and Display of Digital Heritage Sites. DST, 2010-2013.

10. Immersive Environment for Tele-operation, BRNS, DAE, 2010-2015.

11. Vision-Guided Control of a Robot Manipulator, BRNS, DAE, 2010-2015.

12. Large scale data processing and visualization, Naval Research Board, 2008-2010

13. Visual enhancement, manipulation and retargeting of videos, Naval Research Board, 2008-2010

11 Other Academic and Professional Activities

1. On the editorial board of the *International Journal of Computer Vision*, Springer, 2004-2014.

2. On the editorial board of the *Computers and Graphics*, Elsevier, from 2007 - 2010.

3. Mentor (formerly on Board of Directors) of Kritikal Solutions Private Limted and Vehant Technologies Private Limited, TBIU start-up companies of IIT Delhi.

4. Helped Kritikal Solutions and Vehant develop several successful products - *Vehicle underside scanner* (deployed at the Rashtrapati bhavan, Hyderabad airport and over 200 other installations), and *red light violation*, *speed violation* and *automatic license plate reader* (deployed across the country and by traffic departments of over 20 cities).

5. Regular review work for International Conference on Computer Vision (ICCV), Computer Vision and Pattern Recognition (CVPR), European Conference on Computer Vision (ECCV), International Journal of Computer Vision (IJCV), Journal of Image and Vision Computing, IEEE Transactions PAMI and SMC, and others.

6. Served on faculty selection committees of IITs at Delhi, Bombay, Kharagpur, Kanpur, Madras, Guwahati, Mandi, Ropar, Patna, Pallakad, Gandhinagar, Indore and Rajasthan; IISc Bangalore; IIIT Delhi, BHU; ISI Kolkata, Delhi University, Visva Bharati and several others.

7. Invited speaker at the Workshops on *Graphs and Geometry* organised by TIFR and BHM at IIT BHU, IIT Guwahati, NIT Rourkela, Thapar Institute Patiala and BESU Shibpur, WB, Kashmir University and Sikkim University in the period 2010 - 2015.

8. Invited talks at IIT Bombay, IIT Kharagpur, IIT Kanpur, IIT Madras, IISc Bangalore, Jadavpur University, JNU, Delhi University, ISI Kolkata, Microsoft Research, MPI-Informatik (Saar Bruecken), ICRC (Geneva, Tehran, Kathmandu and Delhi), UNICEF (New York), AMLD Lausanne, Oxford University, MIT, Harvard Kennedy School, Univ. Pennsylvania, and several others.

9. Was a member of the *Citizen's Commission on Elections* headed by Justice Madan Lokur, 2020-2021.

12 Some recent publications

Privacy and Security

- Prashant Agrawal, Mahabir Prasad Jhanwar, Subodh Sharma, Subhashis Banerjee. *Publicly auditable privacy-preserving electoral rolls*. IEEE Computer Security Foundations. July, 2024. (https://arxiv.org/abs/2402.11582)

- Prashant Agrawal, Abhinav Nakarmi, Mahavir Prasad Jhawar, Subodh Sharma, Subhashis Banerjee. *Traceable mixnets*. Privacy Enhancing Technology Symposium (PoPETs/PETS), July 2024. (https://arxiv.org/abs/2305.08138).

- Prashant Agrawal, Kabir Tomer, Abhinav Nakarmi, Mahabir Prasad Jhanwar, Subodh Sharma, Subhashis Banerjee. *OpenVoting: Recoverability from failures in dual voting*. E-Vote-ID – The International Conference for Electronic Voting, Luxembourg City, October 2023. (https://arxiv.org/abs/1908.09557)

- Prashant Agrawal, Subodh Sharma, Ambuj Sagar, Subhashis Banerjee. *On health data architecture design*. Book chapter in *Private and controversial: When public health and privacy meet in India*. Edited by Smriti Parsheera. Harper Collins. January, 2023.

