



# BIOINFORMATICS

## Concepts and Applications

This book broadly highlights about the bioinformatics in agriculture sector, chemoinformatics, database resources for medical and health science researches. This book includes important chapters regarding Microarray data analysis in Agri-Informatics, Next generation sequencing, bioinformatics approaches in tomato genome studies, etc. The coverage of this book will enable reader to update his/her knowledge about bioinformatics concepts as well as applications in different sectors. It is believed that this book will be useful for the reader to get equipped with the knowledge regarding current issues related to bioinformatics and related sciences. This book would be useful for the researchers, academicians, scholars and policy-makers.



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**BIOINFORMATICS Concepts and Applications**  
Satendra Singh • Budhayash Gautam • Dharendra Kumar • Gurudayal Ram Guru • Pramod Kumar Yadav • Vibha Raj Shanti



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## Concepts and Applications

Satendra Singh  
Budhayash Gautam  
Dhirendra Kumar  
Gurudayal Ram Guru  
Pramod Kumar Yadav  
Vibha Raj Shanti



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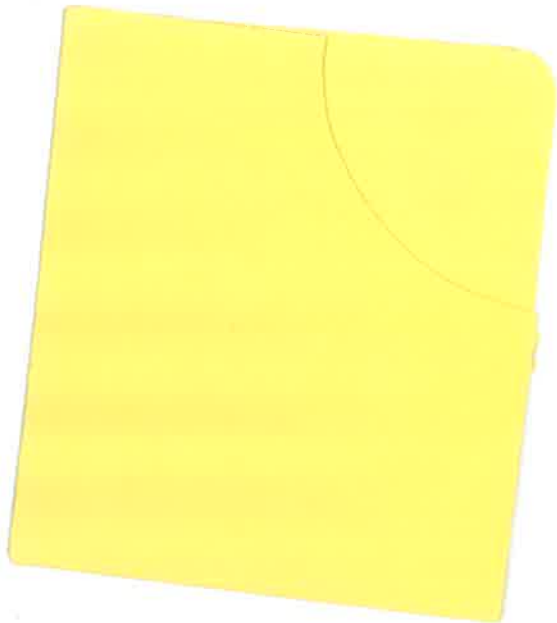
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# **Bioinformatics :** Concepts *and* Applications

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*Editors :*

**Dr. Satendra Singh**  
**Dr. Budhayash Gautam**  
**Dr. Dharendra Kumar**  
**Dr. Gurudayal Ram Guru**  
**Dr. Pramod Kumar Yadav**  
**Vibha Raj Shanti**



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## About the Editors

**Dr. Satendra Singh** is currently working as an Assistant Professor in the Department of Computational Biology and Bioinformatics, Jacob Institute of Biotechnology and Bioengineering, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh. He has completed B. Pharma (UPTU), M. Tech. Bioinformatics (IIITA) and Ph.D. in Bioinformatics (SHUATS). He has qualified GATE-2003, 2004 and GATE-2006. His main area of research interests are genome analysis, drug designing, chemoinformatics molecular dynamics and Agriculture Bioinformatics. Dr. Singh has published research papers in national and international peer reviewed journals. He is the recipient of several awards, including Excellence in Teaching award, Young scientist awards, Best research paper award and Best oral presentation award, etc. Dr. Singh is having life time memberships of several National and International societies.

**Dr. Budhayash Gautam** is an Assistant Professor (Senior Grade) of Bioinformatics and Computational Biology at "Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U.P., India", where he is serving for the last twelve years. He has his Ph.D. in Bioinformatics. He has also two masters, one in Bioinformatics and another one in the Biotechnology area. He has over 14 years of experience of teaching and research where he has taught bioinformatics to graduate, undergraduate and doctoral students. He has worked extensively on several bioinformatics projects. He has more than 40 International research publications published in several good reputed and peer-reviewed journals. He has several co-authored chapters too in his name in books published in various international publishing houses. He has several Awards and Honours in his name given by various national international societies.

**Dr. Dharendra Kumar** is presently working as Assistant Professor of Animal Genetics & Breeding at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J), R.S.Pura, Jammu (J&K). Dr. Dharendra is a recipient of Best Ph.D. Thesis award, Appreciation Award (2), Distinguished Scientist Award, Excellence in Teaching Award, young Scientist Award (2) and Life Science Leadership Award. He has also served as Organizing Secretary of International Conference (1), Joint Organizing Secretary of International Conference (1) and Co-organizing Secretary of National Conference/Symposium (2). Presently he is the

Principal Investigator of Network Project of NBAGR-ICAR on Characterization of Poonchi Chicken. He also acted as a Co-principal.

