Dr VIBHOR KUMAR

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Education   :

1) PHD, computational systems Biology, Helsinki University of Technology(Aalto university), Finland, August 2007.

2) M. Tech in Computer Technology, Electrical Engineering Department, IIT Delhi, December 2001.

Professional appointments after PhD :

Associate professor , Department of computational Biology, IIIT Delhi (January 2021-till now)
Assistant professor, Department of computational Biology, IIIT Delhi, (December 2016- January 2021).
Adjunct scientist at Genome institute of Singapore (2017 - 2021)
Research scientist at Genome institute of Singapore (2014-2016)
Postdoc/Research associate at Genome institute of Singapore (2009-2014)
Senior Bioinformatician in Genseq Malaysia, (2007 – 2008).

Teaching – courses taught

1. Statistical computation (2017, 2018, 2020)

2. Data science in Genomics (2018, 2019, 2020, 2022, 2023)

3. Foundation in Modern Biology (2017, 2018, 2019, 2020, 2021, 2022)

4. Biomedical Image processing (2021)

Field : Genomics, single-cell epigenome and transcriptome, signal processing, data analytics

Skills: regulatory genomics, Advanced statistical approaches, data analytics, linear and graph signal processing , image processing, cryo-EM data processing, big data analytics

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Awards/Honours/achievement   .

1. Honoured by CBSE Board for being one of the highest mark achievers in mathematics in high school (class X)

2. Solved the first and highest resolution structure (so far) of LDL at human body temperature. LDL is involved in development of Atherosclerosis which leads to top 3 cause of death of humans (>30%) (https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death)
https://en.wikipedia.org/wiki/Low-density_lipoprotein#Structure

3. Young investigator grant, BMRC, A-STAR, Singapore, 2015 (150,000 SGD)

4. Outstanding educator award (teaching excellence) at IIIT Delhi in 2018

Thesis guided as supervisor (faculty)

Master's thesis supervised: more than 7

Phd thesis completed/submitted

1. **Smriti Chawla ,** thesis title: Interpreting single cell transcriptomes in the pathway space and its applications in cancer

2. **Neetesh Pandey** , thesis title : Unravelling Cellular Heterogeneity And Phenotypic Drug Responses Using Chromatin Profiles

3. **Shreya Mishra**, thesis title : Advancing Graph based computational approaches to decipher omic signature of diseases

4. **Indra Prakash Jha** , thesis title: Learning from high dimensional healthcare data to improve interpretability and insights

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Professional activities:

Selected National/International professional activities

1. Program committee member and session chair: IEEE ISBME 2009 : IEEE 4th International Symposium on Biomedical Engineering, Bangkok, Thailand, 2009

2. Technical program committee member : EUSIPCO (Top European signal processing conference) for 3 years

3. Organised a Workshop on "Regulatory Genomics" at IIIT Delhi. -2018 (more than 50 participants)

4. Reviewer for grant applications to Shastri Indo-Canadian Institute

5. Served as reviewer for multiple scientific articles for:
EUSIPCO (conference) and IEEE ISMBE conference, Bangkok
Journals : Scientific reports, Communication Biology, IEEE transaction in Neural networks, IEEE access, PLOS one, Briefings in Bioinformatics

6. Editorial Board member in BMC medical genomics
https://bmcmedgenomics.biomedcentral.com/about/editorial-board

7. Part of BINC committee for question paper setting: BINC is national level certification exam setup by department of Biotechnology. (2019)

Institutional activities

1. Involved in designing course curriculum for B. Tech. CSB programme at IIIT Delhi.

2. Coordinator, Institutional review board for 3 years: involved in registration of IRB committee in Indian (ICMR) and International councils and reviewing for ethics approval for project in IIIT Delhi**.**

3. Coordinator B. Tech., computational Biology department for 2 years.

4. Part of DBT post graduate teaching programme : coordinator : Dr Ganesh Bagler (2019-2020) IIIT Delhi.

5. DPR writing committee for TIH Anubhuti

Industrial activities and Positions

1. **Consultant :** ProBirds

2. **Consultant   (1 year) :** a-i-gene (USA)

3. **Senior Bioinformatician :** Genseq (2007-2008) Malaysia

Summary of publications
Google scholar link : **https://scholar.google.com.sg/citations?user=J82o5rYAAAAJ&hl=en**

