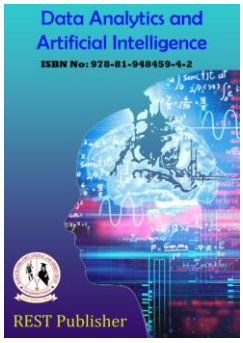
Data Analytics and Artificial Intelligence

Vol: 3(2), 2023

REST Publisher; ISBN: 978-81-948459-4-2

Website: http://restpublisher.com/book-series/daai/

DOI: https://doi.org/10.46632/daai/3/2/22



Gendroid- A Conceptual Bio-Info Android App and Its Challenges

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Abstract. *Bioinformatics is a vast multifarious domain having a share of concepts from Mathematics, Computer Programming to Biological Sciences. It is the leading thrust area in research perspective. It demands knowledge of both Computers and Biology. Latterly has seen an exponential usage of Apps be it for educational purposes or for commercial use. Android app development is playing a key role in creating the demand for newer concepts, which has already dominated the Bio world. Bioinformatics, especially gene analysis has motivated the developers to create many apps related to the bio functionalities. But due to its vast nature and voluminous data, the development cycle is demanding more expertise from the developers. Various Bio-apps are in the market but are not sufficiently covering all the features. This article lists the existing bio-apps with usage analytics based on number of downloads. It strives to explain the conceptual model of Gendroid, a multipurpose bio-app with its prospective development challenges.*

Keywords: *App, Android, Bioinformatics, Genome.*

1. INTRODUCTION

Android app development has seen a new horizon as it caters to lot of needs of the end user with its easy accessibly, user friendliness and its light weight structure. The platform for mobile devices is an open source technique that gives a variety of applications to perform different tasks in different branches. Nowadays mobiles and hand held tiny devices acts as a computer which is finding more market demand [1].Bioinformatics is the information of technology to manage biological data that helps in decoding the genome codes. Bioinformatics field was emerged as a tool to discover the biological information over huge data in the last two decades with the (HGP) Human Genome Project. This article focuses on combining the android functionalities with biological features. Bioinformatics and android can aid the users to understand the genome information in human life ecosystem, meanwhile Web tools and resources of bioinformatics can be integrated with the support of programming languages and software applications.

Bioinformatics: Bioinformatics is the application of computer technology to biological data. It is a major march towards implementing technology enabled data storage and retrieval system, further extended to develop useful softwares. The field of bioinformatics deals with study of genetics, genomics to be specific this will involve the knowledge of genes, DNA, protein structure, RNA and various other biological processes. The study of biological sequences and techniques to analyze and discover pattern and informative sites are all the main features of this inter disciplinary domain. Various algorithms have been used for the information extraction. The vast data of bio domain leads to using of various concepts like machine learning, data mining and cloud techniques for storing the sequences of genome data in cloud for the public access [2].

Android: In the industry of information technology, variety of softwares is emerging rapidly through different sectors to establish the new era of computer science. In general it means developing and deploying applications which may be standalone softwares or web based tools. Android app development is the process by which light weight softwares with extensive features are developed, in turn that are used in tiny handheld digital devices like mobile phones [3].

Genome: A genome is the complete set of genetic data in an organism. Chromosome is long molecules of DNA in genome, a small section of DNA called genes. Genome is a code that is used by cells to know how to behave.

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Human are made of large parts of genome, the first genome was sequenced decades ago with efforts of hundreds of scientist across dozens of countries with cost over 3 billion dollars. Because DNA is a complex mixture of only AGTC, still understanding all 3.2 billions of letters and its interaction is a huge topic for research. It's almost humanly not possible, so to this end the power of computers and technology are incorporated.

2. EXISTING APPS RELATED TO BIOINFORMATICS

Many apps have been developed with interest of bioinformatics users. The apps are in general related to bioinformatics related information retrieval, few for calculation and analysis purpose. Table 1 gives the list of apps with the developing company, basic feature, operating system used for development, size of the app and latest version of it.

