

Prithwish Chakraborty

PhD. candidate, Dept. of Computer Science
Discovery Analytics center, Virginia Tech, USA

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Education

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| Fall 2010 - Current | PhD Student in Computer Science, Virginia Tech, USA. GPA: 3.97/4.00 Advisor Dr. Naren Ramakrishnan |
| 2006 - 2010 | B.E. in Electronics and Telecomm. Engg., Jadavpur University, India. GPA: 9.27/10 |

Research Statement

Research Focus: Data-driven spatio-temporal modeling under weakly correlated signals

- *Application area:* Infectious Disease modeling
- *Broad Focus:* Data Science, Machine Learning and Pattern Recognition.

Research Problems: Disease modeling under uncertainty

- **Short-term Disease Forecasting using Surrogates**
 - Real-time forecasts of ILI to append unstable surveillance data
 - *Designed and implemented big-data ILI short-term forecasting pipeline*
 - *Projects:* EMBERS for IARPA OSI Program (winning team)
- **Long-term Disease Forecasting using Surrogates**
 - Seasonal Models of infectious diseases modulated by real-time surrogates such as Twitter and Weather.
 - *Designed and implemented big-data ILI long-term forecasting pipeline*
 - *Projects:* EMBERS (Influenza, Chikungunya, Dengue), DTRA (Influenza), CDC Challenge (Influenza), Scicast Flu Challenge (Influenza)
- **Concept Drift** Drift-adapted Disease forecasting
 - HQCD: Designed and implemented significant change detector in possibly correlated signals using hierarchical framework
 - Robust-ILI: Drift adapted short-term ILI forecasts from multiple surrogates using drift identification and random resampling.

Professional Experience

- **Virginia Tech** Arlington, VA
GRA in Discovery Analytics Center. Advised by Dr. Naren Ramakrishnan Fall 2011 - Current
 - Worked on Disease Forecasting. Create streaming data ingestion module for Disease surveillance, Weather and News. Implemented big-data disease forecasting pipeline for EMBERS in *python* over EMBERS AWS cluster framework. Forecasts sent in real-time without human supervision and continuously evaluated
 - Interfaced with several agencies such as IARPA and CDC for disease forecasting problems. Collaborated with several institutes such as NDSSL, Virginia Tech and YeLab, University of Michigan, Ann Arbor
 - Helped organize and run flu forecasting market in collaboration with Scicast, George Mason

- University
 - Collaborated on several projects such as pattern detection in Ionospheric Radiation, with ECE VT and solar Photo-voltaic energy prediction with HP Labs
- **Microsoft Research India** Bangalore, IN
Visiting Researcher, invited by Dr. Srivatsan Laxman June 2012
 - Worked on formalization of histogram estimation using random resampling with possible applications towards distribution prediction under out-of-core data estimation problems
- **Amazon Web Services** Seattle, WA
SDE Intern, mentored by Paul Sharpe Summer 2011
 - Worked on updating an Internal Console of AWS Beanstalk towards more real-time status monitoring of the same. Implemented in *java* using *Spring-Hibernate* framework using a combination of *JSP*, *js*, *css*, and *html5*
- **Virginia Tech** Blacksburg, VA
GTA in Dept. of Computer Science. Instructor: Mr. N.D. Barnette Fall 2010 - Spring 2011
 - Grading and tutoring duties for C++ programming class of ≈ 200 students.
- **Indian Institute of Technology, Delhi** Delhi, IN
Research Intern, advised by Prof. B.K. Panigrahi Summer 2009
 - Worked on application of heuristic optimization and machine learning methods to power system characterization and early Epilepsy detection using wavelets. Published several papers to several journals and conferences.

