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PRATIP RANA

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Research Interests

- **Data science:** Machine learning, Deep learning, Information Theory.
- **Biophysical Modeling** Discrete event simulation, Monte-Carlo simulation, Statistical Modeling.
- **Complex System:** Complex Network, Dynamical system.
- **Distributed computing:** Message Passing Interface, GPU computing, Parallel Algorithm.

Research Experience

Research Assistant **Virginia Commonwealth Univ.** 📅 Jan 2015 - May 2020

- **Disease subtype detection using multiview learning:** Using network analysis, deep-learning & multiview-learning algorithms, predicted critical gene targets and different subtypes of disease in the genomics dataset. Improved classification accuracy by 0.05 AUC score of normal samples to the disease samples for a few cancer types.
- **Alzheimer disease dynamic study:** Predicted the behavior of $A\beta_{42}$ protein aggregation in the brain of the Alzheimer patients' using optimization and ordinary differential equations.
- **Mathematical modeling of molecular communication:** Benchmarked the communication fidelity of molecular signaling network using statistical modeling to aid the selective design of synthetic Biomolecular systems.
- **Quantify association between biomedical concepts:** Improved association measure prediction by 10% between biomedical terms using network fusion algorithm and Natural language processing(NLP) techniques.

Education

Richmond, VA **Virginia Commonwealth Univ.** 📅 May 2020

- Ph.D. in Computer Science.
- **Thesis:** Mathematical models of supra-molecular self-assembly and it's application towards alzheimer's disease pathway.
- **Advisor:** Dr. Preetam Ghosh

Kolkata, India **Jadavpur University** 📅 June 2014

- M. Tech in Nanotechnology.
- **Thesis:** Response of SnO₂-Pd-MWCNT Sensors towards Butane, Carbon Monoxide, Alcohol and Acetone.
- **Advisor:** Dr. Amarnath Sen

Kolkata, India **West Bengal Univ. of Technology** 📅 June 2012

- B.Tech in Electronics & Communication

Teaching

Teaching Assistant:

- **Introduction to the Theory of Computation**, Average class size: 85, (VCU)
- **Discrete Mathematics**, Average class size: 70, (VCU)

Student Supervision

- Mentored five undergraduates and high school students on their research projects, and some of them won district and state level prizes.

Other Selected Projects

- **HINGE** (2017-2019). Part of the backend development team of HINGE (a United States Department of Veterans Affairs (VA) cancer care quality measure & data analytics platform) server using Node.js and mongoDb.
- **Graph Brain Project:** (2016-2017) Predicted new conjectures for the independence number of a graph by automated mathematical conjectures discovery software using SageMath.

Scholarships & Awards

- **Hackathon Win (2018 & 2019):** Won second place in *RamHacks 2018* for designing web app to recommend apartments using machine-learning and spatial data analysis techniques. Won third place in *RamHacks 2019* for designing web app to recommend articles in real-estate domain using deep learning and natural language processing techniques.
- **Scholarship:** Awarded for the excellent performance in Graduate Aptitude Test Engineering in 2012, by the Ministry of Human Resource and Development (MHRD, India).

