



Vikram Singh

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AREA OF RESEARCH INTEREST

Ayurveda Informatics, Biological Networks, Data Science, Complex Systems, Systems Modelling

EDUCATION

- Ph.D. in Bioinformatics and Computational Systems Biology, March 2012 School of Computational & Integrative Sciences, Jawaharlal Nehru University, New Delhi.

Thesis title: “Coding and Noncoding Genes: Aspects of their Identification, Distribution & Regulation”

- Advanced Post-Graduate Diploma in Bioinformatics, 2006
School of Computational & Integrative Sciences, Jawaharlal Nehru University, New Delhi.
- M.Sc. in Physics, 2004
Department of Physics, University of Allahabad, Prayagraj. (NET with JRF in Physical Sciences, 2005, UGC-CSIR)
- B.Sc. (Physics, Chemistry, Maths group), 2002
Ewing Christian College, University of Allahabad, Prayagraj.

EMPLOYMENT

- November, 2012 – present: Assistant Professor, Centre for Computational Biology and Bioinformatics, Central University of Himachal Pradesh, Dharamshala.
- July, 2012 – October, 2012: Guest Lecturer, Department of Computer Sciences, Jamia Millia Islamia, New Delhi.
- January, 2012 – May, 2012: Assistant Professor (ad-hoc), Department of Physics, Shivaji College, University of Delhi, New Delhi.
- October, 2011 – April, 2012: Guest Lecturer, Department of Bio-Sciences, Jamia Millia Islamia, New Delhi.

COURSES TAUGHT

1. At Central University of Himachal Pradesh, Dharamshala (to M.Sc./Ph.D. Computational Biology and Bioinformatics)
 - BIN 473: Systems Biology and Biological Networks
 - BIN 451: Algorithms in Bioinformatics
 - BIN 461: Elements of Data Science
 - BIN 607: Machine Learning: Algorithms and Applications
 - BIN 555: Introduction to Synthetic Biology
 - BIN 556: Systems Biology Lab
 - BIN 409: Statistical Methods
 - CBB 411: Introduction to PERL programming
 - CBB 436: History of Science and Technology in India
2. At Department of Computer Sciences, Jamia Millia Islamia. (to M.Sc. Bioinformatics)
 - Advanced Systems Biology
 - Computational Methods for (Biological) Data Analysis

3. At Shivaji College, University of Delhi (to B.Sc. Physics (H))
 - Numerical Analysis
4. At Department of Biosciences, Jamia Millia Islamia. (to B.Sc. Bio-sciences)
 - General Physics (with applications in Biology)

RESEARCH INTERESTS

1. **Ayurveda Informatics:** My group is working towards the integrated applications of bioinformatics and systems biology principles to the age-old traditional Indian medicinal system, commonly known as Ayurveda. We are exploiting the genomic and transcriptomic data of Ayurvedic herbs for guiding the annotation of systems scale gene regulatory and protein-protein interaction networks and development of metabolic models. We are also involved in the network pharmacological evaluation of Ayurvedic herbs for deciphering the multitargeting and synergistic associations of phytochemicals with disease associated proteins and miRNAs, and guided by those insights trying to predict the efficacies of Ayurvedic herbs against various diseases using machine learning methods.
2. **Systems Modelling:** We are trying to understand the synchronization properties of genetic oscillatory networks, natural or synthetically designed, and to study the presence of multistability and multirhythmicity in the networks of coupled oscillators. As most phenomena within the cell are stochastic and have large fluctuations, because of intra- and extra-cellular noise, we study the time evolution of these problems as a discrete, stochastic process along with the traditional deterministic approach. Very recently, we have started studying the human behaviour from the systems modelling perspectives.
3. **Biological Networks:** We are working towards exploring the higher order organization in biological networks, both at the cellular and subcellular scales. The main theme of the research is to find out the scales of biological hierarchy at which these higher order patterns differentiate. Recently, we have examined the index-case global transportation network of SARS-CoV-2 and are also trying to gain network medicine and machine learning guided insights about the COVID-19 therapeutics.

MEMBERSHIPS

Professional Bodies:

- Member, American Chemical Society (2019-20)
- Member, Indian Science Congress (Life Member)
- Member, Vijnana Bharati (Life Member)
- Member, National Network of Mathematical and Computational Biology (2014-2016)
- Member, Himalayan Life Science Society (Founding Member)

EVENTS

- Executive Committee Member, “One day workshop on the commemoration of RadhanathSikdar as a Mathematician and Freedom Fighter” jointly organized by CUHP, GDC Dharamshala, in association with HPU Shimla, HPTU Hamirpur, NIT Hamirpur, and ViBha on 1st November, 2022. Funded by Ministry of Culture, GoI.
- Coordinator, Maharshi Kanad Vyakhyannamala, organised at Central University of Himachal Pradesh, since May 2020.
- Convener, Vigyanotsav organized at Central University of Himachal Pradesh during 27th-28thFebruary 2018.
- Convener, National Symposium on Bioinformatics and Computational Systems Biology organized at Central University of Himachal Pradesh during 12th-14thNovember 2016 in collaboration with NNMCB (DST).