Publications:

Journal Articles   (Impact factor by *2021-2022 citation index*),

1. Divyanshu Srivastava, Ganesh Bagler, **Vibhor Kumar**, Graph Signal Processing on protein residue networks helps in studying its biophysical properties, Physica A: Statistical Mechanics and its Applications, 615, 128603, 2023.   IF: 3.7

2. Shreya Mishra, Neetesh Pandey, Smriti Chawla, Madhu Sharma, Omkar Chandra, Indra Prakash Jha, Debarka SenGupta, Kedar Nath Natarajan, **Vibhor Kumar**, Matching queried single-cell open-chromatin profiles to large pools of single-cell transcriptomes and epigenomes for reference supported analysis, ***Genome Research***, 33: 218-231,2023.   IF: 9.48

3. Shreya Mishra, Neetesh Pandey, Atul Rawat, Divyanshu Srivastava, Arjun Ray, **Vibhor Kumar**, An explainable model using Graph-Wavelet for predicting biophysical properties of proteins and measuring mutational effects. ***IEEE access***, 2023.   IF: 3.9

4. Omkar Chandra, Madhu Sharma, Neetesh Pandey, Indra Prakash Jha, Shreya Mishra, Say Li Kong, **Vibhor Kumar**, Patterns of transcription factor binding and epigenome at promoters allow interpretable predictability of multiple functions of non-coding and coding genes, Computational and Structural Biotechnology Journal, 21, 3590-3603, 2023.   IF: 6.15

5. Madhu Sharma, Indra Prakash Jha, Smriti Chawla, Neetesh Pandey, Omkar Chandra, Shreya Mishra, **Vibhor Kumar**, Associating pathways with diseases using single-cell expression profiles and making inferences about potential drugs, ***Briefings in Bioinformatics***, 23(4), 2022, bbac241   IF: 13.99

6. Nirmala Arul Rayan, **Vibhor Kumar**, Jonathan Aow, Naghmeh Rastegar, Michelle Gek Liang Lim, Nicholas O'Toole, Edita Aliwarga, Danusa Mar Arcego, Hui Ting Grace Yeo, Jen Yi Wong, May Yin Lee, Florian Schmidt, Hajira Shreen Haja, Wai Leong Tam, Tie-Yuan Zhang, Josie Diorio, Christoph Anacker, Rene Hen, Carine Parent, Michael J Meaney & Shyam Prabhakar, Integrative multi-omics landscape of fluoxetine action across 27 brain regions reveals global increase in energy metabolism and region-specific chromatin remodelling, ***Mol. Psychiatry***, 27, 4510–4525, 2022.   IF: 13.43

7. Madhu Sharma, Rohit Kumar Verma, Sunil Kumar, **Vibhor Kumar**, Computational challenges in detection of cancer using cell-free DNA methylation, ***Computational and Structural Biotechnology Journal***, Volume 20, 26-39, 2022   IF:6.15

8. Shreya Mishra, Divyanshu Srivastava, **Vibhor Kumar**. Improving gene-network inference with graph-wavelets and making insights about ageing associated regulatory changes in lungs, ***Briefings in Bioinformatics***, 22(4): bbaa360, 2201   IF:13.99

9. Indra Prakash Jha, Raghav Awasthi, Ajit Kumar, **Vibhor Kumar**, Tavpritesh Sethi, Learning the Mental Health Impact of COVID-19 in the United States With Explainable Artificial Intelligence: Observational Study, ***JMIR mental health***, 8(4), e25097, 2021**.**   IF: 6.33

10. Neetesh Pandey , Omkar Chandra , Shreya Mishra , **Vibhor Kumar**, Improving Chromatin-Interaction Prediction Using Single-Cell Open-Chromatin Profiles and Making Insight Into the Cis-Regulatory Landscape of the Human Brain, ***Front Genet.*** 12:738194.. 2021.   IF:4.77

11. Smriti Chawla, Sudhagar Samydurai, Say Li Kong, Zhenxun Wang, Wai Leong TAM, Debarka Sengupta, **Vibhor Kumar**. UniPath: a uniform approach for pathway and gene-set based analysis of heterogeneity in single-cell epigenome and transcriptome profiles, ***Nucleic Acids Research***, 49(3): e13, 2021.   IF:19.16