Publications

- Rana, P., Pilikiewicz, K.R., Mayo, M.L. and Ghosh, P., 2018. Benchmarking the communication fidelity of biomolecular signaling cascades featuring pseudo-one-dimensional transport. *AIP Advances*, 8(5), p.055220.
- Rana, P., Dean, D.N., Steen, E.D., Vaidya, A., Rangachari, V. and Ghosh, P., 2017. Fatty Acid Concentration and Phase Transitions Modulate A β Aggregation Pathways. *Scientific reports*, 7(1), p.10370.
- Rana, P., Berry, C., Ghosh, P. and Fong, S.S., 2020. Recent advances on constraint-based models by integrating machine learning. *Current Opinion in Biotechnology*, 64, pp.85-91.
- Rana, P., Franco, E.F., Rao, Y., Syed, K., Barh, D., Azevedo, V., Ramos, R.T. and Ghosh, P., 2019. Evaluation of the Common Molecular Basis in Alzheimer's and Parkinson's Diseases. *International journal of molecular sciences*, 20(15), p.3730
- Rana, P., Ghosh, P., Pilikiewicz, K.R., Perkins, E.J., Warner, C. and Mayo, M., 2016, May. Capacity estimates of additive inverse Gaussian molecular channels with relay characteristics. (pp. 237-240). *ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering)*.
- Pilikiewicz, K.R., Rana, P., Mayo, M., Ghosh, P., Ghosh, P. 2019 March. self-Assembly from a single-Molecules perspective. In *Proceedings of the 11th EAI International Conference on Bio-inspired Information and Communications Technologies (formerly BIONETICS)*.
- Ghosh, P., Rana, P., Rangachari, V., Saha, J., Steen, E. and Vaidya, A., 2019. A game theoretic approach to deciphering the dynamics of amyloid- β aggregation along competing pathways [submitted]
- Dean, D.N., Rana, P., Campbell, R.P., Ghosh, P. and Rangachari, V., 2018. Propagation of an A β Dodecamer Strain Involves a Three-Step Mechanism and a Key Intermediate. *Biophysical journal*, 114(3), pp.539-549.
- Rangachari, V., Dean, D.N., Rana, P., Vaidya, A. and Ghosh, P., 2018. Cause and consequence of A β -Lipid interactions in Alzheimer disease pathogenesis. *Biochimica et Biophysica Acta (BBA)-Biomembranes*, 1860(9), pp.1652-1662.
- Dean, D.N., Das, P.K., Rana, P., Burg, F., Levites, Y., Morgan, S.E., Ghosh, P. and Rangachari, V., 2017. Strain-specific fibril propagation by an A β dodecamer. *Scientific reports*, 7, p.40787.
- Nalluri, J.J., Rana, P., Barh, D., Azevedo, V., Dinh, T.N., Vladimirov, V. and Ghosh, P., 2017. Determining causal miRNAs and their signaling cascade in diseases using an influence diffusion model. *Scientific reports*, 7(1), p.8133.
- Nalluri, J., Rana, P., Azevedo, V., Barh, D. and Ghosh, P., 2015, September. Determining influential miRNA targets in diseases using influence diffusion model. In *Proceedings of the 6th ACM Conference on Bioinformatics, Computational Biology and Health Informatics* (pp. 519-520). ACM.
- Nalluri, J.J., Syed, K., Rana, P., Hudgins, P., Ramadan, I., Nieporte, W., Sleeman IV, W., Palta, J., Kapoor, R. and Ghosh, P., 2018, January. A smart healthcare portal for clinical decision making and precision medicine. In *Proceedings of the Workshop Program of the 19th International Conference on Distributed Computing and Networking* (p. 9). ACM.

Publications prior to PhD

- Narjinary, M., Rana, P., Sen, A. and Pal, M., 2017. Enhanced and selective acetone sensing properties of SnO₂-MWCNT nanocomposites: Promising materials for diabetes sensor. *Materials & Design*, 115, pp.158-164.
- Sen, S., Chakraborty, N., Rana, P., Sahu, R., Singh, S., Panda, A.K., Tripathy, S., Pradhan, D.K. and Sen, A., 2016. Effect of Ti doping on the structural, electrical and magnetic properties of GaFeO₃. *Journal of Materials Science: Materials in Electronics*, 27(5), pp.4647-4652.
- Das, S., Rana, S., Mursalin, S.M., Rana, P. and Sen, A., 2015. Sonochemically prepared nanosized BiFeO₃ as novel SO₂ sensor. *Sensors and Actuators B: Chemical*, 218, pp.122-127.
- Singh, A., Mursalin, S.M., Rana, P. and Sen, S., 2015. Electrical properties of palladium-doped CaCu₃Ti₄O₁₂ ceramics. *Applied Physics A*, 120(3), pp.1011-1021.
- Sen, S., Chakraborty, N., Rana, P., Narjinary, M., d Mursalin, S., Tripathy, S., Pradhan, D.K. and Sen, A., 2015. Nanocrystalline gallium ferrite: A novel material for sensing very low concentration of alcohol vapour. *Ceramics International*, 41(8), pp.10110-10115.
- Maharajan, M., Mursalin, M.D., Narjinary, M., Rana, P., Sen, S. and Sen, A., 2014. Synthesis, characterization and vapour sensing properties of nanosized ZnFe₂O₄. *Transactions of the Indian Ceramic Society*, 73(2), pp.102-104.

Posters

- Rana, P., Saha, J., Steen, E., Vaidya, A., Rangachari, V. and Ghosh, P., 2019. A Computational Framework for Preferential Switching of Competing A β Aggregation Pathways Based on Game Theory Approach. *Biophysical Journal*, 116(3), p.420a.
- Rana, P., Rabender, C., Ghosh, P., Anscher, M., Mikkelsen, R., Yakovlev, V., 2018. Analysis of circulating tumor exosomes: their ability to serve as a biomarker for post-radiation toxicity in prostate cancer, VCU Masset cancer center.
- Dean, D.N., Das, P.K., Rana, P., Campbell, R.P., Ghosh, P., Morgan, S.E. and Rangachari, V., 2017. Strain-Specific Propagation by an Amyloid-Beta Dodecamer. *Biophysical Journal*, 112(3), p.362a.

Book Chapter

- Pilkiewicz, K.R., Rana, P., Mayo, M., Ghosh, P., Ghosh, P., June 2019, *Molecular Communication and Cellular Signaling from an Information Theory Perspective*. CRC Press: "Nanoscale Networking and Communications Handbook"