- Madan Lokur, Wajahat Habibullah, Hariparanthaman, Arun Kumar, Subhashis Banerjee, Pamela Philipose, John Dayal, Sundar Burra and M. G. Devasahayam. *Citizens' Commission on Elections' Report on EVMs and VVPAT*, Economic and Political Weekly, Vol. 57, Issue No. 3, 15 Jan, 2022.

- Prashant Agrawal, Anubhutie Singh, Malavika Raghavan, Subodh Sharma, Subhashis Banerjee. *Elements of an accountability-based framework for privacy protection*, 2021. (working paper)

- Prashant Agrawal, Subodh Sharma, Subhashis Banerjee. *An operational architecture for privacy-by-design in large public service applications*, 2020 (working paper)

- Subhashis Banerjee, Subodh Sharma. *Privacy concerns with Aadhaar*. Commun. ACM 62(11): 80, 2019.

- Shweta Agrawal, Subhashis Banerjee and Subodh Sharma. *Privacy and Security of Aadhaar: A Computer Science Perspective*. Economic and Political Weekly, September 2017.

AI for social good

- Adel Daoud, Felipe Jordan, Makkunda Sharma, Sourabh Bikash Paul, Fredrik Johansson, Devdatt Dubhashi, Subhashis Banerjee. *Using satellites and artificial intelligence to measure health and material-living standards in India.* Social Indicators Research. April 29, 2023. https://doi.org/10.1007/s11205-023-03112-x

Computational radiology

- Krithika Rangarajan, Veeramakali Vignesh Manivannan, Harpinder Singh, Amit Gupta, Hrithik Maheshwari, Rishparn Gogoi, Debashish Gogoi, Rupam Jyoti Das, Smriti Hari, Surabhi Vyas, Raju Sharma, Shivam Pandey, V. Seenu, Subhashis Banerjee, Vinay Namboodiri and Chetan Arora. *Simulation training in mammography with AI-generated images: a multireader study.* European Radiology. August 2024. (https://doi.org/10.1007/s00330-024-11005-x)

- Deeksha Bhalla, Krithika Rangarajan, Tany Chandra, Subhashis Banerjee, Chetan Arora. *Reproducibility and Explainability of Deep Learning in Mammography: A Systematic Review of Literature.* The Indian Journal of Radiology and Imaging. October 2023. (10.1055/s-0043-1775737)

- Krithika Rangarajan, P Aggarwal, D K Gupta, Rohan Dhanakshirur, Akhil Baby, Chandan Paul, A K Gupta, Smriti Hari, Subhashis Banerjee, Chetan Arora. *Deep learning for detection of iso-dense, obscure masses in mammographically dense breasts.* European Radiology. June 2023. https://doi.org/10.1007/s00330-023-09717-7

- Anupama Ramachandran, Deeksha Bhalla, Krithika Rangarajan, Raja Pramanik, Subhashis Banerjee, Chetan Arora. *Building and evaluating an artificial intelligence algorithm: A practical guide for practicing oncologists.* Artif Intell Cancer. Jul 28, 2022; 3(3): 42-53. https://doi.org/10.35713/aic.v3.i3.42

- Krithika Rangarajan, Aman Gupta, Saptarshi Dasgupta, Uday Marri, Arun Kumar Gupta, Smriti Hari, Subhashis Banerjee, Chetan Arora. *Ultra-high resolution, multi-scale, context-aware approach for small cancers on Mammography.* Nature Scientific Reports 12, 11622 (2022). https://doi.org/10.1038/s41598-022-15259-7

- Deeksha Bhalla, Anupama Ramachandran, Krithika Rangarajan, RohanDhanakshirur, Subhashis Banerjee, Chetan Arora. *Basic principles of AI simplified for a Medical Practitioner: Pearls and Pitfalls in Evaluating AI algorithms.* Current Problems in Diagnostic Radiology, 2022. ISSN 0363-0188. https://doi.org/10.1067/j.cpradiol.2022.04.003.