Activities

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| Tutorial | P. Chakraborty, M. Marathe, N. Ramakrishnan, and A. Vulikanti. Computational Epidemiology and Public Health Policy Planning, Feb 2016. Tutorial, AAAI 2016 |
| Invited Talks | P. Chakraborty. Data Driven Model for Disease Forecasting, 10 2014. Invited Talk, First IEEE international Workshop on Big Data in Computational Biology (BCDE 2014) |
| Patent | M. Marwah, M. Arlitt, P. Chakraborty, and N. Ramakrishnan. Predicting near-future photo-voltaic generation, Sept. 28 2012. US Patent App. 13/631,480 |
| Opinion Piece | P. Chakraborty. US Flu Forecast: Exploring links between national and regional level seasonal characteristics. http://bit.ly/1CSHTk7 , 2014. Accessed: 2015-03-21 |

Publications

Current Publications

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| 2016 | P. Chakraborty, S. Muthiah, R. Tandon, and N. Ramakrishnan. Hierarchical Quickest Change Detection via Surrogates. <i>arXiv preprint arXiv:1603.09739</i> , 2016 |
| | S. Ghosh, P. Chakraborty, E. Cohn, J. S. Brownstein, and N. Ramakrishnan. Designing Domain Specific Word Embeddings: Applications to Disease Surveillance. <i>arXiv preprint arXiv:1603.00106</i> , 2016 |
| | H. Wu, Y. Ning, P. Chakraborty, J. Vreeken, N. Tatti, and N. Ramakrishnan. Generating Realistic Synthetic Population Datasets. <i>arXiv preprint arXiv:1602.06844</i> , 2016 |

- 2015 P. Khadivi, P. Chakraborty, R. Tandon, and N. Ramakrishnan. Time Series Forecasting via Noisy Channel Reversal. In *Machine Learning for Signal Processing (MLSP), 2015 IEEE 25th International Workshop on*, pages 1–6. IEEE, 2015
- Z. Wang, P. Chakraborty, S. R. Mekar, J. S. Brownstein, J. Ye, and N. Ramakrishnan. Dynamic Poisson Autoregression for Influenza-Like-Illness Case Count Prediction. In *Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, pages 1285–1294. ACM, 08 2015
- H. Wu, P. Chakraborty, S. Ghosh, and N. Ramakrishnan. Forecasting Influenza in Senegal with Call Detail Records, 04 2015. NETMOB 2015
- 2014 P. Chakraborty, P. Khadivi, B. Lewis, A. Mahendiran, J. Chen, P. Butler, E. O. Nsoesie, S. R. Mekar, J. S. Brownstein, M. V. Marathe, and N. Ramakrishnan. Forecasting a Moving Target: Ensemble Models for ILI Case Count Predictions. In *Proceedings of the 2014 SIAM International Conference on Data Mining, Philadelphia, Pennsylvania, USA, April 24-26, 2014*, pages 262–270, 2014
- 2012 P. Butler, P. Chakraborty, and N. Ramakrishnan. The Deshredder: A visual analytic approach to reconstructing shredded documents. In *Visual Analytics Science and Technology (VAST), 2012 IEEE Conference on*, pages 113–122. IEEE, 2012
- P. Chakraborty, M. Marwah, M. Arlitt, and N. Ramakrishnan. Fine-Grained Photovoltaic Output Prediction Using a Bayesian Ensemble. In *Twenty-Sixth AAAI Conference on Artificial Intelligence*, page online, 2012