12. Rachesh Sharma, Neetesh Pandey, Aanchal Mongia, Shreya Mishra, Angshul Majumdar, **Vibhor Kumar**. FITs: forest of imputation trees for recovering true signals in single-cell open chromatin profiles, ***NAR Genomics and Bioinformatics***, 2(4): lqaa091 2020*.*   *IF: 5*

13. Karaj Khosla*, Indra Prakash Jha*, Ajit Kumar, **Vibhor Kumar**. Local-Topology-Based Scaling for Distance Preserving Dimension Reduction Method to Improve Classification of Biomedical Data-Sets. ***Algorithms*** 2020, 13(8), 192.   IF: 0.51

14. Tong Ming Liu, Ege Deniz Yildirim, Pin Li, Hai Tong Fang, Vinitha Denslin, **Vibhor Kumar**, Yuin Han Loh, Eng Hin Lee, Simon M.Cool, Bin Tean Teh, James H.Hui, Bing Lim, Ng Shyh-Chang, Ascorbate and Iron Are Required for the Specification and Long-Term Self-Renewal of Human Skeletal Mesenchymal Stromal Cells, ***Stem cell Reports***, 14(2) 210-225 (2020*).*   IF*: 7.29*

15. Divyanshu Srivastava, Arvind Iyer, **Vibhor Kumar** #, Debarka Sengupta#, CellAtlasSearch: a scalable search engine for single cells, ***Nucleic Acids Research***, 46(W1):W141-W147, 2018. **(# corresponding Authors**)   IF: 19.16

16. Ankur Sharma, Elaine Yiqun Cao, **Vibhor Kumar**, Xiaoqian Zhang, Hui Sun Leong, Angeline Mei Lin Wong, Neeraja Ramakrishnan, Muhammad Hakimullah, Hui Min Vivian Teo, Fui Teen Chong, Shumei Chia, Matan Thangavelu Thangavelu, Xue Lin Kwang, Ruta Gupta, Jonathan R. Clark, Giridharan Periyasamy, N. Gopalakrishna Iyer & Ramanuj DasGupta, Longitudinal single-cell RNA sequencing of patient-derived primary cells reveals drug-induced infidelity in stem cell hierarchy, ***Nature Communications***, 9, 4931 (2018*).*   IF: 17.649

17. Ankur Sharma, **Vibhor Kumar**, Elaine Yiqun Cao, Hui Sun Leong, Muhammad Hakimullah, Neeraja Ramakrishnan, Xiaoqian Zhang, Fui Teen Chong, Shumei Chia, Matan Thangavelu Thangavelu, Angeline Mei Lin Wong, Xue Lin Kwang, Daniel Shao-Weng Tan, Giridharan Periyasamy, N Gopalakrishna Iyer, Ramanuj DasGupta, Single-cell RNA-seq unveils divergent modes of chemoresistance in squamous cell carcinoma, ***Mechanisms of Development***, 145, s114, 2017.   IF: 2.176

18. **Vibhor Kumar** , Nirmala Arul Rayan, Masafumi Muratani, Stefan Lim, Bavani Elanggovan, XIN Lixia, Tess Lu, Harshyaa Makhija, Jeremie Poschmann, Thomas Lufkin, Huck Hui Ng# & Shyam Prabhakar#, Comprehensive benchmarking reveals H2BK20 acetylation as a distinctive signature of cell-state-specific enhancers and promoters. *Genome Research*, 26(5) , 612-623, 2016.   IF: 9.4

19. Wenjie Sun, Jeremie Poschmann, Ricardo Cruz-Herrera del Rosario, Neelroop N. Parikshak, Hajira Shreen Hajan, **Vibhor Kumar** , Ramalakshmi Ramasamy, T. Grant Belgard, Bavani Elanggovan, Chloe Chung Yi Wong, Jonathan Mill, Daniel H. Geschwind, Shyam Prabhakar. Histone Acetylome-wide Association Study of Autism Spectrum Disorder, accepted, *cell, 167(5), 1385-1397, e11, 2016.* IF: 66.85

20. Irene Aksoy, Guillaume Marcy, Jiaxuan Chen1, Ushashree Divakar, **Vibhor Kumar,** Daniel John-Sanchez, Mehran Rahmani, Noel J. Buckley and Lawrence W. Stanton, A Role for REST in Embryonic Stem Cells Cardiac Lineage Specification, *Stem Cells,* 34(4):860-72, 2016.   IF: 5.2