STUDENTS

Ph.D. students:

- **Thesis awarded:**
 1. Gagandeep Singh – (2020)
Thesis title: In-silico studies on systems scale characterization of *Camellia sinensis* (tea) using transcriptomic and genomic data
Currently, Postdoctoral Researcher at Institute of Molecular Biosciences, University of Queensland, Australia

2. Neha Choudhary – (2022)
Thesis title: Network pharmacological evaluation of selected Ayurvedic medicines
Currently, Assistant Professor at Centre for Computational Biology and Bioinformatics, Central University of Himachal Pradesh, Dharamshala, India

- **Submitted:**

1. Vikram Singh – (2022)
Thesis title: Exploration of higher order organization in cellular and sub-cellular networks

- **Ongoing:**

1. Ashish Panghalia – UGC Fellowship
Thesis title: Network theory and machine learning based studies on small molecule-ncRNA associations
2. Sweta Devi – DST-INSPIRE Fellowship
Thesis title: Network medicine guided deep learning of Ayurvedic formulations

M.Sc. students:

- Abhishek Rana, Nitika Bharadwaj, Shilpa Thakur, Vishal Singh (2023)
- Amit Daroch, Ragini Gautam, Nitika Sharma, Diksha Sharma, Samiksha, Priyanka Sharma (2022)
- Priya, Priyanka, Priyanka Rattan, Rittu Sharma, Anshika Verma, Priyanka Sharma, Deeksha Sharma, Vaishali (2021)
- Ankita Chauhan, Pushpesh Dhiman, Radhika Joshi, Shilpa Pathania (2020)
- Deepanshi Awasthi, Akruiti Sharma, Poonam, Jyoti Verma, Deepika Bharmoria, Naveen Chaudhary, Ibha Thakur, Kajal Sharma, Kanchan Bala, Swati, Varsha Kumari (2019)
- Sweta Devi, Shilpa Devi, Deepika Kumari, Sahivani Thakur, Divya Bharti, Nandini Rana, Anupama, Nirjala Devi, Rashmi Sharma, Shefali Choudhary, Sabir Khan, Bindiya Koundal, Shilpa Sharma (2018)
- Neha Chouhan, Nisha, Shivani, Varsha Patial, Ritika, Pushpa Kumari, Priyanka Kumari, Ishu, Meenu (2017)
- Tanya Verma, Ashish Panghalia, Gulshan Dhiman, Anju Bala, Sristi Devi, Poonam Thakur (2016)
- Bhanu Sharma, Swati Rana, Rishu, Prakash Chand (2015)
- Girija Kaushal, Ravi Saroch, Naina Patiyal, Isha Chandel, Swati Kashyap, Rajni Sharma (2014)
- Vikram Singh (2013)

SELECTED PUBLICATIONS

Peer Reviewed Articles:

- [A multiscale modelling framework to study the interdependence of brain, behavior and pandemic](#)
S Kumar, B Sharma and **V Singh**
Nonlinear Dynamics, 2023; 111:77297749
- [Construction and stochastic scale-free modelling of empirical, global, index-case SARS-CoV-2 transmission network](#)
V Singh and **V Singh**
Journal of Complex Networks, 2022; 10.1:cnab047
- [Multi-scale mechanism of antiviral drug-alike phytoligands from Ayurveda in managing COVID-19 and associated metabolic comorbidities: insights from network pharmacology](#)
N Choudhary and **V Singh**
Molecular Diversity, 2022; 26:25752594
- [Systems scale characterization of circadian rhythm pathway in *Camellia sinensis*](#)
G Singh, V Singh and **V Singh**
Computational and Structural Biotechnology Journal, 2022; 20:598-607
- [Genome-wide interologous interactome map \(TeaGPIN\) of *Camellia sinensis*](#)
G Singh, V Singh and **V Singh**
Genomics, 2021; 113:553-564
- [Deciphering the multi-scale mechanisms of *Tephrosia purpurea* against polycystic ovarian syndrome \(PCOS\) and its major psychiatric comorbidities: Studies from network pharmacological perspective](#)
N Choudhary, S Choudhary, A Kumar and **V Singh**
Gene, 2021; 773:145385

