Ritesh Kumar

Curriculum Vitae

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Education and Qualifications

2009 B.E. (CSE) Manipal Institute of Technology
2011 M.Tech. (Advanced Instrumentation) Academy of Scientific & Innvovative Research
2019 PhD (submitted 2017) Academy of Scientific & Innvovative Research.

Positions held

2011–2015	**Scientist**, Central Scientific Instruments Organisation
2015–2020	**Senior Scientist**, Central Scientific Instruments Organisation
2020–Present	**Principal Scientist**, Central Scientific Instruments Organisation
2019–2022	**Royal Society Newton Fellow**, University of Hertfordshire, UK
2009 (Jan)–2009 (July)	**Intern**, Citrix R&D India

Course Taught and familiar

2014–now **Statistical Analysis and Machine Intelligence**, responsible for teaching, evaluation, practicals (2 hrs lectures and 2 hrs practical per week, co-taught with Rishemjit Kaur)
Data Science and Machine Learning both applications and theory
Data Structures and algorithm analysis
Introduction to computing
Compiler design

Awards and Fellowships

2019 Royal Society Newton Fellowship (awarded to 40 early career researchers all over the world in an year).
2019 IC2S2 travel fellowship to present research work.
2018 Sakura science exchange fellowship by JST, Japan.
2016 Among the winning teams for grand challenge awarded by IIT Patna (hand held instrument for nitrogen mapping).
2016 Among the winning teams (ViResPred) for presenting work at RECOMB/ISCB Conference by DARPA.
2013 Volkswagen Foundation, Germany sponsorship to present research work at OdorSpaces 2013.
2009 Quick Hire Fellowship for MTech by CSIR, India.
2008 Qualified in Google Code jam.
2002 Ramakrishna Mission Vidyapith scholarship for secondary and senior secondary education.

Research

- My current research involves around three categories, Understanding Chemical space of odorants using machine learning, Odor Source Localisation Techniques using mobile autonomous systems, Electronic Nose and Tongue system development.
- I have authored more than 35 peer reviewed papers in Journals and Conferences some of them appeared in high impact journals such as IEEE transaction on Cybernetics (IF-11.4), Science Advances (IF-13) and Sensors and Actuators B (IF-7). A list of publications is on the following page.
- I currently supervise one PhD student. I have previously supervised another 15 Masters and B.Tech. students.
- I am an active open source software developer all of which are available on GitHub.

Talks and other Academic Activities

- Talks on using machine learning for understanding fragrance space at ECRO, ISOT conferences and University of Hertfordshire, UK.
- 'Using Slack Conversations to understand participation', DEI townhall at Global Consortitum for Chemosensory researchers.
- 'Machine learning for electronic nose and tongue design', VIT, Bhopal, India.
- Machine learning tutorials at MIDL-2019, Baba Farid College of Engineering & Technology, Bathinda.
- Organised Machine learning workshop at CSIO Chandigarh, MIDL-19
- 'Big data and Application', IETE, Chandigarh, India

- 'Artificial Intelligence and applications', MIT, Jaipur, India.
- 'Social Impact theory optimization, UIET, Chandigarh, India'.
- Reviewer PLOS Computational Biology, Scientific Reports, PLOS One, Royal Society-Interface, Chemmometrics and Intelligent Laboratory Systems.

Funded Projects

I have worked in government and industry sponsored projects involving various domains of technology as PI, Co-PI and member. These projects are in collaboration with researchers across domains and institutions.

2021	Design of food recommender system using machine learning	FoodPairing, Belgium	PI	Rs. 16.9 Lakhs
2021	Bitterness Masking evaluation of Green Tea using machine learning	TATA Consumer Products Ltd., Pune, India	PI	Rs. 8.5 Lakhs
2019	DeepFragrance: Artificial Intelligence Methods for designing fragrant molecules	Royal Society, UK	PI	100,500 GBP
2021	CSIR-Digital Food Safety Portal System 2.0 Digital Food Safety Portal, analytics and Digitalization of the Indian Burden of Foodborne Diseases, Chemicals Risk Assessment as well as food design using Artificial Intelligence and Machine Learning Tools	CSIR, India	Co-PI	Rs. 1.47 Cr
2018	Smartphone imaging aided point of care dipstick platform for heavy metals sensing in water	DST, India	Co-PI	Rs. 25 Lakhs
2015	Development of Integrated Technological Solutions for Security and Operations based on UV Sensor Technologies	CSIR, NMITLI	Co-PI	Rs. 36 Lakhs
2012	Biomimetic Artificial Organoleptic Systems	CSIR, India	Co-PI	Rs. 60 Lakhs
2020	Characterizing Risk Indicators to cause Anaemia Prevalence among young Children and Adolescents in BRICS countries using Artificial Intelligence	DST, India	Member	Rs. 48 Lakhs
2018	Data logging system for Deg Bhapka process monitoring	FFDC, Kannuaj	Member	Rs. 1 Lakh
2018	Identification of volatiles released from rancid cashews and their correlation/characterization	nanoPix ISS (P) Ltd., Hubli	Member	Rs. 1.5 Lakhs
2017	Upgradation of Existing Iodine Value Meter	M/S Vaisheshika Systems Ltd., Ambala	Member	Rs. 1.36 Lakhs
2015	WSN for explosive detection	PSA Office, India	Member	Rs. 60 Lakhs

