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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., Pilkiewicz, 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., Pilkiewicz, 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).
- Pilkiewicz, 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"