

Arghya Bhattacharya

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Summary

Fourth-year doctoral candidate with experience in both academic research and industry; experienced in designing cache-friendly algorithms that are good in both theory and practice, and machine-learning augmented algorithms for traditional online problems; actively looking for internship positions in applied sciences for Summer'22, specifically, in the field of software engineering, machine learning, and data science.

- **Ph.D. Candidate**, Dept. of Computer Science, Stony Brook University
- **Member**, Stony Brook University Consulting Club
- **Mentor**, HS-WISE (High School Women in Science and Engineering)
- **JBNSTS Senior Scholar'12** (Jagadis Bose National Science Talent Search)
- **Administrative Member**, JB Scholars Professional Development Forum

Research Interest

External memory algorithm
Parallel algorithm
Machine learning
Online algorithm
Filesystem aging

Technical Skills

C++	Python
Shell	Latex
MySQL	Matlab
Keras	PyTorch

Work Experience

- **Stony Brook University** Stony Brook, NY
Research Project Assistant Jun 2019 - Present
 - **Machine-learning augmentation:** Redesigned traditional online algorithms for rent-or-buy problems with augmentation by single and multiple machine learning oracles [Paper published in WALCOM'22]. The empirical framework includes evaluation on synthetic and real-world datasets using ML models for time-series prediction, such as LSTM and FbProphet [Article submitted in Algorithmica, Springer]. Introduced external-memory data structures (learning-indexed B-tree) for efficient range queries [Manuscript in preparation]. Designed green paging and parallel paging algorithms with ML augmentation [Manuscript in preparation].
 - **Cache-efficient algorithms:** Designed an empirical framework to evaluate when (a, b, c) -regular cache-oblivious algorithms are cache-efficient as external memory algorithms and do not degrade in the face of memory fluctuations that are common in most modern systems. [Paper submitted in SPAA'22] [code]
 - **Threading ecosystem:** Built a framework to evaluate the performance of external memory algorithms with multi-threading in a multi-program environment. [Manuscript in preparation] [code]
 - **Filesystem aging:** Evaluated microbenchmarks and application-level fragmentation benchmarks to measure slow-down in the random read performance for several production filesystems (**ext4**, **btrfs**, **xfs**, **zfs**, and **f2fs**) as well as a B^+ -tree based write-optimized in-kernel filesystem **BetrFS**. [Article submitted in ACM TOCS] [code]
- **Stony Brook University** Stony Brook, NY
Teaching Assistant Sept 2018 - May 2019
 - Fundamentals of Information Technology (ISE 218), Prof. Kevin McDonnell
 - System Fundamentals - II (CSE 320), Prof. Eugene Stark
- **National University of Singapore** Singapore
Research Engineer May 2018 - Aug 2018
 - Reviewed the performance of multi-objective optimization algorithms using evolutionary computation based on decomposition techniques under Prof. Dipti Srinivasan.
- **Pricewaterhouse Coopers (PwC) India Pvt. Ltd.** Kolkata, India
Consultant July 2016 - Sept 2017
 - Built a payroll automation system using DotNet technologies using MVC architecture.
 - Implemented the Microsoft Navision enterprise resource planning software (ERP) for finance, procurement, and inventory management.