Other ongoing and completed research

- Using Network analysis to understand relationship between spices and their health effects (with Rishemjit Kaur, Lav Varshney).
- Bout detection and plant volatiles differentiation using enose (with Michael Schmuker and Sam Sutton).
- What million farmers say: Understanding Kisan Call Centre data (with Rishemjit Kaur, Sudarshan Iyengar).
- Hand-held system for plant health monitoring based on color measurements of leaves and machine learning (with Rishemjit Kaur, Shambo Roy).
- Evaluation of Plant health monitoring systems using machine learning (with Varinderpal Singh, Rishemjit Kaur).
- Machine Learning software for classification of hemolytic potency of peptides (with G P S Raghava, Kumardeep Chaudhary).
- Machine Learning algorithm development for early and late stage cancer patients based on TCGA gene expression data (with G P S Raghava).

Publications

Refereed research papers

1. Bhondekar, A. P., R. Kaur, R. Kumar, R. Vig, and P. Kapur (2011). A novel approach using Dynamic Social Impact Theory for optimization of impedance-Tongue (iTongue). *Chemometrics and Intelligent Laboratory Systems* **109**(1), 65–76.
2. Kaur, R., R. Kumar, A. Gulati, C. Ghanshyam, P. Kapur, and A. P. Bhondekar (2012). Enhancing electronic nose performance: A novel feature selection approach using dynamic social impact theory and moving window time slicing for classification of Kangra orthodox black tea (Camellia sinensis (L.) O. Kuntze). *Sensors and Actuators B: Chemical* **166**, 309–319.