21. Sumantra Chatterjee, V Sivakamasundari, Sook Peng Yap, Petra Kraus, **Vibhor Kumar**, Xing Xing, Siew Lan Lim, Joel Sng, Shyam Prabhakar and Thomas Lufkin, In vivo genomewide analysis of multiple tissues identifies gene regulatory networks, novel functions and downstream regulatory genes for Bapx1 and its co regulation with Sox9 in the mammalian vertebral column, *BMC Genomics* 2014, **15**:1072 doi:10.1186/1471-2164-15-1072.   IF: 4.55

22. Sumantra Chatterjee, Petra Kraus, V Sivakamasundari, Sook Peng Yap, **Vibhor Kumar**, Shyam Prabhakar, Thomas Lufkin, Genome wide binding (ChIP-Seq) of murine Bapx1 and Sox9 proteins in vivo and in vitro*, Genomics Data*, 10, 51-53, 2016.   IF: 0.54

23. Sumantra Chatterjee, V. Sivakamasundari, Petra Kraus, Sook Peng Yap, Vibhor Kumar, Shyam Prabhakar, Thomas Lufkin, Gene expression profiles of Bapx1 expressing FACS sorted cells from wildtype and Bapx1-EGFP null mouse embryos*, Genomics Data*, 5: 103–105. 2015.   IF: 0.54

24. Kyle M. Loh*, Lay Teng Ang*, Jingyao Zhang*, **Vibhor Kumar***, Jasmin Ang, Jun Qiang Auyeong, Kian , Leong Lee, Massimo Nichane, Lorenz Poellinger, Qingfeng Chen, Shyam Prabhakar, Irving L. Weissman & Bing Lim. Efficient Endoderm Induction from Human Pluripotent Stem Cells by Logically Directing Signals Controlling Lineage Bifurcations. *Cell Stem cell* ,14(2):237-52. 2014. (*equal contributing).   IF: 25.26

25. **Vibhor Kumar**, Masafumi Muratani, Nirmala Arul Rayan, Petra Kraus, Thomas Lufkin, Huck Hui Ng and Shyam Prabhakar, Uniform, optimal signal processing of mapped deep-sequencing data, *Nature biotechnology*, 31 (7), 615-622, 2013.   IF:68.16

26. Jia-Hui Ng*, **Vibhor Kumar***, Masafumi Muratani*, Petra Kraus, Jia-Chi Yeo, Lai-Ping Yaw, Kun Xue, Tomas Lufkin, Shyam Prabhakar, Huck-Hui Ng, In Vivo Epigenomic Profiling of Germ Cells Reveals Germ Cell Molecular Signatures. *Developmental Cell*. 11;24(3):324-33. 2013. **(* co-first, equal contribution)** IF: 13.4

27. Cecilia L. Winata, Igor Kondrychyn, **Vibhor Kumar,** Kandhadayar G. Srinivasan, Yuriy Orlov, Ashwini Ravishankar, Shyam Prabhakar, Lawrence W., Stanton, Vladimir Korzh, Sinnakaruppan Mathavan. Genome wide analysis reveals Zic3 interaction with distal regulatory elements to regulate zebrafish developmental genes. ***PLOS genetics*** ;9(10):e1003852,2013   IF: 5.1

28. Michelle Percharde, Fabrice Lavial, Jia-Hui Ng, **Vibhor Kumar**, Rute A. Tomaz, Nadine Martin, Jia-Chi Yeo, Jesus Gil, Shyam Prabhakar, Huck-Hui Ng, Malcolm G. Parker, and Veronique Azuara, Ncoa3 functions as an essential Esrrb coactivator to sustain embryonic stem cell self-renewal and reprogramming, ***Genes and Development,*** 26: 2286-2298, 2012.   IF: 12.89

 29. Vibhor Kumar, Sarah J Butcher, Katariina Öörni, Peter Engelhardt, Jukka Heikkonen, Kimmo Kaski, Mika Ala-Korpela, Petri T Kovanen, Three-Dimensional cryoEM Reconstruction of Native LDL Particles to 16Å Resolution at Physiological Body Temperature. ***PloS ONE*** 6(5): e18841. 2011.   IF: 3.75

