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ML ALGORITHM VISUALIZER

Divija Sisodia, Ketuman Vishwakarma, Bhavesh Rajani, Anukrati Rawal, Devashish Mandloi

Guided By: Prof. Akshita Mishra

Department of Information Technology, Acropolis Institute of Technology & Research, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Indore, India

Abstract— *An algorithm animation environment is a means for exploring the dynamic behaviour of algorithms that makes possible a fundamental improvement in the way we understand and think about them. It presents multiple graphical views of an algorithm in action, exposing properties that might otherwise be difficult to understand or even remain unnoticed. [1]. Keeping in mind the rules and techniques required to create a good algorithm animation, with emphasis on animations that would be used when learning algorithms. In this context, we propose that animations should in particular emphasize the visualization and the complexity of the algorithms. This implies that writing a good animation must be more than just showing the graphically enhanced features provided by most common animation systems but instead, each animation must be individually designed and programmed. That is exactly what we did in our mobile application. We have added a chatbot to suggest which algorithm to use according to the input given by the user to implement Artificial Intelligence and Machine Learning. We have covered only AI/ML algorithms, which solves the problem as there are not many applications available that provide AI/ML algorithms.*

Keywords— Artificial Intelligence, Machine Learning, Mobile application, Animations, Algorithms

1. INTRODUCTION

"*ML Algo Visualizer*", the goal of the project is to develop a platform where a user can find all the algorithms of computer science at one place. The project will consist of animations explaining all the steps of an algorithm. Books may provide theory but it is scientifically proven that visualization is more helpful in understanding the core concepts and that is our targeted area. One of the difficulties most beginner programmers face is to grasp what is happening with the execution of each line of code, that's where we come in with the animations. Understanding data structures and algorithms, both of which are abstract concepts, is an integral part of software engineering and elementary computer science education. However, people usually have difficulty in understanding abstract concepts and processes such as procedural encoding of algorithms and data structures. One way to improve their understanding is to provide visualizations to make the abstract concepts more concrete. [2]. Many papers have been published on how to teach data structures and algorithms. One explanation for this is the rapid evolution of the computer science discipline that has had a profound effect on the field, affecting both content and pedagogy. However, it is surprising that there has been so little discussion about how to learn data structures and algorithms hence, we chose to put forward a way to comprehend them easily. The potential of such algorithm animation environments is great, but can be fully realized only if they are sufficiently easy and enjoyable to use. This dissertation is a step towards achieving these goals. In it, we developed a model for creating real-time animations, as well as a framework for interacting with these animations. Problems addressed during the course of the project: AI/ML algorithms can be daunting to understand for beginners. Our app will simplify the learning process by providing the content visually and simply.

2. RELATED WORK

Marc Brown's dissertation on algorithm visualization (AV) won the 1988 ACM Dissertation of the Year award, it seemed to many computer science educators that the dawn of an algorithms-made-simple era was just around the corner. If educators use computer graphics to depict an algorithm's actions, how could students not come to understand the algorithm more easily and in

greater depth? Brown's work was brilliant from a computer graphics perspective. He set the stage for how to display exquisite algorithm visualizations with relative ease. It appeared to have discovered a new technology for teaching computer science. Researchers developed a variety of new systems, and Web applets that animated algorithms abounded. Many computer science instructors advised their students who were having trouble understanding an algorithm X to go to URL Y and view a great animation that would help them study this difficult material. [3]. Alas, these animations were great if you were a computer science professional, someone who already understood the algorithm's essentials before watching the animation. Such professionals could wax ecstatic about how the stunning graphics captured the essence of the algorithm. However, students attempting to learn the algorithm were often mystified by the high powered display they saw unfolding in front of them. Stanford University psychologist Barbara Tversky very aptly quoted "The advances in the technology of producing attractive graphics often seem to drive and outstrip … the research on their utility."

2.1 Preliminary Investigation

- A website called Log2 Base 2 provides paid courses.
- Also, there exists some apps on the Google Playstore such as "AlgoPrep", "Algorithme", "Algorithm Visualizer", etc.
- A plethora of animated videos can be found on various Youtube channels explaining AI/ML algorithms.