3. Kumar, R., A. P. Bhondekar, R. Kaur, S. Vig, A. Sharma, and P. Kapur (2012). A Simple Electronic Tongue. *Sensors and Actuators B: Chemical*.
4. kumar, R., R. Kaur, and A. P. Bhondekar (2012). *SITO LIBRARY https://mloss.org/software/view/457/*.
5. Saurabh, S. and R. Kumar (2012). Global reduction in measles mortality(Correspondence). *The Lancet* **380**(9850), 1303.
6. Kaur, R., R. Kumar, A. P. Bhondekar, and P. Kapur (2013). Human opinion dynamics: An inspiration to solve complex optimization problems. *Scientific reports* **3**(1), 1–7.
7. Kumar, R., R. Kaur, A. P. Bhondekar, and P. Kapur (2014). Understanding the odour network. *Flavour* **3**(Suppl 1), P7.
8. Macaš, M., A. P. Bhondekar, R. Kumar, R. Kaur, J. Kuzilek, V. Gerla, L. Lhotská, and P. Kapur (2014). Binary social impact theory based optimization and its applications in pattern recognition. *Neurocomputing* **132**, 85–96.
9. Kaur, R., R. Kumar, A. P. Bhondekar, R. Suzuki, and T. Arita (2015). Effects of Topological Variations on Opinion Dynamics Optimizer. In: *International Conference in Swarm Intelligence*. Springer, Cham, pp.3–13.
10. Kumar, R., R. Kaur, B. Auffarth, and A. P. Bhondekar (2015). Understanding the Odour Spaces: A Step towards Solving Olfactory Stimulus-Percept Problem. *PLoS ONE* **10**(10).
11. Kumar, R., R. Kaur, and A. P. Bhondekar (2015). "The Smell Network". In: *Multidisciplinary Social Networks Research Communications in Computer and Information Science, (http://link.springer.com/chapter/10.1007%2F978-3-662-48319-0_38)*. Vol. 540. Springer Berlin Heidelberg, pp.460–469.
12. Sarkar, S. T., A. P. Bhondekar, M. Macaš, R. Kumar, R. Kaur, A. Sharma, A. Gulati, and A. Kumar (2015). Towards biological plausibility of electronic noses: A spiking neural network based approach for tea odour classification. *Neural Networks* **71**, 142–149.
13. Sharma, G., S. Kumar, A. Kumar, A. Sharma, R. Kumar, R. Kaur, and A. P. Bhondekar (2015). Development of lipid membrane based taste sensors for electronic tongue. *Procedia Computer Science* **70**, 146–152.
14. Bhardwaj, N., R. Kumar, R. Verma, A. Jindal, and A. P. Bhondekar (2016). Decoding algorithm for color QR code: a mobile scanner application. In: *2016 international conference on recent trends in information technology (ICRTIT)*. IEEE, pp.1–6.
15. Chaudhary, K., R. Kumar, S. Singh, A. Tuknait, A. Gautam, D. Mathur, P. Anand, G. C. Varshney, and G. P. Raghava (2016). A web server and mobile app for computing hemolytic potency of peptides. *Scientific reports* **6**(1), 1–13.
16. Chowdhury, S. R., R. Kumar, R. Kaur, A. Sharma, and A. P. Bhondekar (2016). Quality assessment of engine oil: an impedance spectroscopy based approach. In: *2016 IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics Engineering (UPCON)*. IEEE, pp.608–612.
17. Kumar, R., R. Kaur, A. P. Bhondekar, and G. P. S. Raghava (2016). SMELL AND LANGUAGE: DATACENTRIC APPROACH TO PREDICTING SMELL OF A MOLECULE. *Journal of Digital Olfaction Society* **4**(1).
18. Kumar, S., S. Bagchi, S. Prasad, A. Sharma, R. Kumar, R. Kaur, J. Singh, and A. P. Bhondekar (2016). Bacteriorhodopsin–ZnO hybrid as a potential sensing element for low-temperature detection of ethanol vapour. *Beilstein journal of nanotechnology* **7**(1), 501–510.
19. Bhalla, S., K. Chaudhary, R. Kumar, M. Sehgal, H. Kaur, S. Sharma, and G. P. Raghava (2017). Gene expression-based biomarkers for discriminating early and late stage of clear cell renal cancer. *Scientific reports* **7**(1), 1–13.
20. Keller, A., R. C. Gerkin, Y. Guan, A. Dhurandhar, G. Turu, B. Szalai, J. D. Mainland, Y. Ihara, C. W. Yu, R. Wolfinger, R. Kumar, et al. (2017). Predicting human olfactory perception from chemical features of odor molecules. *Science* **355**(6327), 820–826.
21. Sinha, A., R. Kaur, R. Kumar, and A. Bhondekar (2017). A cooperative control framework for odor source localization by multi-agent systems.
22. Sinha, A., R. Kaur, R. Kumar, and A. P. Bhondekar (2017). Cooperative control of multi-agent systems to locate source of an odor. *arXiv preprint arXiv:1711.03819*.
23. Chowdhury, S. R., A. P. Bhondekar, R. Kumar, S. Bagchi, R. Kaur, and V. Karar (2018). Circuit arrangement to suppress crosstalk in chemo-resistive sensor arrays. *IET Science, Measurement & Technology* **12**(8), 1039–1046.
24. Fourati, S., A. Talla, M. Mahmoudian, J. G. Burkhart, R. Klén, R. Henao, T. Yu, Z. Aydın, K. Y. Yeung, M. E. Ahsen, R. Kumar, et al. (2018). A crowdsourced analysis to identify ab initio molecular signatures predictive of susceptibility to viral infection. *Nature communications* **9**(1), 1–11.
25. Gaurav, K., A. Kumar, R. Kumar, and A. P. Bhondekar (2018). Exploring robot behavior in search of a chemical source. In: *2018 International Conference on Intelligent Autonomous Systems (ICoIAS)*. IEEE, pp.146–149.
26. Kumar, A., J. Saxena, R. Kumar, and R. Kaur (2018). MAI Mitigation in MC-CDMA Systems Using Social Impact Based Wireless Communication Algorithm. *Wireless Personal Communications* **101**(3), 1765–1786.