Education

- **Stony Brook University** New York, USA
Ph.D. Candidate, Dept. of Computer Science *Fall 2018 – Spring 2023 (expected)*
 - **Advisor:** Prof. Michael A. Bender, **Collaborator:** Rezaul A. Chowdhury
 - Cumulative GPA 3.78 / 4.0
 - **Courses:** Analysis of Algorithms, Computer Networks, Discrete Maths, Data Science, Introduction to Computer Vision, Theory of Database Systems, Medical Imaging.
 - **Class Projects:**
 - * Optimizing network congestion window using Ricci Curvature.
 - * Semantic segmentation using U-Net and instance segmentation of nuclei using Mask R-CNN.
 - * Identifying fundraising donors with Logistic Regression, Decision Tree, Random Forest and LightGBM.
- **Jadavpur University** Kolkata, India
B.E. in Electrical Engineering *Jul. 2012 – May. 2016*
 - Cumulative GPA: 7.74/10 Total marks: 72.69/100 with First Class
 - Qualified GATE 2016 in Electrical Engineering Score: 45.66 GATE Score: 584/1000 Rank: 3278
 - **Related Coursework:** Advanced Instrumentation-I, Advanced Instrumentation-II, Digital Signal Processing, Numerical Analysis and Computer Programming, Reliability Engineering, Signals and Systems, Circuit Theory, Control System Engineering
 - **Class Projects:**
 - * Algorithms used in affective computing for Human Machine Interaction: a study of Bi-dimensional Empirical Mode Decomposition (BEMD) based feature extraction, Principle Component Analysis (PCA), Linear Discriminant Analysis (LDA) based dimensionality reduction, Gray-level Co-occurrence Matrix (GLCM), Histogram of Oriented Gradients (HOG), Local Ternary Pattern (LTP) based feature elimination, and Multi-class Support Vector Machine (SVM), k-Nearest Neighbor (k-NN) based classification in context of emotion recognition.
 - * Biomedical Image Processing tools and algorithms and Cancer Detection using Optical Colonoscopy Videos.
 - * Design of a Portable Electronic Device for Non-invasive continuous measurement of Blood Pressure by Bio-impedance measurement and Assessment of Cardiac Health in larger perspective.

Selected Publications & Posters

- **Arghya Bhattacharya**, Rathish Das, “Machine Learning Advised Ski Rental Problem with a Discount,” *16th International Conference and Workshops on Algorithms and Computation (WALCOM’22)*.
- **Arghya Bhattacharya**, Rathish Das, and Michael A. Bender, “Machine Learning Advised Ski Rental Problem with a Market Interest Rate,” under review in *Algorithmica, Springer*.
- **Arghya Bhattacharya**, Rathish Das, and Michael A. Bender, “Learning Indexed B-tree,” to be submitted in *30th Annual European Symposium on Algorithms (ESA’22)*.
- Alex Conway, Ainesh Bakshi, **Arghya Bhattacharya**, Rory Bennett, Yijheng Jiao, Erik Knorr, Michael A. Bender, Willaim Jannen, Rob Johnson, Bradley C. Kuzmaul, Donald E. Porter, Yang Zhan, and Martin Farach-Colton, “File System Aging,” under review in *ACM Transactions on Computer Systems (TOCS)*.
- **Arghya Bhattacharya**, Abiyaz Chowdhury, Helen Xu, Rezaul A. Chowdhury, Rathish Das, Rob Johnson, and Michael A. Bender, “When Are Cache-Oblivious Algorithms Cache Adaptive?” under review in *16th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA’22)*.
- **Arghya Bhattacharya** “Progress Imbalance in Multi-process Performance,” *Graduate Research Day (2021), Dept. of Computer Science, Stony Brook University*.
- **Arghya Bhattacharya**, Dwaipayan Choudhury, and Debangshu Dey, “Edge-enhanced Bi-dimensional empirical mode decomposition based emotion recognition using fusion of feature set,” *Soft Computing, Springer (2018) 22: 889–903*.
- **Arghya Bhattacharya**, Dwaipayan Choudhury, and Debangshu Dey, “Emotion Recognition from Facial Image Analysis Using Composite Similarity Measure Aided Bi-dimensional Empirical Mode Decomposition,” *First IEEE Conference on Control, Measurement and Instrumentation (CMI’16)*.
- Mainak Biswas, **Arghya Bhattacharya**, and Debangshu Dey, “Classification of Various Colon Diseases in Colonoscopy Video using Cross-Wavelet Features,” *IEEE International Conference on Wireless Communications Signal Processing and Networking (WiSPNET’16)*.