Sutanu Bhattacharya, Ph.D.
Assistant Professor
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USA

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Education

Ph.D. in Computer Science and Software Engineering   Summer 2021
Auburn University, USA
Advisor: Dr. Debswapna Bhattacharya (Now at Virginia Tech)
G.P.A: 3.79

M.Tech in Distributed and Mobile Computing   June 2014
Jadavpur University, India
Advisor: Dr. Pampa Sadhukhan
C.G.P.A: 8.11

B.Tech in Information Technology   June 2011
Bengal Institute of Technology, India
C.G.P.A: 7.67

Employment

Assistant Professor, Department of Computer Science, Auburn University at Montgomery, USA, joining on 16 August 2022.

Assistant Professor, Department of Computer Science, Florida Polytechnic University, USA, September 2021 – August 2022.

Assistant Professor, Department of Computer Science and Engineering, Chaibasa Engineering College, India, July 2014 – Aug 2017.

Teaching Experience

As an Assistant Professor at Florida Polytechnic University (September 2021 – August 2022)

1. Advanced Algorithm Design and Analysis (COP5531): This is a graduate level course, covering effective and advanced algorithms including Dynamic Programming, Greedy Algorithms, Approximation Algorithms, Randomized Algorithms, Linear Programming, and Genetic Algorithms. I taught the course in Spring 2022, containing 8 graduate students.
2. Senior Design II (COP4935C): This is a second course of two courses that are based on supervised team projects. This is a continuation to the project in Senior Design I. I taught a section of around 50 students in Spring 2022.
3. Senior Design I (COP4934C): The objective of this course is to cultivate the capability of designing and modeling computer applications based on the finding of facts within an application domain. I taught three sections in Fall 2021, each containing around 25 students.

As an Assistant Professor at Chaibasa Engineering College, India (July 2014 – August 2017)

1. Discrete Mathematics (MH1401): This course was designed for fourth-semester undergraduate Computer Science and Engineering (C.S.E.) students, which covered Logic, Set, Relation, Function, Induction and Recursion, Counting, Graphs, and Trees. I supervised this course, where the number of enrolled students was 46 (2013-17 batch) and 49 (2014-18 batch).
2. Operating System (CS1504): This course covered Thread, Process Management, Memory Management, and Disk Management. I supervised this course, where the number of enrolled students was 48 (2014-18 batch). This course is designed for fifth-semester undergraduate C.S.E. students.
3. Digital logic (CS1302): This course covered the Combinational Logic circuit as well as the Sequential Logic Circuit with applications. Around 50 third-semester undergraduate students of the C.S.E. department of 2013-17 and 2014-18 batches, respectively, took this course.
4. Data Structure using C (CS1402): Fourth-semester undergraduate C.S.E. students of 2013-17 and 2014-18 batches as well as fifth-semester undergraduate Electrical Engineering (E.E.) students of 2013-17 batch took this course, where Array, Linked List, Stack, Queue, Sorting and Searching, Tree, and Graph were covered in C.
5. Analysis and Design of Algorithm (CS1606): Sixth-semester undergraduate C.S.E. students of 2013-17 batch took this course, where Elementary Data Structures, Sorting, Hashing, Trees, Graphs, Dynamic Programming, and Greedy Algorithms were covered.
6. Formal Language and Automata Theory (CS1501): Fifth-semester undergraduate C.S.E. students of 2013-17 batch took this course where Finite automata, Context-free Grammars, Decidability, and Intractability were covered. The number of enrolled students was 46.
7. Programming in Python: Almost 50 students took this course as their summer training in 2017, and it covered Control flow, Function and Module, Files, Input/Output, List, and Dictionary.
8. Programming in C: I tutored around 20 struggling students in 2015 and 2016. It covered Control flow, Function, Arrays, Pointers, Structures, and Files. Since C was the first programming language that they were learning, I guided students one-to-one to enable them to do well in learning C.
9. Introduction to Computing (CS1201): This was an introductory course offered to freshman undergraduate students. The number of enrolled students was 92, 94, and 87 in 2014, 2015, and 2016, respectively.

As a Teaching Assistant at Auburn University (Fall 2017 – Summer 2020)

1. Fundamental of Computing I (COMP 1210): It introduces the fundamentals of computing as well as certain aspects of software engineering, which enables students to construct logical, readable, and correct programs. I was a lab instructor of this course from Fall, 2017 to Spring, 2019. My supervisor was Dr. James Cross.
2. Computational Intelligence & Adversarial Machine Learning (COMP 5970/6970): It is a graduate-level course, which introduces concepts of Evolutionary Computation, Machine learning techniques such as SVM, NN, Naïve Bayesian Classifiers, Adv Machine learning. I was a TA of this course in Fall, 2019 and my supervisor was Dr. Gerry Dozier.

Online Courses:

3. Introduction to Computer Science I & II (CPSC 1213 and 1223): These courses are the online version of COMP 1210. I was a (virtual) lab instructor of this course from Fall, 2018 to Spring, 2020. My supervisor was Dr. James Cross.