Other Publications

- 2015 S. Ghosh, P. Chakraborty, E. O. Nsoesie, S. R. Mekar, J. S. Brownstein, and N. Ramakrishnan. A Temporal Topic Modeling Analysis to Assess the Association between Trends in News Reports and Infectious Disease Outbreaks. to be submitted, 2016
- F. S. Tabataba, P. Chakraborty, N. Ramakrishnan, M. Marathe, J. Chen, and B. Lewis. Standard Measures and Quality Metrics for Evaluating the Performance of Forecasting Methods: Special Study on Influenza in US. to be submitted, 2016
- P. Chakraborty, B. Lewis, S. Eubank, M. Marathe, J. Brownstein, and N. Ramakrishnan. How not to forecast the flu. to be submitted, 2016
- 2012 P. Chakraborty, G. G. Roy, B. Panigrahi, R. Bansal, and A. Mohapatra. Dynamic economic dispatch using harmony search algorithm with modified differential mutation operator. *Electrical Engineering*, 94(4):197–205, 2012
- T. K. Gandhi, P. Chakraborty, G. G. Roy, and B. K. Panigrahi. Discrete harmony search based expert model for epileptic seizure detection in electroencephalography. *Expert Systems with Applications*, 39(4):4055–4062, 2012
- 2011 G. G. Roy, S. Das, P. Chakraborty, and P. N. Suganthan. Design of non-uniform circular antenna arrays using a modified invasive weed optimization algorithm. *Antennas and Propagation, IEEE Transactions on*, 59(1):110–118, 2011
- P. Chakraborty, S. Das, G. G. Roy, and A. Abraham. On convergence of the multi-objective particle swarm optimizers. *Information Sciences*, 181(8):1411–1425, 2011
- 2010 G. G. Roy, P. Chakraborty, and S. Das. Designing fractional-order $PI^\lambda D^\mu$ controller using differential harmony search algorithm. *International Journal of Bio-Inspired Computation*, 2(5):303–309, 2010
- G. G. Roy, P. Chakraborty, S.-Z. Zhao, S. Das, and P. N. Suganthan. Artificial foraging weeds for global numerical optimization over continuous spaces. In *IEEE Congress on Evolutionary Computation*, pages 1–8, 2010

2009 P. Chakraborty, G. G. Roy, S. Das, and B. Panigrahi. On population variance and explorative power of invasive weed optimization algorithm. In *Nature & Biologically Inspired Computing, 2009. NaBIC 2009. World Congress on*, pages 227–232. IEEE, 2009

G. G. Roy, B. Panigrahi, P. Chakraborty, and M. K. Mallick. On optimal feature selection using modified harmony search for power quality disturbance classification. In *Nature & Biologically Inspired Computing, 2009. NaBIC 2009. World Congress on*, pages 1355–1360. IEEE, 2009

P. Chakraborty, G. G. Roy, S. Sinha, S. Bose, A. Mondal, and S. Das. Automatic Shape Independent Clustering Inspired By Ant Dynamics. In *The Proceedings of International Workshop on Machine Intelligence Research organized by Machine Intelligence Research Labs*, pages 64–74, 2009

P. Chakraborty, G. G. Roy, S. Das, D. Jain, and A. Abraham. An improved harmony search algorithm with differential mutation operator. *Fundamenta Informaticae*, 95(4):401–426, 2009

D. Jain, G. G. Roy, P. Chakraborty, and S. Das. Fuzzy Entropy-based Object Segmentation with an Inertia-Adaptive PSO. In *Advanced Computing and Communications, 2008. ADCOM 2008. 16th International Conference on*, pages 13–18. IEEE, 2008

Participation in Conferences

- **KDD 2015**, 21st ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Sydney, Australia, August 2015.
- **SDM 2014**, 2014 SIAM International Conference on Data Mining, Philadelphia, USA, April 2014.
- **DDD 2013**, 2nd International Conference on Digital Disease Detection, San Francisco, USA, September 2013.
- **AAAI 2012**, 26th AAAI Conference on Artificial Intelligence, Toronto, Canada, July 2012.

Awards and Honors

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| <i>Award</i> | Who's Who in American College's and Universities, Virginia Tech | 2014 |
| | Student Travel Award, AAAI | 2012 |
| <i>Honor</i> | Vice President, Alpha Epsilon Lambda | 2013 |
| | Upsilon Pi Epsilon, Inducted | 2013 |
| | Phi Kappa Phi, Invited | 2014 |
| | Golden Key,Invited | 2014 |
| | Tau Beta Pi,Invited | 2013 |
| <i>Other</i> | President, Indian Student Association at Virginia Tech | 2012-2013 |

Technical Skills

Programming Python, C/C++, R, Java, Matlab

Javascript, Perl, HTML/CSS

Frameworks NOSQL: MongoDB, MapReduce, Django, NodeJS, Spring