- Krithika Rangarajan, Rohan Dhanakshirur, Arun Gupta (AIIMS), Smita Manshanda, Subhashis Banerjee, Chetan Arora. *Multi-modal cancer detection on mammography using patient history and multiple view.* 2021 (Communicated)

- Krithika Rangarajan, Sumanyu Muku, Amit Kumar Garg, Pavan Gabra, Sujay Halkur Shankar, Neeraj Nischal, Kapil Dev Dev Soni, Ashu Seith Bhalla Seith Bhalla, Anant Mohan, Pawan Tiwari, Sushma Bhatnagar, Raghav Bansal, Atin Kumar, Shivanand Gamanagati, Richa Aggarwal, Upendra Baitha, Ashutosh Biswas, Arvind Kumar, Pankaj Jorwal, . Shalimar, A Shariff, Naveet Wig, Rajeshwari Subramanium, Anjan Trikha, Rajesh Malhotra, Randeep Guleria, Vinay Namboodiri, Subhashis Banerjee, Chetan Arora.

Artificial Intelligence-Assisted Chest X-Ray Assessment Scheme for COVID-19. European Radiology. January 2021. (https://doi.org/10.1007/s00330-020-07628-5)

- Sneha Goswami, Ambikapathi P, Suransh Chopra, Vishwas Lathi, Krithika Rangarajan, Surabhi Vyas, Smriti Hari, Arun Gupta, Vinay Namboodiri, Subhashis Banerjee, Chetan Arora. *Simulation Training for Diagnostic Radiology: Use of GAN Generated Images for Resident Training in Mammography*. RSNA 2020.

Neurosurgery simulation

- Britty Baby, Daksh Thapar, Mustafa Chasmai, Tamajit Banerjee, Kunal Dargan, Ashish Suri, Subhashis Banerjee, Chetan Arora. *From Forks to Forceps: A New Framework for Instance Segmentation of Surgical Instruments*. IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2023.

- Britty Baby, Mustafa Chasmai, Tamajit Banerjee, Ashish Suri, Subhashis Banerjee, Chetan Arora. *Representation Learning using Rank Loss for Robust Neurosurgical Skills Evaluation*. Accepted for publication in International Conference on Image Processing (ICIP), October 2022.

- Britty Baby, Ramandeep Singh, Rajdeep Singh, Ashish Suri, Chetan Arora, Subodh Kumar, Prem Kumar Kalra, Subhashis Banerjee. *A Review of Physical Simulators for Neuroendoscopy Skills Training*. World Neurosurgery, 137:398-407, May 2020.

- Britty Baby, Ramandeep Singh, Ashish Suri, Rohan Raju Dhanakshirur, Argha Chakraborty, Subodh Kumar, Prem Kumar Kalra, Subhashis Banerjee. *A review of virtual reality simulators for neuroendoscopy*. Neurosurgical Review, Volume 43, pages 1255-1272, 2020.

- Ramandeep Singh, Britty Baby, Natesan Damodaran, Vinkle Srivastav, Ashish Suri, Subhashis Banerjee, Subodh Kumar, Prem Kalra, Sanjiva Prasad, Kolin Paul, Sneh Anand, Sanjeev Kumar, Varun Dhiman, David Ben-Israel, Kulwant Singh Kapoor. *Design and Validation of an Open-Source, Partial Task Trainer for Endonasal Neuro-Endoscopic Skills Development: Indian Experience*. World Neurosurgery, 86:259-69, Feb 2016.

- M Tripathi, R. C. Deo, A. Suri, V. Srivastav, B Baby, S. Kumar, P. Kalra, S. Banerjee, T. S. Roy, S. Lalwani. *Quantitative Analysis of Kawase's Triangle versus Modified Dolenc Kawase Rhomboid Approach for Middle Cranial Fossa Lesions with Variable Antero-posterior Extension*, Journal of Neurosurgery, 2015.

- M Tripathi, R. C. Deo, A. Suri, V. Srivastav, B Baby, S. Kumar, P. Kalra, S. Banerjee, T. S. Roy, S. Lalwani. *Quantitative Analysis of Variable Extent of Anterior Clinoidectomy with Intradural and Extradural Approaches: 3-Dimensional Analysis and Cadaver Dissection*, Neurosurgery, March 2015, Suppl 2:147-61.