4. Data Structures (CPSC 1233): It is designed to introduce fundamental data structures and associated algorithms, as well as applications in which they are commonly used. I was a (virtual) lab instructor of this course in the Summer, 2020 and my supervisor was Dr. Dean Hendrix.

Research Experience

Ph.D. dissertation research   Fall 2017 – Summer 2021
Advisor: Dr. Debswapna Bhattacharya, Assistant Professor (Now at Virginia Tech)
Title: New computational and data-driven methods for protein homology modeling (Publications in Nature Scientific Reports, PROTEINS, PLOS Computational Biology, PLOS ONE, Bioinformatics, Frontiers; as well as Front Cover Article of PROTEINS, Highlight Talk at ACM-BCB, Fellowship Award at ISMB/ECCB, Best Poster Award, and Young Research Excellence Award).
Institute: Auburn University
Description: Considering the recent advancements in residue-residue contact prediction technologies powered by sequence co-evolution and deep learning, we propose a new contact-assisted threading method, which integrates the residue-residue contact information with various sequential and structural features to improve the threading scoring function for the better template selection. A large-scale benchmarking result on 500 targets demonstrates that our contact-assisted threading method attains a statistically significantly better threading performance than a baseline contact-free threading acting as a control. Our study further reveals contact-assisted threading using high-quality contacts with the Matthews Correlation Coefficient (MCC) ≥ 0.5 improves the threading performance in nearly 30% of the cases, while low-quality contacts with the MCC <0.35 degrades the performance for 50% of the cases. Moreover, instead of leveraging binary contacts, we move one step further by developing a new distance- and orientation-based covariational threading method by effectively integrating information from inter-residue distances and orientations along with the topological network neighborhood of a query-template alignment. Multiple large-scale benchmarking results on query proteins classified as weakly homologous from the Continuous Automated Model Evaluation (CAMEO) experiment and from the current literature show that our method outperforms several existing state-of-the-art threading approaches, demonstrating that the integration of the neighborhood effect with the inter-residue distance and orientation information synergistically contributes to the improved threading performance.

Technical Skills

Data Science Tools: TensorFlow, Keras, scikit-learn, R
Data Visualization Tools: Matplotlib, Seaborn
Molecular Visualization Tools: PyMOL, Chimera
Languages known: Python, C, C++, Java, Perl, R

Honors and Awards

(8) Work has been selected for **Highlight Talk** in the 12th ACM-BCB conference (Virtual), Aug 1-4, 2021.

(7) **Fellowship award** for ISMB/ECCB 2021 conference (Virtual), July 25 – 30, 2021.

(6) **Best Poster** award in the 11th ACM-BCB conference (Virtual), Sept 21-24, 2020.

(5) Work has been selected for **Highlight Talk** in the 10th ACM-BCB conference, Niagara Falls, NY, Sept 7-10, 2019.

(4) Paper got published as the **Front Cover Article** in the July 2019 issue of Proteins: Structure, Function, and Bioinformatics journal.

(3) Awarded **Young Research Excellence Award** (2nd place) at 16th Annual MCBIOS Conference, Birmingham, USA, 2019.

(2) Awarded Travel grant to attend 16th Annual MCBIOS Conference, Birmingham, USA, 2019.

(1) A.I.C.T.E. **National Scholarship** for M.Tech at Jadavpur University, Kolkata, India [2012 – 2014].

Peer-reviewed Publications

Book Chapter

(1) **S. Bhattacharya,** R. Roche, M. H. Shuvo, B. Moussad, D. Bhattacharya, "Contact-assisted threading in low-homology protein modeling", Methods in Molecular Biology, by **Springer Nature**, 2021 (Accepted). *(Impact Factor: 10.71)*

Journals

(9) R. Roche, **S. Bhattacharya**, M. H. Shuvo, D. Bhattacharya, "rrQNet: protein contact map quality estimation by deep evolutionary reconciliation", **Proteins: Structure, Function, and Bioinformatics, https://doi.org/10.1002/prot.26394**, (2022). *(Impact Factor: 3.756)*

(8) **S. Bhattacharya**, R. Roche, B. Moussad, D. Bhattacharya, "DisCovER: distance- and orientation-based covariational threading for weakly homologous proteins", **Proteins: Structure, Function, and Bioinformatics**, (2021). [**First method to utilize inter-residue orientations to boost protein threading performance**], [**Fellowship Award for 29th ISMB/ECCB**]. *(Impact Factor: 3.756)*

(7) Kryshtafovych et al. (2021). Modeling SARS-CoV2 proteins in the CASP-commons experiment. *Proteins: Structure, Function, and Bioinformatics*, (2021). *(Impact Factor: 3.756)*

(6) **S. Bhattacharya,** R. Roche, M. H. Shuvo, D. Bhattacharya, "Recent advances in protein homology detection propelled by inter-residue interaction map threading", **Frontiers in Molecular Biosciences**, 8, 377 (2021). *(Impact Factor: 4.620)*

