Sourasekhar Banerjee (Ph.D.)

Postdoctoral Researcher,
Dept. of Information Technology, Computer Systems division,
Uppsala University

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Research Interests

Federated Learning and Optimization, Deep Learning, Applied Machine Learning, Cybersecurity

Work Experience

Postdoctoral Researcher *October 1, 2024 - Present*
Department of Information Technology, Computer Systems Division
Uppsala University
Uppsala, Sweden

Doctoral Student *June 6, 2020 - September 30, 2024*
Department of Computing Science
Umeå University
Umeå, Sweden

Research Internship *April 15, 2024 - June 15, 2024*
Social and Cognitive Computing Department
A*STAR Agency for Science Technology and Research, Institute of high performance computing, Singapore

Visiting Doctoral Student *September 1, 2023 - September 29, 2023*
Department of Electrical and Electronic Engineering
Imperial College London , London, UK

Education

Doctoral Student *June 6, 2020 - September 30, 2024*
Department of Computing Science,
Umeå University, Umeå, Sweden

Master of Technology *August 1, 2016 - July 31, 2018*
Computer Science and Engineering
University of Calcutta
Kolkata, India
Percentage: 82.25%

Master of Science *August 1, 2014 - July 31, 2016*
Computer and Information Science
University of Calcutta
Kolkata, India
Percentage: 75.54%

Bachelor of Science (Hons.) *August 1, 2011 - July 1, 2014*
Computer Science
St. Xavier's college
(University of Calcutta)
Kolkata, India
Percentage: 71%

Research Projects

Postdoctoral Researcher *October 1, 2020 - Present*
Cybersecurity in the Internet of Things. Specifically, the project will study machine learning-based intrusion detection systems. (Vinnova funded research project in the call "Cybersäkerhet för avancerad industriell digitialisering")

PhD Thesis *June 6, 2020 - Present*
Advancing Federated Learning: Algorithms and Use-Cases

This dissertation aims to achieve four main research goals. The first goal (RO1) is to select features in federated settings. Produce an efficient feature selection algorithm for federated learning. The second goal (RO2) focuses on optimizing the participation of slower-performing nodes, known as stragglers, to mitigate the effects of system heterogeneity in federated learning systems. The third goal (RO3) involves developing strategies to personalize models and address the challenges posed by statistical heterogeneity. Lastly, the fourth goal (RO4) examines the use of personalized federated learning to tackle various socio-cognitive problems, such as predicting event memorability and developing privacy advisor models.

M.Tech Thesis *July 1, 2017 - July 1, 2018*
A Framework Towards Generalized Mid-term Energy Forecasting Model for Industrial Sector in Smart Grid

The research focused on to build a generalized mid-term forecasting model for the industrial sector to predict the quarterly energy usage of a vast geographic region accurately with a diverse range of influential parameters.

MSc. Thesis *July 1, 2015 - July 1, 2016*
A Design towards Reduced Message Complexity using Symmetric Algorithm for Process Synchronization

The research focused on to build a prioritized version of the well-known Ricart–Agrawala algorithm for mutual exclusion in distributed systems.

Awards & Achievements

- **WASP funded Ph.D. position**, Umeå University, Sweden (2020-present)
- Granted **110000 SEK** from WASP for the research internship to A*STAR-IHPC for a period of maximum 3 months.
- Granted **30000 SEK** from WASP for a research visit to Imperial College London for one month.
- Granted USD 500 from IEEE CIS as travel grant in **IEEE WCCI, 2022**.
- AICTE **GATE** fellowship (2016-2018)
- Qualified UGC-NET **Assistant Professor** December-2018
- Qualified **JEST** 2018
- Ranked 3^{rd} in M.Tech program on Computer Sc. and Engg. in University of Calcutta (2018)
- Ranked 5^{th} in M.Sc program on Computer and Information Sc. in University of Calcutta (2016)

Ph.D. Courses

Deep Learning and GAN
Learning Theory
Artificial Intelligence and Machine Learning
Ethical, Legal and Societal Aspects on AI and Autonomous Systems
Cloud Computing and Software Engineering

Teaching Experience

TA in 5DV171 Operating System ***Spring, 2022***
(B.S LP3)
Department of Computing Science
Umeå University

TA in 5DV171 Operating System ***Spring, 2023***
(B.S LP3)
Department of Computing Science
Umeå University

Other roles

- (Reviewer in Journal)
  - IEEE TCSS, TAI,
- (Reviewer in Conference)
  - ICONIP, IJCNN, ECML-PKDD, AAMAS, ACSS, NeurIPS, ICLR, AISTATS
- (Program Committee member)
  - 19th Swedish National Computer Networking and Cloud Computing Workshop (SNCNW 2024)
  - International Conference on Neural Information Processing, 2024.

