Dr. Sagnik Chakraborty

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Work Experience

Co-founder, Faculty & Mentor | March 2020-Present | Vector Educational & Consultancy Services

- Co-founded Vector, an augmented data driven learning platform for STEM education and Career Counselling
- Mentored students to be efficient and effective problem solvers in STEM
- Fostered adaptive learning, curiosity, and independent thinking
- Managed technical, administrative, outreach roles
- Undertook result oriented approach validated by student success stories and excellent reviews

Science Communicator | May 2022-Present | Cactus Communications

- Created original, engaging content in the form of press releases, infographics, video summaries from technical manuscripts
- Employed extensive research and teaching experience to explain technical content to both technical and non-technical audience

Yield Engineer | May 2018-February 2020 | Intel Corporation

- Owned and led the development, stability, improvement, and performance functions of extremely advanced characterization instruments in Semiconductor Physics
- Used expertise of Experimental Physics, Optics, Statistical Analysis acquired during PhD to troubleshoot issues gating product yield and solve them efficiently, driven by solid models

Post-doctoral Research Associate | March 2018-May 2018 | University of Illinois at Chicago

- Trained graduate students in the lab pursuing research in direction set forth in PhD thesis

Education

PhD Physics | March 2018 | University of Illinois at Chicago (UIC)

- PhD in Physics (March 2018),
- Core coursework: Classical Mechanics, Quantum Mechanics, Electrodynamics, Statistical Mechanics
- Elective coursework: Solid State Physics, Transmission Electron Microscopy, Molecular Biophysics, Computational Biophysics, Programming in MATLAB, Statistics and Machine Learning

Master of Science, Physics (M.Sc.) | 2011 | Indian Institute of Technology Madras (IITM)

- Elective coursework: Advanced Electronics, Mathematical Methods in Physics, Experimental High Energy Physics, Computational methods in Physics, Laser Applications

Bachelor of Science, Physics (B.Sc.) | 2009 | St. Xavier's College, University of Calcutta

- Physics Honors with 1st class
- General coursework: Mathematics, Computer Science

Research Experience

Research Assistant at Ansari Biophysics Lab, UIC (June 2014 – Feb 2018)

- Performed interdisciplinary and collaborative research employing strong foundation of techniques and analysis methodologies in Physics to address a central question in the life sciences
- Developed a new fluorescence-based approach to study DNA dynamics and fluctuations that are central for its interactions with proteins
- Technical skills: Fluorescence Lifetime Spectroscopy, Time-Correlated-Single-Photon-Counting, Ultrafast Laser Temperature-Jump (T-jump) Spectroscopy, Steady State Fluorescence Spectroscopy, Fluorescence Resonant Energy Transfer (FRET), Coding in Matlab, Maximum Entropy Analysis Algorithm, Molecular Dynamics Simulations, Transmission Electron Microscopy, Scanning Electron Microscopy
- Thesis title: **Visualizing spontaneous DNA dynamics and its role in mismatch recognition by damage repair protein Rad4**

CPLC summer school at University of Illinois at Urbana Champaign (July 2016)

- Part of 8-member team comprising of graduate students and post-doctoral fellows hosted by the Center for Physics of Living Cells, UIUC
- Performed single molecule FRET experiments and all atom MD simulations in the Physics of DNA module in the genome biology track of this National Science Foundation funded "Frontiers in Physics" program

Junior Research Fellow at Saha Institute of Nuclear Physics, India (August 2011 – July 2012)

- Employed C++ and ROOT programing to analyze data from high energy physics experiments
- Project: A comparative study of Electromagnetic shower shape variables for photons, charged pions and neutral pions in CMS Electromagnetic Calorimeter

Master of Science, Physics M.Sc. candidate at Indian Institute of Technology Madras (August 2010 – April 2011)

- Modeling phenomenon in high energy physics such as decays and resonances
- Thesis topic: Study of the strong phase parameters of the decay $D^0 \rightarrow K_S^0\pi^+\pi^-\pi^0$ and their use in CP violating parameter in the Standard Model

Coding Experience

- Machine Learning Specialization Certificate issued Coursera & Stanford Online
- Python coding applied to Defect Metrology at Intel
- Matlab coding applied to thesis research data analysis at UIC
- Molecular Dynamics Simulations applied to Biophysics at UIC
- Statistics & Machine Learning applied to Bioengineering at UIC
- C++/ROOT coding applied to High Energy Physics at SINP