Investigator under Network Projects of ICAR on "Characterization of Sheep and Goat". He was the co-project leader of the project "Capacity building /Training of Women Self Help Group members from Umeed as Community Paravets". He has published more than 40 research and review articles in reputed national and international scientific journals. He has edited three books. He has also contributed in scientific fields by means popular articles, conference proceeding papers, short communications, chapters in books, manuals, edited publications, etc.

**Dr. Gurudayal Ram Guru** is presently working as an Assistant Professor in the Department of Molecular and Cellular Engineering, Jacob Institute of Biotechnology and Bioengineering, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh. He has done B.Sc. Agriculture from Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, M.Sc. (Agri.) Biotechnology from Odisha University of Agriculture, Technology and Sciences, Bhubaneswar, Odisha, Ph.D. Biotechnology from Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh. He is recipient of ICAR merit and DBT scholarships during UG and PG studies respectively and has qualified UGC-CSIR NET. He is currently teaching and guiding Undergraduate, Postgraduate and Doctoral students for their project work/dissertation/thesis. He has published research papers in national and international peer reviewed journals and has been appointed as member, Editorial Board and Reviewer of several journals. He has also participated in several National and International conferences. He has been conferred several awards like Excellence in Teaching award, Young scientist award and Best oral presentation award, etc. He has life time memberships of several National and International societies.

**Dr. Pramod Kumar Yadav** has obtained M. Tech. (Bioinformatics) degree from Indian Institute of Information Technology (IIIT), Allahabad in 2006 and Ph.D. (Bioinformatics) from SHUATS, Allahabad in 2014. He has qualified GATE-2003 and GATE-2004, and received graduate scholarship by Ministry of Human Resource and Development, Govt. of India, New Delhi. Currently, Dr. Yadav is working as an Asst. Professor (senior scale) in the Dept. of Computational Biology & Bioinformatics, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (Allahabad), U.P., India. He is actively involved in Teaching and Research since last 14 years. He has published 26 research articles in international and national peer-reviewed journals. Dr. Yadav is recipient of Young

Scientist Award-2015 by Society of Bioinformatics and Biological Sciences. He has given several invited talks in workshops/conferences. Dr. Yadav is editorial board member and reviewer of many international journals. His areas of research interest include molecular modelling, molecular dynamics simulation, docking, structure-based drug designing, in silico drug target identification, and computational epitope prediction.

**Vibha Raj Shanti** is PI of WOS-B project funded by DST, Gov. of India. Her areas of research interest include drought stress, next generation sequencing, transcriptom study, bio-pesticides, etc. She has published research papers in national and international peer reviewed journals.

## *Preface*

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Bioinformatics is a new field of science but it is making progress in every field of biotechnology very rapidly. Bioinformatics has its applications in the medicine by providing the genome information of various organisms, and also in the field of agriculture has also taken advantage of this field because micro-organisms play an important role in agriculture and bioinformatics provides full genomic information of these organisms. The genome sequencing of the plants and animals has also provided lots of benefits to agriculture. Tools of bioinformatics are playing significant role in providing the information about the genes present in the genome of these species. These tools have also made it possible to predict the function of different genes and factors affecting these genes. Transcriptome is a mirror of the sequence of the DNA (Gene) from which it has been transcribed, thus by analyzing the entire collection of RNA sequences in a cell (transcriptome), researchers can determine when and where each individual gene is turned on or off in particular cell or tissue of an organism. Chemoinformatics is one of the promising branches of drug discovery which enables the application of modern day computational approaches to decipher the chemical problems. Microarrays are belonged to most recent discoveries in the developmental biology studies, to facilitate to keep an eye on an expression of probes of thousands of genes concurrently. Gene expression profiling recognizes the simultaneous expression intensities of the enormous probes, usually inside the multiple experiments spanning a range of cell types, treatments or environmental conditions and it is assayed by microarray data analysis. In recent decades, next-generation sequencing (NGS) and bioinformatics have become an advance application in understanding and improving the study of genome. Next-generation sequencing (NGS), also known high throughput sequencing is bringing a revolution in genomics and proteomics by revealing the unknown facts of genome. Medical and health science databases are collection of information for medical and health science research collected from scientific experiments, published literature and computational studies. These databases contain information from variety of research areas including genomics, proteomics, metabolomics, microarray gene expression, physiology, structural biology and drug discovery which include information on gene structure, function and localization as well as clinical effects of mutations. Tomato is one of the most important vegetable plant, and is considered as model crop for fruit development for many plants.

The chapters are invited from the various scholars, researchers and academicians throughout the country. We are highly thankful to all the resource persons for their valuable contribution in this book. The views expressed in this book are solemnly those of the authors.

Despite the careful efforts have been made in compilation of present publication, if any error, may kindly be pardoned and brought to the notice for further improvement. We hope the present publication will be useful to the scholars, researchers, policy-makers and academicians in the field of bioinformatics, biotechnology and related fields.

#### Editors

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