TABLE 1. List of Bio-apps with technical details

App name	Proprietary	Features	App size	Version	Downloads	Operating system
Synmod game	Bioinformatics	Game	2.3 mb	2.0.3	1K+	IOS/ Android
Peptide mass calculator	Peptide Synthics	Calculator	2.7 mb	1.0.1	1K+	Android
3D brain	DNA learning	Information	93 kb	1.0.3	1M+	Android
Biocode	Khaled tarek	Information	7.1 mb	1.5	1T+	Android
Bioinformatics genome analysis	Aris LLC	Web based analysis	11 mb	0.2	100+	Android
Genomapp	RF Developers	Information	87 mb	7.81	50T+	Android
Bioinformatics	Softecks	Information	15 mb	0.1.2	1K+	Android
DNA app	App lab	Analyzer	1.7 mb	1.2.7	10K+	Android
Genome jumper	Sib Swiss Institute of Bioinformatics	Game	43 mb	2.8	5T+	Android
Bio Gene	Computational Biology Center	Information	152 kb	1.3	1K+	IOS
Applied Bioinformatics	Kristijan Davidovski	Information	28.6 mb	10.1.0	-	IOS
Bioinformatics Corner	Intime information System	Learning	11mb	1.6.2	1K+	Android
Bioinformatics Forum	Intime Information System	Sharing Chatting	12 mb	1.1.1	100+	Android
Bioinformatics	Kirill Sidorov	Dictionary	13 mb	80.91.30	12K+	Android

3. BIO-APP USAGE ANALYTICS

As listed in Table1 above, very few apps have been developed and is in usage. Some of them are information repositories, where the user can use the app for basic biology or genome related information. Few have more

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downloads and usage as they are game based. The existing apps are developed based on specific purposes only, no single app is in use which covers many features pertaining to bioinformatics. Figure 1 is a usage analysis graph which gives a visual understanding of number of apps being downloaded, based on the requirement and popularity an analysis was done which resulted in the graph below. The analysis shows that **Genom app** is the android application which has the highest downloads nearly 50T+, developed by RF developers and the application is based on Genome Information. On the contrary **Bioinformatics forum** is another android application which has the least downloads. It is developed by In time information system. The application is based on chatting and sharing. The overall analysis clearly shows that no single app is equipped with many useful features of bioinformatics. This is the important consideration and motivation for the conceptual Gendroid model development.

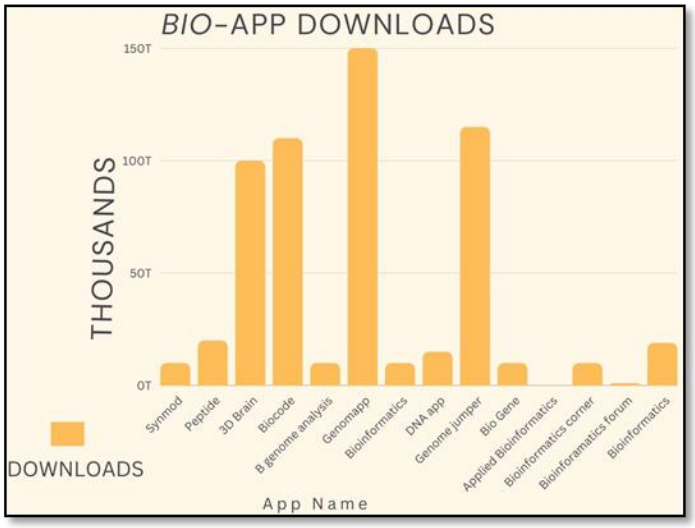

FIGURE 1. Bio-apps usage analysis graph

4. PROPOSED METHODOLOGY FOR GENDROID DEVELOPMENT

Gendroid is a conceptual proposed Bio-app model which tries to integrate various functionalities related to gene study viz. Fetching of DNA/RNA sequences from various repositories, Performing Sequence analysis, give the visualization support in form of building evolutionary trees of different forms etc [9]. The basic work flow of Gendroid application is to initiate the tailor made idea, to make a conceptual design to have the clear understanding of the development requirements and various challenges in development cycle. Since Bioinformatics is a ever growing field the adaption process is quite challenging, so developing and stabilizing the model is the at most priority of Gendroid [7]. The basic work flow is as explained below:

- Ideation–Any App or a tool development always needs a strong concept to work on. Gendroid is one such idea which is a tangible mixture of Android features and Bio related functionalities.
- Design - This phase aims to establish the user experience and interface of the application by designing the layout of overall application.
- Development – Accomplishing the draft design to actual working module is the target of this stage. The choice of programming language, addressing all the coding issues, integration of the modules, and finally to give a good visualization to the concepts are the phases of development process. Execution of various functionalities is made possible with integration of supporting API's taking software as a service model into consideration [4], [6].

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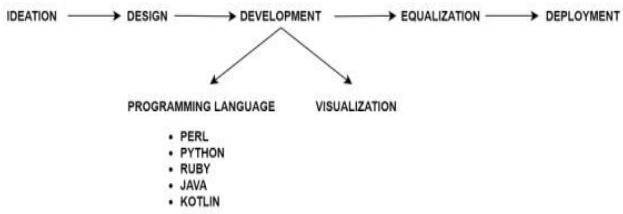

- **Stabilization** –Once the development cycle is complete, the quality assurance process begins by testing the basic version for correctness and accuracy. This facilitates the further improvement in the functionalities. The enhancement will standardize on the version control, resulting in an optimum model.
- **Deployment** – The completed and pre-tested model is made available for the end users through this process. By the deployment process the model optimality can be increased through feedback mechanism.

5. PROSPECTIVE CHALLENGES IN GENDROID DEVELOPMENT

Based on the demand-supply concept the App development has been in trend, as the app users are increasing so is the development process due to its ease of use and the device specifications. Considering the versatile nature of the bio related functionalities, developing a multifunctional app is quite challenging due to many practical reasons. Figure2 emphasizes on major prospective developmental challenges that the Gendroid-Mobile app for Bioinformatics has to embark upon.

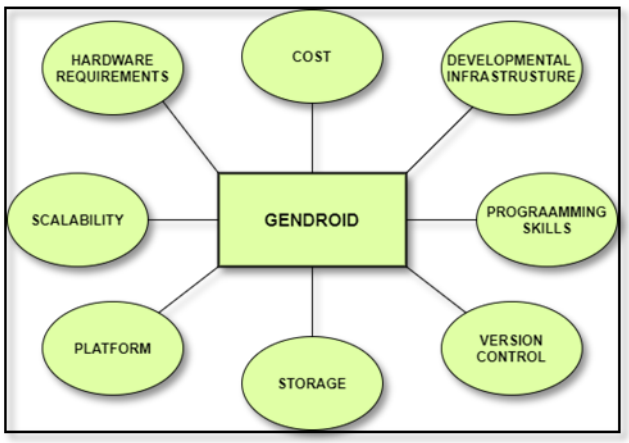

FIGURE 2. Challenges that rise in Gendroid application development

- Developmental Infrastructure – Gendroid application infrastructure needs the integration and support of various tools, processes, services that are used during development, testing and implementation phase. So the infrastructural requirement for the development is the primitive challenge.
- Programming skills – Gendroid app development requires a mastery over programming languages and algorithms for the smooth execution. Android app in terms of technological sense basically uses Python, Java, C, C++, and few scripting languages like: Perl, Ruby, Java Scriptas the most preferred and prudent choices.
- Version control – The chromosomes/gene sequences are discovered on a day today basis, which poses a challenge to Gendroid that need sup gradation and an increase in the capability on a regular interval.
- Storage – To store millions of genome sequences, enough facilities are required, to this end cloud storage plays a key role in storing data and files in an off-site location either we access through the public internet or private network [10].
- Platform – The platform for application has to be compatible and adaptable. Platform independence is a big challenge in app development process.
- Scalability – maintaining consistency and catering to the huge and quick changes is the specialty any app should posses.
- Hardware requirement – to analyze the genome code, it .requires the huge data compiling capacity and also to track the sequence of resultant code is time consuming, which demands a better IT setup.
- Cost – The development of application involves various stages where it includes storage space, execution capabilities, cloud support etc., which needs good cost estimation.