Research Publications

- D. Paul, H. Mu, A. Tavakoli, Q. Dai, *S.Chakraborty*, C. He, A. Ansari, S. Broyde, J-H. Min, **Impact of DNA sequences on DNA 'opening'by the Rad4/XPC nucleotide excision repair complex**, DNA Repair, 107, 103194, **2021**
- D. Paul, H. Mu, A. Tavakoli, Q. Dai, X. Chen, *S.Chakraborty*, C. He, A. Ansari, S. Broyde, J-H. Min, **Tethering-facilitated DNA 'opening' and complementary roles of β-hairpin motifs in the Rad4/XPC DNA damage sensor protein**, Nucleic Acids Research, 48 (21), 12348-12364, **2020**
- *S.Chakraborty*, P J. Steinbach, D. Paul, J-H. Min, A. Ansari, **Enhanced spontaneous DNA twisting/bending fluctuations unveiled by fluorescence lifetime distributions promote mismatch recognition by DNA-repair protein Rad4/XPC**, Nucleic Acids Research, 46 (3), 1240-1255, **2017**

Selected Conference Presentations

- S. Baral, *S.Chakraborty*, D. Paul, J-H. Min, A. Ansari, **Anomalous DNA unwinding dynamics in mismatched DNA uncovered with laser temperature-jump spectroscopy and implicated in DNA damage sensing** , Annual March Meeting of the American Physical Society **2022**
- S. Baral, *S.Chakraborty*, D. Paul, J-H. Min, A. Ansari, **Rapid (Sub-20 μS) intrinsic DNA Fluctuations at Damaged Sites Implicated in Stalling Rad4/XPC DNA Repair Protein During Damage Sensing** , 65th Annual Meeting of the Biophysical Society **2021**
- *S.Chakraborty*, S. Baral, D. Paul, PJ. Steinbach, PA. Rice, J-H. Min, A. Ansari, **Evidence for conformational capture mechanism for damage recognition by DNA repair protein Rad4**, 63rd Annual Meeting of the Biophysical Society **2019**
- *S.Chakraborty*, D. Paul, J-H. Min, PA. Rice, A. Ansari, **Using minicircles to test the role of DNA bending in mismatch recognition by Rad4/XPC**, 63rd Annual Meeting of the Biophysical Society **2019**
- *S.Chakraborty*, D. Paul, S. Baral, H. Mu, PJ. Steinbach, S. Broyde, J-H. Min and Anjum Ansari, **Visualizing spontaneous DNA dynamics and its role in mismatch recognition by damage recognition protein Rad4**, 62nd Annual Meeting of the Biophysical Society **2018**
- *S.Chakraborty*, PJ. Steinbach, D. Paul, J-H. Min, A. Ansari, **Does enhanced dynamics in damaged DNA signal "distress" to a repair protein?** Annual March Meeting of the American Physical Society **2017**

Teaching experience

- Mentored students across secondary to master's level to be efficient problem solvers in STEM, kindling curiosity and interest in the subject at Vector
- Instructed classroom and lab based undergraduate Physics courses with excellent feedback from students at UIC

Honors and awards

- PhD candidate Travel Award awarded by College of Liberal Arts and Sciences, UIC (February 2017 and January 2016)
- Selected to represent UIC Physics at Science Communication workshop ComSciCon Chicago 2016
- Debesh Kamal Scholarship for pursuing research abroad awarded by Ramakrishna Mission Institute of Culture, Kolkata, India (July 2012)
- National Eligibility Test & Junior Research Fellowship in Physics awarded by Human Resource Development Group, Council of Scientificand Industrial Research, Government of India (July 2011)
- Institute Junior Research Fellowship awarded by Saha Institute of Nuclear Physics, Kolkata, India (July 2011)

Selected Test scores

- National Eligibility Test, **All India Rank: 55** (CSIR) out of approx. 20,000 test takers (2011)
- TOEFL iBT: 110 on a scale of 120 (2010)
- IIT JAM: **All India Rank: 91** out of approx. 5000 test takers (2009)
- Indian School Certificate Examination: 94% (I.S.C. 2005)

Volunteering and Outreach

- Served as a resource person for the state level special lecture cum career guidance programme on "Physics as a subject of higher education and career opportunities", MDM, Kolkata (2021)
- Volunteered for demonstrating experiments to Curie High School students visiting Ansari and Min labs at UIC for field trips (May 2017, May 2016)
- Represented UIC Physics in Science Communication Workshop, ComSciCon Chicago (2016)
- Coordinated Physics qualifier examination workshops for 1st and 2nd year graduate students at UIC (2016, 2015)
- Served as a Science Fair judge with fellow graduate students and faculty from UIC Physics at Poe Elementary School evaluating science projects by 5th and 6th graders (2013)
- Developed experiments for General Physics laboratory in M.Sc. Curriculum at Indian Institute of Technology Madras (2011)
- Organized 'Ramanessence', a science fest at Department of Physics, Indian Institute of Technology Madras (2010)
- Authored article titled 'Beyond the Horizons-A taste of the infinite' published in the annual college magazine of St.Xavier's College, Kolkata, 'The Xaverian' (2009)