Samrat Nath

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EDUCATION

University of Arkansas (UA), Fayetteville, Arkansas, USA

- Doctor of Philosophy (Ph.D.) in Electrical Engineering — May 2020
  - *Cumulative GPA*: 4.00 / 4.00
  - *Courses*: Intro to Deep Learning | Machine Learning | Statistical Inference | Computational Statistics | Multivariate Analysis | Regression Analysis | Time Series Analysis | Detection and Estimation
  - *Dissertation*: Low Latency Anomaly Detection with Imperfect Models

Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

- Bachelor of Science (B.Sc.) in Electrical and Electronic Engineering — Jul 2014
  - *Cumulative GPA*: 3.71 / 4.00
  - *Courses*: Digital Signal Processing | Communication Theory | Random Signals & Process | Probability & Statistics | Control System | Power System | Digital Communications
  - *Thesis*: Spatio-Temporal Feature Extraction Scheme for Human Action Recognition

TECHNICAL SKILLS

- Programming Languages: Python, R, C++, SQL, MATLAB
- Machine Learning Frameworks: Jupyter, Spyder, scikit-learn, TensorFlow, PyTorch, Azure
- Engineering & Data Analytic Softwares: Alteryx, Tableau, Proteus, PSpice, Orcad, Simulink
- Miscellaneous: Git, Bash, Linux, LaTeX, MS Office, Prezi

PROFESSIONAL EXPERIENCE

Walmart, Bentonville, Arkansas, USA — Jun 2020 – Present

- Data Scientist, *Core Services: Retail & Emerging Technologies - Digital Facilities*
  - Working with the Real Estate Analytics Team and developing data-driven solutions involving machine learning and optimization to drive business forward.

University of Arkansas, Fayetteville, Arkansas, USA — Jan 2016 – May 2020

- Graduate Research and Teaching Assistant, *Department of Electrical Engineering*
  - Performed research in the areas of Optimization, Statistical Signal Processing, Machine Learning, and Wireless Communication with numerical simulations performed in MATLAB & Python.
  - Published 6 journal papers and 6 conference papers.
  - Assisted in grading of undergraduate courses such as Systems and Signals, Probability and Stochastic Process, Communication Theory.
  - Instructed 50 undergraduate students on average each year in MATLAB.

Walmart, Bentonville, Arkansas, USA — Jun 2019 – Aug 2019

- Summer Intern Data Analyst, *Global Business Service - Digital Solutions*
  - Developed an app using Alteryx for estimation & optimal allocation of maintenance budget in HVAC & Refrigeration sector of stores with Regression and Optimization models built in R.

RESEARCH EXPERIENCE

University of Arkansas Jan 2016 – May 2020

- Low-latency Anomaly Detection
  - Developed a real-time algorithm for detecting false data injection attacks and state estimation in smart grid with dynamic models and evaluated the analytical performance of the algorithm using Markov-chain.
  - Formulated a low-latency algorithm for detecing bearing faults of direct-drive wind turbines utilizing the statistical distribution of stator currents at a given frequency.
  - Proposed a sequential algorithm for quick change point detection in a system with multiple post-change models under both bayesian and non-bayesian setting.
- Optimized Scheduling
  - Formulated a scheduling strategy for information pushing system based on optimal stopping time theory to optimize the delay and energy efficiency.
  - Designed Markov decision process (MDP) based multicast scheduling scheme in delay-constrained content-centric wireless networks while optimizing overall system cost.
  - Proposed a periodic MDP-based online policy of battery charge scheduling for grid-connected photo-voltaic systems with the objective of minimizing the long-term energy cost purchased from the grid.
- Mobile Edge Computing
  - Presented a Deep Reinforcement Learning- based approach for optimal dynamic computation offloading and resource allocation in multi-user mobile edge computing (MEC) systems using Deep Deterministic Policy Gradient (DDPG) algorithm.

Bangladesh University of Engineering and Technology Mar 2013 – Jul 2014

- Image Processing and Pattern Recognition
  - Developed algorithms for human action recognition based on spatio-temporal variations of human silhouette while applying classification methods such as kNN and SVM.
  - Designed schemes for lip contour extraction using morphological reconstruction based segmentation approach with k-means clustering.