2.2 Study of existing system

Sr. No.	Existing Application /Website	Features	Benefits	Limitations/Gaps
1.	AlgoPrep	Provides animations to limited algorithms, contains theory of searching, sorting, complexities etc..	Provides pretty good theory for Data Structure algorithm	Does not include AI/ML algorithms
2.	Algorithme	Provides animations for Sorting Algorithms, Graph Algorithms, Maze Simulation etc..	Contains animations for variety of algorithms	Animations are not so interactive and some features are paid.
3.	Algorithm Visualizer	Provides animations for data structure algorithms, contains theory and application of those algorithms.	Describes the applications and complexities of algorithms side by side.	Animations are not so interactive and it does not include AI/ML algorithms.
4.	Log2Base2.com	Provides animations of various algorithms	Gives complete walkthrough of various courses along with animations	All the features are paid, only a 3 day free trial is available.

Most of them didn't cover the major algorithms that people find difficulty in while understanding. Also

they covered basic Data Structures algorithms. In all the apps and websites, the one thing we saw in common was that the user himself had to find an appropriate solution for his problem by going through all the algorithms available on the platform. For example: if a user wants to search the best path search algorithm. Then he'll have to read the theory part of all the algorithms applicable in this scenario (like BFS, Dijkstra's Algorithm and A* algorithm) then decide which one to use. Some of them were paid as well.

3. METHODOLOGY

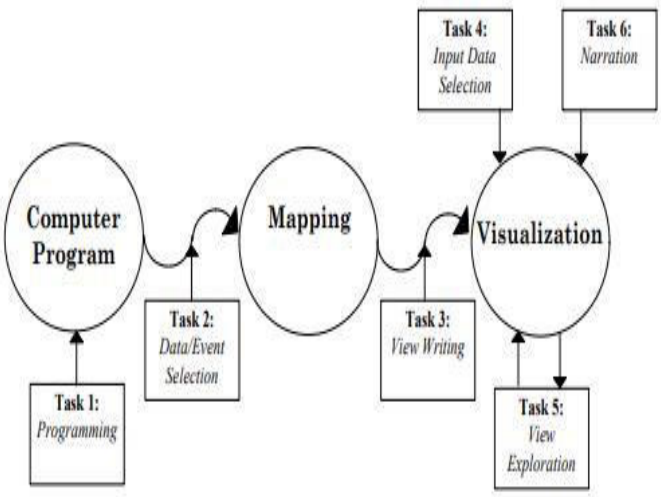
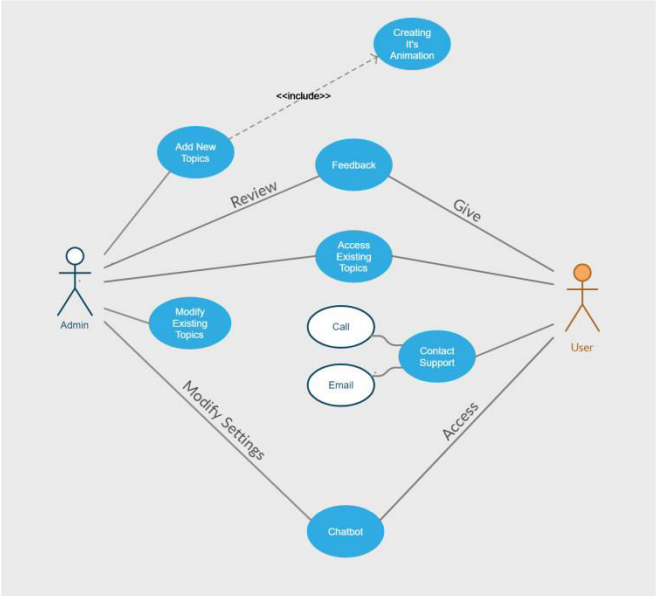


