

Importance of Bioinformatics Application and Data Mining in Medicine

Duygu Kirkik ^{1*}, Pinar Karadayi Atas ²

¹Department of Medical Biology, University of Health Sciences, Istanbul, Turkey.

²Department of Computer Engineering, Arel University, Istanbul, Turkey.

Corresponding Author: Duygu Kirkik, Department of Medical Biology, University of Health Sciences, Istanbul, Turkey.

Received Date: June 22, 2022; **Accepted Date:** June 30, 2022; **Published Date:** July 12, 2022.

Citation: Duygu Kirkik, and Pinar Karadayi Atas. (2022) Importance of Bioinformatics Application and Data Mining in Medicine. *Journal of General medicine and Clinical Practice*, 5(3); Doi: [10.31579/2639-4162/068](https://doi.org/10.31579/2639-4162/068)

Copyright: © 2022 Duygu Kirkik, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Bioinformatics and data mining is a multidisciplinary area that is important area for solving biological problems and they help predictions about biological solutions. Bioinformatics tools have a role in the development of science and technology, and it is crucial to biotechnological production, determining the structures and functions of protein, designing small molecules, identification of complex genetic function or regulation activities, and production of new macromolecules are used in medical or industrial. The aim of this article is to understand the usage of bioinformatics tools and data mining and highlight its importance in medicine.

Key Words: bioinformatics; biological; biotechnological

Introduction

Bioinformatics approach includes the integration of computers, software tools, and databases to address biological questions and it is often used to generate large datasets [1]. Genomics and proteomics are two important large-scale activities using bioinformatics. The main purpose of the bioinformatics approach is to understand and define all the functions related to an organism whose genome is given and to increase the quality of life.

The bioinformatics approach supports the collection of quantitative data on genomes, protein sequences, and three-dimensional structures of proteins, metabolic pathway databases, cell lines, hybridoma information, and biodiversity-related information of all biological species, including humans [2]. Recently, bioinformatics tools have been used in many studies. Moreover, it is significant in production and process development based on biotechnology. The design and development of drugs are expensive and time-consuming processes. Bioinformatics greatly shortens both the cost and the realization time of these processes [3]. The research area is very large in bioinformatics such as DNA, RNA, and protein sequencing studies, three-dimensional structure investigations of macromolecular structures, investigation of the interaction of small molecules (potential therapeutic agents, active peptides, ribozymes, etc.) with their ligands, integration of heterogeneous biological databases, mathematical modeling, and simulation of many biological activity processes, from chemical reactions to intercellular communication [4]. Innovations in biotechnology have shown fastest-growing production area of technology. One of the best features of bioinformatics tools is that

can medical diagnosis and treatment, as well as drug design. Another best feature is that cheap. Experimental methods are used to determine the structure of proteins and they are very expensive. The experiments can take a long time, and the use of statistical and cognitive methods has become a necessity. Thus, the bioinformatics tool provides creating a data set of protein-protein interaction by using the information in the protein data bank and then statistically examining the interaction using this data set. Role of these data in determining the interaction mechanisms of proteins with each other [5].

Bioinformatics plays a very important role in medicine and medical sciences. A significant function of bioinformatics is to help explain biological events at the molecular level. Pathogen enzymes or mutated natural enzymes can be modeled by homology, and these models can be used to explain molecular biologically determined effects. Recently, bioinformatics has focused on the application of the medical science area [6]. For instance, gene expression is part of this area, and generally, the expressions of cells can affect by different diseases and compare with healthy cells, and this information can use in the diagnosis of disease and target drug design [7]. Moreover, bioinformatics tools help to design compounds that can bind to the expressed protein, and more importantly, to identify transcription regulators that cause changes in the expression level. In this context, the toxicity of the drugs can test by these tools, and evaluation of response can do without a laboratory in the pharmacological application [8].

The usage of data mining is common in bioinformatics and it has developed day by day in computer science. Biological data can differ in

content such as genes, protein sequences, evolutionary relationships, three-dimensional structures, etc. and information is stored in different formats. There is much information in the literature but it is not usable in cognitive methods. In recent years, data mining has been developed by computer engineers and geneticists and it supports easy access to medical sciences [9].

The usage of information technologies such as data mining, artificial intelligence, internet-based information exchange, and programming and statistical, mathematical modeling, and analysis methods has increased in bioinformatics. [10,11]. These developments become important interdisciplinary collaborations.

Conclusion

Understanding the function of proteins, and finding the relationships between the amino acid sequences are important in medicine. Today, the three-dimensional structure of hundreds of thousands of proteins belonging to different organisms is known. These structures are collected in protein data banks. This information will provide a better understanding of many biological events; therefore, it will be useful in the identification, diagnosis, and treatment of genetic diseases. Many researchers will need computational biology and bioinformatics in the future.

Conflict of Interest: We declare that there is no conflict of interest.

References

1. Bayat A. Science, medicine and the future: Bioinformatics. *BMJ*, 2002; 324 p: 1018-1022
2. Bayat A. (2002). Science, medicine, and the future: Bioinformatics. *BMJ*.324(7344):1018-1022.
3. Altman, R.B., 2012. Translational Bioinformatics: Linking the Molecular World to the Clinical World. *Clinical Pharmacology & Therapeutics*, 91(6), pp.994-1000.
4. Li S, Shen Q, Su M, Liu X, Lu S, Chen Z, Wang R, Zhang J. AlloScore: a method for predicting allosteric ligand-protein interactions. *Bioinformatics*. 2016 May 15;32(10):1574-1576.
5. Marín-López MA, Planas-Iglesias J, Aguirre-Plans J, et al. (2018). On the mechanisms of protein interactions: predicting their affinity from unbound tertiary structures. *Bioinformatics*. 34(4):592-598.
6. Sarachan BD, Simmons MK, Subramanian P, Temkin JM. (2003). Combining medical informatics and bioinformatics toward tools for personalized medicine. *Methods Inf Med*. 42(2):111-5. PMID: 12743645.
7. Xia X. (2017). Bioinformatics and Drug Discovery. *Curr Top Med Chem*. 17(15):1709-1726.
8. Berger SI, Iyengar R. (2009). Network analyses in systems pharmacology. *Bioinformatics*. Oct 1;25(19):2466-2472.
9. Koh HC, Tan G. Data mining applications in healthcare. *J Healthc Inf Manag*. 2005 Spring;19(2):64-72. PMID: 15869215.
10. Cunningham-Oakes E, Trivett H. Applied Bioinformatics and Public Health Microbiology: challenges, discoveries and innovations during a pandemic. *Microb Genom*. 2022 Jan;8(1):000757.
11. Ding LJ, Schlüter HM, Szucs MJ, Ahmad R, Wu Z, Xu W. Comparison of Statistical Tests and Power Analysis for Phosphoproteomics Data. *J Proteome Res*. 2020 Feb 7;19(2):572-582.



This work is licensed under Creative Commons Attribution 4.0 License

To Submit Your Article Click Here:

Submit Manuscript

DOI: [10.31579/2639-4162/068](https://doi.org/10.31579/2639-4162/068)

Ready to submit your research? Choose Auctores and benefit from:

- > fast, convenient online submission
- > rigorous peer review by experienced research in your field
- > rapid publication on acceptance
- > authors retain copyrights
- > unique DOI for all articles
- > immediate, unrestricted online access

At Auctores, research is always in progress.

Learn more <https://www.auctoresonline.org/journals/general-medicine-and-clinical-practice->