Members

IEEE member

Computer Skills

Languages: C, Python, LaTeX.
Software Packages: PyTorch, Scikit-Learn, Numpy, Pandas.

Publications

(Submitted)

1. **Sourasekhar Banerjee**, Vengateswaran Subramaniam, Debaditya Roy, Vigneshwaran Subbaraju, Monowar Bhuyan."The case for federated learning in developing personalized image privacy advisor."

(Accepted)

1. **Sourasekhar Banerjee**, Debaditya Roy, Vigneshwaran Subbaraju, Monowar Bhuyan. "Predicting Event Memorability using Personalized Federated Learning", Accepted in IEEE /CVF Winter Conference on Applications of Computer Vision (WACV), Arizona, USA, Feb 28 - March 4, 2025
2. **Sourasekhar Banerjee**, Ali Dadras Alp Yurtsever, Monowar Bhuyan. "Personalized Multi-tier Federated Learning", in International Conference on Neural Information Processing, 2024 (This work is an extension of the accepted work in FL-NeurIPS'22)

(Published)

1. **Sourasekhar Banerjee**, Devvjiit Bhuyan, Erik Elmroth Monowar Bhuyan. "Cost-Efficient Feature Selection for Horizontal Federated Learning",in IEEE Transactions on Artificial Intelligence, DOI: 10.1109/TAI.2024.3436664, 2024
2. Ali Dadras, **Sourasekhar Banerjee**, Karthik Prakhya, Alp Yurtsever. "Federated Frank-Wolfe Algorithm", accepted in ECML-PKDD, 2024.
3. **Sourasekhar Banerjee**, Yashwant Singh Patel, Pushkar Kumar, and Monowar Bhuyan. "Towards Post-Disaster Damage Assessment using Deep Transfer Learning and GAN-based Data Augmentation", in 24th International Conference on Distributed Computing and Networking (ICDCN), 2023.
4. **Sourasekhar Banerjee** , Xuan-Son Vu, and Monowar Bhuyan. "Optimized and Adaptive Federated Learning for Straggler-Resilient Device Selection", In IEEE International Joint Conference in Neural Networks (IJCNN), 2022.
5. **Sourasekhar Banerjee**, Erik Elmroth, and Monowar Bhuyan. "Fed-FiS: a Novel Information-Theoretic Federated Feature Selection for Learning Stability." In International Conference on Neural Information Processing (ICONIP), pp. 480-487. Springer, Cham, 2021.
6. **Sourasekhar Banerjee**, Rajiv Misra, Mukesh Prasad, Erik Elmroth, and Monowar H. Bhuyan. "Multi-diseases classification from chest-X-ray: A federated deep learning approach." In Australasian Joint Conference on Artificial Intelligence, pp. 3-15. Springer, Cham, 2020.
7. Yashwant Singh Patel, **Sourasekhar Banerjee**, Rajiv Misra, and Sajal K. Das. "Low-latency energy-efficient cyber-physical disaster system using edge deep learning." In Proceedings of the 21st International Conference on Distributed Computing and Networking, pp. 1-6. 2020.
8. Chakraborty, Manali, **Sourasekhar Banerjee**, and Nabendu Chaki. "A Framework Towards Generalized Mid-term Energy Forecasting Model for Industrial Sector in Smart Grid." In International Conference on Distributed Computing and Internet Technology, pp. 296-310, 2020.
9. **Sourasekhar Banerjee**, Prasita Mukherjee, Sukhendu Kanrar, and Nabendu Chaki. "A novel symmetric algorithm for process synchronization in distributed systems." In Algorithms and Applications, pp. 51-66. Springer, Singapore, 2018.

(Patent Granted)

1. Shekhar Himanshu, **Sourasekhar Banerjee** , Yashwant Patel, Rajiv Misra. " System and Method For Detection of Banned Objects From Images In Real-Time Using Intelligence at The Edge"[Filed for Indian Patent, Application No: 202031006618, 2020]

References

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Senior Scientist II
Agency for Science Technology and Research (A*STAR)

Institute of high perfor- mance computing, Singapore
Social and Cognitive Computing Department
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