- [Complete mitogenome of endemic plum-headed parakeet *Psittacula cyanocephala* characterization and phylogenetic analysis](#)
P Dey et al.
Plos one, 2021: 0241098
- [TulsiPIN: An Interologous Protein Interactome of *Ocimum tenuiflorum*](#)
V Singh, G Singh and **V Singh**
Journal of Proteome Research, 2020; 19(2):884-899
- [Insights about multi-targeting and synergistic neuromodulators in Ayurvedic herbs against epilepsy: integrated computational studies on drug-target and protein-protein interaction networks](#)
N Choudhary and **V Singh**
Scientific Reports, 2019: 10565
- [Construction and analysis of an interologous protein-protein interaction network of *Camellia sinensis* leaf \(TeaLIPIN\) from RNASeq data sets](#)
G Singh, V Singh and **V Singh**
Plant Cell Reports, 2019; 38:1249-62
- [A census of *P. longum*'s phytochemicals and their network pharmacological evaluation for identifying novel drug-like molecules against various diseases, with a special focus on neurological disorders](#)
N Choudhary and **V Singh**
PloS one, 2018; 13(1):e0191006
- [Functional elucidation of hypothetical proteins for their indispensable roles towards drug designing targets from *Helicobacter pylori* strain HPAG1](#)
G Singh and **V Singh**
Journal of Biomolecular Structure and Dynamics, 2018; 36(4):906-18
- [Bifurcation in Cell Cycle Dynamics Regulated by p53](#)
MJ Alam, S Kumar, **V Singh** and RKB Singh
PloS one, 2015; 10(6):e0129620
- [Stochastic synchronization of circadian rhythms](#)
RKB Singh, **V Singh** and R Ramaswamy
Journal of Systems Science & Complexity, 2010; 23(5):978-88

Books and Book Chapters:

- [Systems and Synthetic Biology](#)
V Singh and Pawan K Dhar (Eds.)
Springer-Verlag, Dordrecht, Netherlands, 2015 (ISBN 978-94-017-9513- 5)
- [Design Principles of Synthetic Biological Oscillators](#)
A Panghalia and **V Singh**
in Advances in Synthetic Biology, Eds. Vijai Singh (Springer, Singapore, 2020) pp. 99-127
- Higher order organization in biological systems: an introduction
V Singh and **V Singh**
to appear in Bioinformatics and Computational Biology: Technological Advancements, Applications and Opportunities, Eds. TR Singh, H Saini and MC Juniori (CRC Press, 2023) [ISBN 978-10-033-3124-7]
- [Modelling Methodologies for Systems Biology](#)
V Singh
in Systems and Synthetic Biology, Eds. Vikram Singh and Pawan K Dhar, (Springer-Verlag, Dordrecht, Netherlands, 2015) pp. 43-62
- [Switching Mechanism in the p53 Regulatory Network](#)
MJ Alam, **V Singh** and RKB Singh
in Systems and Synthetic Biology, Eds. Vikram Singh and Pawan K Dhar, (Springer-Verlag, Dordrecht, Netherlands, 2015) pp. 195-216

Conference Proceedings:

- Spectral analysis of long noncoding RNAs
V Singh and R Ramaswamy
International Conference on BioInformatics and Computational Biology, BICB 2011, B31–B38. (ISBN: 978-981-08-8119-1)
- Synchronization of coupled repressilators via quorum sensing
V Singh, AS Mer, R Pandey, A Nandi and R Ramaswamy
International Workshop On Physics In Biology: A Synergy IWPBS 2007; 117–125. (ISBN: 978-81-8424-576-9)

Preprints:

- [Characterizing the organizational diversity of protein interaction networks across three domains of life](#)
V Singh and **V Singh**
arXiv (2022): 2203.00999
- [Characterizing circadian connectome of *O. tenuiflorum* using an integrated network theoretic framework](#)
V Singh and **V Singh**
bioRxiv (2022): 2022.03.02.482599v1
- [Neuromodulators in food ingredients: insights from network pharmacological evaluation of Ayurvedic herbs](#)
N Choudhary and **V Singh**
arXiv (2021): 2108.09747
- [Modelling the role of media induced fear conditioning in mitigating post-lockdown COVID-19 pandemic: perspectives on India](#)
S Kumar, B Sharma and **V Singh**
arXiv (2020): 2004.13777v2
- [Emergent dynamics in an astrocyte-neuronal network coupled via nitric oxide](#)
B Sharma, S Kumar, S Ghosh and **V Singh**
arXiv(2203): 2203.07193