(5) R. Roche, **S. Bhattacharya**, D. Bhattacharya, "Hybridized distance- and contact-based hierarchical structure modeling for folding soluble and membrane proteins", **PLOS Computational Biology, 17(2): e1008753**, (2021). [**Highlight Talk**]. *(Impact Factor: 4.428)*

(4) A. McGehee, **S. Bhattacharya**, R. Roche, D. Bhattacharya, "PolyFold: An interactive visual simulator for distance-based protein folding", **PLOS ONE**, 15(12): e0243331 (2020). [**Best Poster Award**]. *(Impact Factor: 2.740)*

(3) M. H. Shuvo, **S. Bhattacharya**, D. Bhattacharya, "QDeep: distance-based protein model quality estimation by residue-level ensemble error classifications using stacked deep residual neural networks", **ISMB Proceedings**, **Bioinformatics**, 36(S1): i285-i291 (2020). *(Impact Factor: 5.610)*

(2) **S. Bhattacharya**, D. Bhattacharya, "Evaluating the significance of contact maps in low-homology protein modeling using contact-assisted threading", **Nature Scientific Reports**, 10(1), 1-13 (2020). *(Impact Factor: 4.379)*

(1) **S. Bhattacharya**, D. Bhattacharya, "Does inclusion of residue-residue contact information boost protein threading?", **Proteins: Structure, Function, and Bioinformatics**, 87(7): 596-606 (2019). [**Front Cover Article**], [**Highlight Talk**], [**Top Downloaded Paper** of 2018-2019 by WILEY]. *(Impact Factor: 3.756)*

Abstracts

(3) R. Roche, **S. Bhattacharya**, D. Bhattacharya, "Hybridized distance- and contact-based hierarchical structure modeling for folding soluble and membrane proteins", **BCB '21**: Proceedings of the 12th **ACM** International Conference on Bioinformatics, Computational Biology and Health Informatics, USA, August 2021, Pages 1 (2021).

(2) **S. Bhattacharya**, D. Bhattacharya, "How Effective is Contact-assisted protein threading?", **BCB'19**: Proceedings of the 10th **ACM** International Conference on Bioinformatics, Computational Biology and Health Informatics, September 2019, Pages 553 (2019).

(1) **S. Bhattacharya**, D. Bhattacharya, "Contact-assisted protein threading: an evolving new direction", **BCB'19**: Proceedings of the 10th **ACM** International Conference on Bioinformatics, Computational Biology and Health Informatics, September 2019, Pages 536 (2019).

Posters

(5) **S. Bhattacharya**, R. Roche, D. Bhattacharya, "DisCovER: distance- and orientation-based covariational threading for weakly homologous proteins", 29th **ISMB/ECCB** conference, Virtual Event, July 25-30, 2021. (**Fellowship Award**)

(4) A. McGehee, **S. Bhattacharya**, R. Roche, D. Bhattacharya, "PolyFold: An interactive visual simulator for distance-based protein folding", 11th **ACM-BCB** Conference, Virtual Event, Sept 21-24, 2020. (**Best Poster Award**)

(3) **S. Bhattacharya**, D. Bhattacharya, "Contact-assisted protein threading: an evolving new direction", 2019 Graduate Engineering Research Showcase, Auburn University, USA, November 7, 2019.

(2) **S. Bhattacharya**, D. Bhattacharya, "Contact-assisted protein threading: an evolving new direction", 10th **ACM-BCB** Conference, Niagara Falls, NY, Sept 7-10, 2019. [pdf of the poster]

(1) **S. Bhattacharya**, D. Bhattacharya, "Does inclusion of residue-residue contact information boost protein threading?", 16th Annual **MCBIOS** Conference, Birmingham, USA, March 28-30, 2019. [pdf of the poster]

Oral Presentations

(4) **S. Bhattacharya**, R. Roche, D. Bhattacharya, "DisCovER: distance- and orientation-based covariational threading for weakly homologous proteins", 29th **ISMB/ECCB** conference, Virtual Event, July 25-30, 2021. (**Fellowship Award**)

(3) **S. Bhattacharya**, D. Bhattacharya, "How Effective is Contact-assisted Protein Threading?", 10th **ACM-BCB** Conference, Niagara Falls, NY, Sept 7-10, 2019. (**Highlight Talk**)

(2) **S. Bhattacharya**, D. Bhattacharya, "Does contact information powered by deep learning boost protein threading?", Student Symposium, Auburn University, USA, April 9, 2019.

(1) **S. Bhattacharya**, D. Bhattacharya, "Does inclusion of residue-residue contact information boost protein threading?", 16th Annual **MCBIOS** Conference, Birmingham, USA, March 28-30, 2019. (**Won 2nd place in student oral presentation**). [News, Proceedings]

Service & Outreach

(4) Reviewer of Bioinformatics, BMC Bioinformatics. 2022

(3) Member of the departmental Curriculum Committee at Florida Poly 2021-22

(2) Reviewer of Nature Scientific Reports. 2021

(1) External reviewer of IEEE-BIBM conference, San Diego, CA, USA. 2019