30. **Vibhor Kumar**, Jukka Heikkonen, Jorma Rissanen and Kimmo Kaski, Minimum description length denoising with histogram models, ***IEEE trans. on signal Processing***, 54(8): 2922-2928, 2006. IF:5.02

31. Pasi Kaukinen*, **Vibhor Kumar***, Kirsi Tulimäki, Peter Engelhardt, Antti Vaheri, and Alexander Plyusnin, Oligomerization of Hantavirus N protein: C-terminal α-helices interact to form a shared hydrophobic space, ***Journal of Virology***, 78(24): 13669-13677, 2004. **(* co-first)**   IF:6.54

 32*. **Vibhor Kumar**, Jukka Heikkonen, Peter Engelhardt and Kimmo Kaski, Robust filtering and particle picking in micrograph images towards 3D reconstruction of purified proteins with cryo-electron microscopy. ***Journal of Structural Biology***, 145(1-2):41-51, 2004.   IF: 3.23

33. Agne Alminaite, Vera Halttunen, **Vibhor Kumar**, Antti Vaheri, Liisa Holm, and Alexander Plyusnin, Oligomerization of Hantavirus nucleocapsid protein: Analysis of the N-terminal coiled-coil domain, ***Journal of Virology***, 80(18): 9073-9081, 2006.   IF:6.549

Comments/highlights

*34. ***Vibhor Kumar** and Shyam Prabhakar*, A new mark for enhancers, Principals of systems Biology-4, Cell systems, 2(4) P216-218, 2016   *IF: 11.09*

Book Chapter

35.   A Plyusnin, **V Kumar**, O Vapalahti, P Engelhardt, Nucleocapsid Protein of Hantaviruses (Bunyaviridae): Structure and Functions, Structure-Based Study Of Viral Replication: (With CD-ROM), 553-570.

Technical peer-reviewed publications in conference proceedings

36. Vibhor Kumar and Jukka Heikkonen, Denoising with flexible histogram models on minimum description length principles, proceedings of 13th International conference on Systems, Signals and Image Processing, IWSSIP-2006, September 21-24 , 2006, Budapest, Hungary.

 37. Lena Hallivuori, **Vibhor Kumar,** Jukka Heikkonen , Using Kalman Filters to Model Gene,Regulatory Networks, In Juho Rousu, Samuel Kaski, and Esko Ukkonen, editors, Probabilistic Modeling and Machine Learning in Structural and Systems Biology (PMSB 2006), International workshop proceedings, 2006.

38. Vibhor Kumar, Danai Laksameethanasan and Peter Engelhardt, Reconstructing small and invisible Protein structures with electron microscopy, International Symposium on Biomedical Engineering, Bangkok, 2009.

Patent :

Patent Application : Linking drugs targeting pathways with diseases and side-effect using single-cell transcriptome.

Selected out of many Talks/Workshop/Posters

1. poster at 3rd Annual Joint Conference on Systems Biology, Regulatory Genomics, and Reverse Engineering Challenges, New York, 2011. (presented poster)
2. Presentation at International Symposium on Biomedical Engineering, Bangkok, 2009.
3. invited talk at Biotechnology Workshop: Structure Biology NSYSU, TAIWAN, 2008. (invited speaker)
4. presentation at 13th International Conference on Systems, Signals and Image Processing, Budapest, Hungary, 2006. (presented a scientific manuscript reviewed for proceedings)
5. poster at International work shop on Probabilistic Modelling and Machine Learning in Structural and Systems Biology (PMSB 2006), Helsinki, Finland, 2006. (presented poster)
6. presentation at IT university of Copenhagen, June, 2023
7. presentation at Denmark Technical University, june 2023

8. 2nd International Conference on Genome Biology (Madurai Kamraj University)
http://www.genomicsmku.org/docs/MKU%20SBS%20ICGB2%20Flyer.pdf

9. Webinar in perspective of computational Biology (IISER Mohali)
https://sites.google.com/view/compbiowebinar/home

10. Manav – Data Science Webinar Series
    https://indiabioscience.org/events/webinar-on-the-analytical-challenges-and-promises-of-single-cell-epigenomics

11. invited speaker in India-UK bilateral SPARC symposium, August, 2020,