- Ashish Suri, Payal Jotwani, Britty Baby, Vinkle K Srivastav, Tara S Roy, Sanjiv Lalwani, Martin Bettag, Christoph Busert, Marcus Mehlitz, Subhashis Banerjee, Sanjiva Prasad, Prem Kalra. *Neurosurgery Skills Training-Past, Present and Future: Hands-On Skills Training Modules to Virtual Reality Simulation*. Journal of Neurological Surgery Part B: Skull Base. Vol. 75, Issue S 01, pages A077, 2014.

- P. Jotwani, V. Srivastav, M. Tripathi, R. C.i Deo,B. Baby, N. Damodaran, R. Singh, A. Suri, M. Bettag, T. S. Roy, C. Busert, M. Mehlitz, S. Lalwani, K. Garg, K. Paul, S. Prasad, S. Banerjee, P. Kalra, S. Kumar, B. S. Sharma, A. K. Mahapatra. *Free-access Open-source e-Learning in Comprehensive Neurosurgery Skills Training*, Neurol India 2014 July-August 62 (4): 352-61.

- A. Suri, M. Bettag, M. Tripathi, R. C. Deo, T. S. Roy, S. Lalwani, C. Busert, M. Mehlitz, B. Baby, V. Srivastav, R. Singh, S. Kumar, P. Kalra, S. Banerjee, K. Paul, S. Prasad. *Simulation in Neurosurgery* in India-NETS. CNS Quarterly 2014;3:23-26.

Computer vision and machine learning

- Lokender Tiwari, Anish Madan, Saket Anand, Subhashis Banerjee. *REGroup: Rank-aggregating Ensemble of Generative Classifiers for Robust Predictions*, IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2022.

- Makkunda Sharma, Sourabh Bikash Paul, Adel Daoud, Fredrik Johansson, Felipe Jordan, Devdatt Dubhashi, Subhashis Banerjee. *Using satellites and artificial intelligence to measure health and material-living standards in India*, https://arxiv.org/abs/2202.00109 (Communicated).

- Suvam Patra, Kartikeya Gupta, Faran Ahmad, Chetan Arora, Subhashis Banerjee. *Batch based Monocular SLAM for Egocentric Videos*, IEEE Winter Conference on Applications of Computer Vision (WACV), March 2019.

- Suvam Patra, Pranjal Maheshwari, Shashank Yadav, Chetan Arora, Subhashis Banerjee. *A Joint 3D-2D based method for free space detection on roads*. IEEE Winter Conference on Applications of Computer Vision (WACV), March 2018.

- Shashank Yadav, Suvam Patra, Chetan Arora, Subhashis Banerjee, *Deep CNN with Color Lines model for unmarked road segmentation*, IEEE International Conference on Image Processing (ICIP 2017), Beijing, September 2017.

- Suvam Patra, Himanshu Aggarwal, Himani Arora, Chetan Arora, Subhashis Banerjee. *Computing Egomotion with Local Loop Closures for Egocentric Videos*. IEEE Winter Conference on Applications of Computer Vision (WACV), March 2017.

- Brojeshwar Bhowmick, Suvam Patra, Avishek Chatterjee, Venu Madhav Govindu, Subhashis Banerjee. *Divide and Conquer: A Hierarchical Approach to Large-scale Structure-from-Motion*. Computer Vision and Image Understanding (CVIU), Volume 157, pp. 190-205, April 2017.

- Chetan Arora, Subhashis Banerjee, Prem Kalra and S. N. Maheshwari. *Generalized Flows for Optimal Inference in Higher Order MRF-MAP*. IEEE Transactions on Pattern Analysis and Machine Intelligence, Volume: 37, Issue: 7, pp. 1323 - 1335, July 2015.

13 Commentaries and popular writing

https://subhashis-banerjee.in/#opeds