PUBLICATIONS

- **Journal**
  - **S. Nath** and J. Wu, "Deep Reinforcement Learning for Dynamic Computation Offloading and Resource Allocation in Cache-assisted Mobile Edge Computing Systems" in *Intelligent and Converged Networks* (in press), Nov 2020.
  - **S. Nath** and J. Wu, "Quickest Change Point Detection with Multiple Post-change Models" in *Journal of Sequential Analysis: Design Methods and Applications* (in press), Nov 2020.
  - **S. Nath** and J. Wu, "Online Battery Scheduling for Grid-connected Photo-Voltaic Systems," in *Journal of Energy Storage*, vol. 31, pp. 101713, Oct 2020.
  - **S. Nath**, J. Wu, Y. Zhao, and W. Qiao, "Low Latency Bearing Fault Detection of Direct-drive Wind Turbines Using Stator Current," in *IEEE Access*, vol. 8, pp. 44163-44174, Mar 2020.
  - **S. Nath**, I. Akingeneye, J. Wu, and Z. Han, "Quickest Detection of False Data Injection Attacks in Smart Grid with Dynamic Models," in *IEEE Journal of Emerging and Selected Topics in Power Electronics (in press)*, Aug 2019.
  - **S. Nath**, J. Wu, and J. Yang, "Delay and energy efficiency tradeoff for information pushing system", in *IEEE Transactions on Green Communications and Networking*, vol. 2, no. 4, pp. 1027-1040, Dec 2018.

- **Conference**
  - **S. Nath** and J. Wu, "Dynamic Computation Offloading and Resource Allocation for Multi-user Mobile Edge Computing", in *Proc. IEEE Global Communications Conf. (GLOBECOM)* (presented), Taipei, Taiwan, Dec 2020.
  - **S. Nath**, Y. Li, J. Wu, and P. Fan, "Multi-user Multi-channel Computation Offloading and Resource Allocation for Mobile Edge Computing", in *Proc. IEEE Intern. Commun. Conf. (ICC)*, Dublin, Ireland, Jun 2020.
  - **S. Nath**, J. Wu, and H. Lin, "Optimum Multicast Scheduling in Delay-Constrained Content-Centric Wireless Networks", in *Proc. IEEE Intern. Commun. Conf. (ICC)*, Shanghai, China, May 2019.
  - **S. Nath** and J. Wu, "Bayesian quickest change-point detection with multiple candidates of post-change models", in *Proc. IEEE Global Conf. on Signal and Information Processing (GlobalSIP)*, Anaheim, CA, U.S.A., Nov 2018.
  - **S. Nath**, J. Wu, and J. Yang,"Optimum energy efficiency and Age-of-Information tradeoff in multicast scheduling," in *Proc. Intern. Conf. on Communications (ICC)*, Kansas City, MO, U.S.A., May 2018.
  - **S. Nath**, J. Wu, and J. Yang, "Optimizing age-of-information and energy efficiency tradeoff for mobile pushing notifications", in *Proc. Intern. Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, Sapporo, Japan, Jul 2017.
  - S. I. Audin, **S. Nath**, S. Basak, F. S. Rahman, R. Nath, and S. A. Fattah, "A human action recognition scheme based on spatio-temporal variation of region of interest in horizontal and vertical direction", in *Proc. Intern. Conf. on Informatics, Electronics & Vision (ICIEV)*, Dhaka, Bangladesh, May 2014.
  - F. S. Rahman, R. Nath, **S. Nath**, S. Basak, S. I. Audin, and S. A. Fattah, "Lip contour extraction scheme based on K-means clustering in different color planes", in *Proc. Intern. Conf. on Informatics, Electronics & Vision (ICIEV)*, Dhaka, Bangladesh, May 2014.
  - R. Nath, F. S. Rahman, **S. Nath**, S. Basak, S. I. Audin, and S. A. Fattah, "Lip contour extraction scheme using morphological reconstruction based segmentation", in *Proc. Intern. Conf. on Electrical Engineering and Information & Communication Technology*, Dhaka, Bangladesh, Apr 2014.

ACADEMIC AWARDS & SCHOLARSHIPS

- Dean's List Award, *BUET* — 2010 – 2012
  - Obtained Honors (3.75) grade point in junior and senior years.
- University Admission Test Excellency Scholarship, *BUET* — 2009
  - Ranked in top 1% among 7000+ applicants in undergraduate admission test.
- Dhaka Education Board Scholarship, *Ministry of Education, Bangladesh* — 2008
  - For excellence in Higher Secondary School Certificate Examination (H.S.C).
- Perfect Attendance Certificate, *Notre Dame College, Dhaka, Bangladesh* — 2008
  - Maintained 100% class attendance in higher secondary school.

LEADERSHIP EXPERIENCE

- President, Bangladesh Student Organization at the UA — Jun 2017 – May 2018
  - Managed a registered student organization of 37 Bangladeshi students.
  - Organized an annual cultural event with 130+ guests.

PROFESSIONAL AFFILIATIONS

- Member, IEEE — Jan 2018 – Dec 2019
- Member, IEEE Young Professionals — Jan 2018 – Dec 2019
- Member, IEEE Signal Processing Society — Jan 2019 – Dec 2019