27. Kumar, R., R. Kaur, A. P. Bhondekar, and G. P. Raghava (2018). “Human Opinion Inspired Feature Selection Strategy for Predicting the Pleasantness of a Molecule”. In: *Advanced Computational and Communication Paradigms*. Springer, pp.197–205.
28. Kumar, R. and M. Schmuker (2019). DeepFragrance a peek into the olfactory chemical space. In: *ECRO 2019, Trieste - Italy*. https://www.ecro.online/app/download/9978832670/ECRO2019_Book%20of ...
29. Sinha, A., R. Kumar, R. Kaur, and A. P. Bhondekar (2019). Consensus-Based Odor Source Localization by Multiagent Systems. *IEEE Transactions on Cybernetics* **49**(12), 4450–4459.
30. Sinha, A., R. Kumar, R. Kaur, and R. K. Mishra (2019). Consensus-Based Odor Source Localization by Multiagent Systems Under Resource Constraints. *IEEE transactions on cybernetics* **50**(7), 3254–3263.
31. Chowdhury, S. R., A. P. Bhondekar, R. Kumar, S. Bagchi, R. Kaur, and V. Karar (2020). Analysis of a Novel Circuit Arrangement to Suppress Crosstalk in 2-D Resistive Sensor Arrays. *Circuits, Systems, and Signal Processing* **39**(3), 1227–1243.
32. Kumar, R., R. Kaur, and M. Schmuker (2020a). DeepFragrance: An embedding based approach to solve olfactory stimulus percept problem. In: *ISOT, Achems 2020*.
33. Kumar, R., R. Kaur, and M. Schmuker (2020b). DeepFragrance: Embedded molecular representations for searching fragrance-like molecules. In: *ECRO 2020*.
34. Parma, V., K. Ohla, M. G. Veldhuizen, M. Y. Niv, C. E. Kelly, A. J. Bakke, K. W. Cooper, C. Bouysset, N. Pirastu, M. Dibattista, R. Kumar, et al. (2020). More than smell—COVID-19 is associated with severe impairment of smell, taste, and chemesthesis. *Chemical Senses* **45**(7), 609–622.
35. Saurabh, S., R. Kumar, M. K. Gupta, P. Bhardwaj, V. L. Nag, M. K. Garg, and S. Misra (2020). Prolonged persistence of SARS-CoV-2 in the upper respiratory tract of asymptomatic infected individuals. *QJM: An International Journal of Medicine* **113**(8), 556–560.
36. Saurabh, S., R. Kumar, N. Kumar, P. Bhardwaj, V. L. Nag, M. K. Garg, and S. Misra (2020a). Dynamics of SARS-CoV-2 transmission among evacuees quarantined at Jaisalmer, India.
37. Saurabh, S., R. Kumar, N. Kumar, P. Bhardwaj, V. L. Nag, M. K. Garg, and S. Misra (2020b). Dynamics of SARS-CoV-2 transmission among Indian nationals evacuated from Iran. *Disaster medicine and public health preparedness*, 1–7.
38. Adhikari, P., R. Kumar, S. Iyengar, and R. Kaur (2021). What a million Indian farmers say?: A crowdsourcing-based method for pest surveillance. In: *Proceedings of KDD Workshop on Data-driven Humanitarian Mapping, 27th ACM SIGKDD Conference, New York, USA*.
39. Gopalakrishnan, K., A. Sharma, N. Emanuel, P. K. Prabhakar, and R. Kumar (2021). Sensors for Non-Destructive Quality Evaluation of Food. *Food Chemistry: The Role of Additives, Preservatives and Adulteration*, 397–449.
40. Kumar, R., M. Singh, P. Singh, V. Parma, K. Ohla, S. B. Olsson, V. Saini, J. Rani, K. Kishore, P. Kumari, et al. (2021). Leveraging machine learning and self-administered tests to predict COVID-19: An olfactory and gustatory dysfunction assessment through crowd-sourced data in India. *medRxiv*.
41. Parma, V., K. Ohla, M. G. Veldhuizen, M. Y. Niv, C. E. Kelly, A. J. Bakke, K. W. Cooper, C. Bouysset, N. Pirastu, M. Dibattista, et al. (2021a). Corrigendum to: More Than Smell—COVID-19 Is Associated With Severe Impairment of Smell, Taste, and Chemesthesis. *Chemical Senses* **46**.
42. Parma, V., K. Ohla, M. G. Veldhuizen, M. Y. Niv, C. E. Kelly, A. J. Bakke, K. W. Cooper, C. Bouysset, N. Pirastu, M. Dibattista, et al. (2021b). Erratum: More Than Smell-COVID-19 Is Associated with Severe Impairment of Smell, Taste, and Chemesthesis (Chemical Senses (2020. *Chemical Senses* **46**.
43. Kumar, V., S. Patel, S. Sharma, R. Kumar, and R. Kaur (2022). Fifty Years of Cervical Myelopathy Research: Results from a Bibliometric Analysis. *Asian Spine Journal*.
44. Suhag, R., R. Kumar, A. Dhiman, A. Sharma, P. K. Prabhakar, K. Gopalakrishnan, R. Kumar, and A. Singh (2022). Fruit peel bioactives, valorisation into nanoparticles and potential applications: A review. *Critical Reviews in Food Science and Nutrition*, 1–20.