TALKS/ LECTURES

- Invited talk on “Introduction to Network Medicine” in the 26th Refresher Course in Life Sciences & Biotechnology, UGC-Human Resource Development Centre, Jawaharlal Nehru University, New Delhi, 6th-18th December, 2021
- Invited talk on “Introduction to Network Pharmacology” in the In service teachers training programme, GCTE Dharamshala, 9th-14th December, 2019
- Invited talk on “Higher-order organization in PINs and RINs” in the symposium “Bioinformatics: Back to the Future-2” held at JNU, New Delhi, 29th September 2018
- Invited talk on “Higher-order organization in bidirectional biological networks” in the national conference on “Recent Advances in Experimental and Theoretical Physics (RAETP-2018)” held at Central University of Jammu, 17th-18th April 2018.
- Invited talk on “Exploring organization principles in the biological systems in the national symposium on “Emerging Trends in Computational Biology” held at JNU, New Delhi, 16th-18th December 2017.
- Invited talk on “Computational Design of Synthetic Gene Circuits in the international conference on “International Biological Engineering Meeting (iBEM 1.0)” held at JNU, New Delhi, 26th-28th March 2017.
- Invited talk on “Computational Design of Networks in the “Synthetic Biology Workshop” held at SBT, JNU, New Delhi, 28th March 2016.
- Invited talk on “Noise induced emergent properties in the dynamics of four-gene-repressilator (FGR) in the “National Symposium on Computational Systems Biology” held at JUIT, Waknaghat, 18th-20th March 2016.
- Invited talk on “Networks in Biology, Dynamics on Networks in the “A workshop on Bioinformatics: Genomics, Proteomics and Systems Biology” held at SMVDU, Katra, 10th-11th March 2016.
- Invited talk on “Aspects of Statistical Genomics and Dynamical Gene Regulation” in the symposium on “Multilevel Modeling in Biological Systems” held at SC&IS, JNU, New Delhi, 14th March 2015.
- Invited talk on “Introduction to Bioinformatics and its Applications” in the lecture program on “Mathematical

Modelling and Data Analysis in Biology” held at IIT Mandi, 27th-29th October 2014.

- Invited talk on “At the Interface of Bioinformatics and Systems Biology” in the international conference in “Future and Challenges of Computational and Integrative Sciences” held at HRMV, Jalandhar, 7th-8th November 2014.
- Invited talk on “Competition and Co-operation in the Colonies of Synthetic Biological Systems” in the “Indo-US conference on Synthetic and Systems Biology” held at JNU, New Delhi, during 9th-12th November 2014.
- Invited talk on “Dynamical Systems: From Cells to Societies” in the national workshop on “Analytical Aspects of Dynamics” held at CUHP, Dharamshala, during 11th-17th November 2014.
- Oral presentation on “Spectral Analysis of long non-coding RNAs” in the “International Conference on Bioinformatics and Computational Biology” (BICB 2011), Singapore, 28th February-1st March 2011.
- Invited talk on “Universal Spectral Features of Genomic DNA Sequences” in the national workshop on “Physics of DNA” held at Banaras Hindu University, Varanasi, 11th-13th August 2010.
- Oral presentations in the Dynamics Day Delhi conferences 2008, 2009.
- Delivered lectures at the workshop on “Applications of Bioinformatics” held at Kumaun University, Nainital, 29th August-01st September 2007.

CONFERENCES/ SCHOOLS ATTENDED

- Ministry of Education sponsored online Refresher Course (21st Century Environmental Issues, Challenges & Solutions) under the aegis of Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching at Teaching Learning Centre, Ramanujan College, University of Delhi, New Delhi during 15th July 2021 -29th July 2021.
- Ministry of Education sponsored online Refresher Course (Advanced Research Methodology: Tools and Techniques) under the aegis of Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching at Teaching Learning Centre, Ramanujan College, University of Delhi, New Delhi during 30th January 2021 -14th February 2021.
- UGC-Sponsored Refresher Course (1st Interdisciplinary Course in Environmental Studies) at Academic Staff College, Jawaharlal Nehru University, New Delhi during 28th August 2016 -23rd September 2016.
- UGC-Sponsored Orientation Course at Academic Staff College, Jawaharlal Nehru University, New Delhi during 05th-30th October 2015.
- Symposium on “Complex Systems: From Physics to Biology”, Jawaharlal Nehru University, New Delhi, 15th-16th October, 2013.
- Short course on “Introduction to Immunology for Physical Scientists and Engineers” by Prof. Arup Chakraborty, IIT Bombay, 25th-27th October 2010.
- International Conference on “Evolution of Complex Networks”, Indian Institute of Science, Bangalore, 13th-15th January 2010.
- “DST SERB school on Nonlinear Dynamics”, Delhi University, Delhi, 7th-25th December 2009.
- International Workshop on “Complex Dynamics of Physiological Systems: From Heart to Brain, CDPS 2007”, Presidency College, Kolkata, 11th-15th February 2007.
- International Conference on Bioinformatics (InCOB), New Delhi, 18th - 20th December 2006.

PERSONAL DETAILS

- Date of birth: 01-01-1981
- Nationality: Indian
- Marital status: Married to Dr.Shilpi Singh
- Daughter: Yashvi Singh, Son: Keshav Singh
- Correspondence address: Dr.Vikram Singh, Room No. 209, Centre for Computational Biology and Bioinformatics, Central University of Himachal Pradesh, Shahpur Campus, Kangra-176206, India