6. CONCLUSION

Bioinformatics prompts to create a universal set of features covering the biological, mathematical information with technology implementation, which aid to solve complex biological problem. The ultimate goal of Gendroid application is to integrate the large scale data for understanding the genome code mechanism in various development processes. In comparison to existing bio-apps Gendroid can be a one stop solution to various bio needs in term of technology implementation. It adds new features to analyze the pattern and generate similarities, which promote the visualization of results.

REFERENCE

[1]. Thomas C. G & A. Jayanthila Devi; A Study and Overview of the Mobile App Development Industry; International Journal of Applied Engineering and Management Letters (IJAEML), ISSN: 2581-7000, Vol. 5; 1, June 2021; http://doi.org/10.5281/zenodo.4966320.

[2]. M YounusWani, NA Ganie, S Rani, S Mehraj, MR Mir, MF Baqual, KA Sahaf, FA Malik and KA Dar;Advances and applications of Bioinformatics in various fields of life; International Journal of Fauna and Biological Studies; 2018;5(2):03-10; www.faunajournal.com.

[3]. Phi-Vu Nguyen, Chandra ShekhaVerma, Samuel Ken-En Gan; DNA App: a mobile application for sequencing data analysis; Bioinformatics, Volume 30, Issue 22, 15 November 2014, Pages 3270–3271, https://doi.org/10.1093/bioinformatics/btu525.

[4]. GoranBrestovac& TihanaGalinacGrbac; Development environment for Android application development: An experience report; January 2011, https://www.researchgate.net/publication/221412909

[5]. Survey of Bioinformatics Mobile Applications;CS 6030 – Bioinformatics Summer || 2012 Jason ericjhonson

[6]. J. Liu and J. Yu, Research on Development of Android Applications, 2011 4th International Conference; on Intelligent Networks and Intelligent Systems, Kuming, China, 2011, pp. 69-72, doi:10.1109/ICINIS.2011.40.

[7]. Neha Verma1 , Sarita Kansal2 , HunedMalvi ; Development of Native Mobile Application Using Android Studio for Cabs and Some Glimpse of Cross; Platform Apps; International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 16 (2018) pp.12527-12530 © Research India Publications. http://www.ripublication.com.

[8]. Leroy Hood and Lee Rowen; The Human Genome Project: Big Science transforms biology and medicine; Hood and Rowen Genome Medicine 2013, http://genomemedicine.com/content/5/9/79

[9]. Chandra ShekharPareek, RafalSmoczynski, and AndrzejTretyn; Sequencing technologies and genome sequencing; JAppl Genet. 2011; 52(4): 413–435.Published online 2011 Jun 23. doi: 10.1007/s13353-011-0057-x

[10]. Kun Liua , Long-jiang Donga; Research on Cloud Data Storage Technology and Its Architecture Implementation; 2012 International Workshop on Information and Electronics Engineering (IWIEE)Procedia Engineering 29 (2012) 133 – 137 1877-7058 © 2011 Published by Elsevier Ltd.doi:10.1016/j.proeng.2011.12.682

[11]. J. C. Rajapakse, L. Wong & R. Acharya Pattern Recognition in Bioinformatics: AnIntroductionPRIB 2006. Lecture Notes in Computer Science(), \vol 4146. Springer, Berlin, Heidelberg. https://doi.org/10.1007/11818564_1.