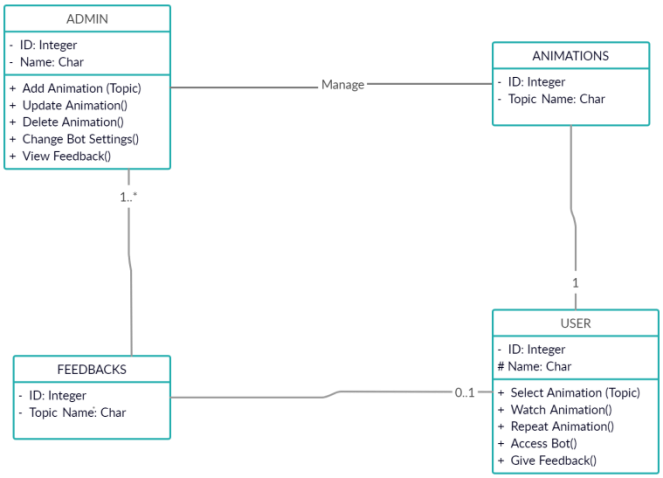
Figure 1. Deriving SV's six high level tasks from Roman and Cox's formal model of Software Visualization(SV) [4].

A common technique for constructing a visualization is to first code it and then annotate it with calls to have graphics produced at interesting events during the algorithm's execution. To elucidate, the algorithm designer provides the programs that are to be animated, identifies key "interesting events" in the programs, and also contributes to the design of

Use Case Diagram:

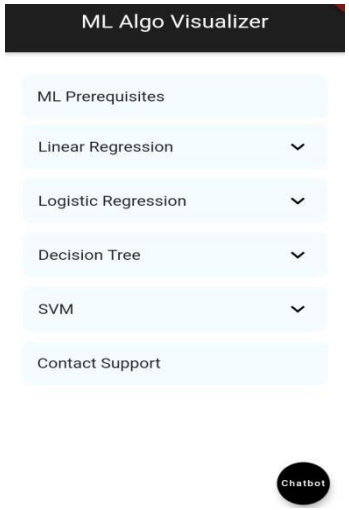


Class Diagram:

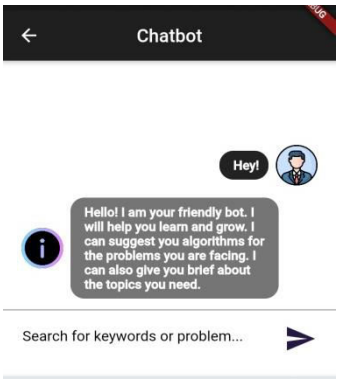


graphical representations of the data structures. The animator implements views that comprise the graphical presentation; these views dynamically change in response to interesting events. The scriptwriter uses the high-level command facilities to produce scripts containing specific material for presentation to users. The user makes use of these scripts or directly interacts with the dynamic graphical representations of his algorithms. [5].

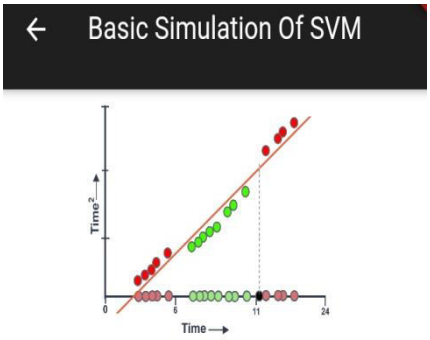
- We have implemented our mobile application with Flutter using Dart.



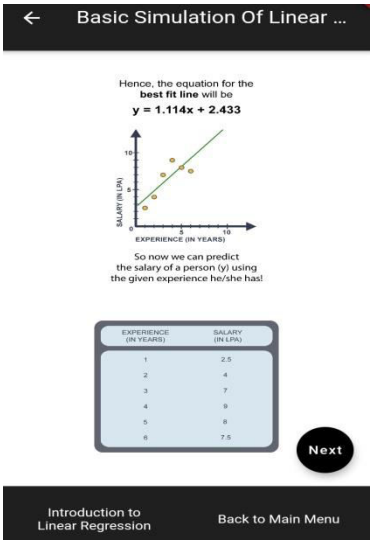
- For the chat bot, we have designed the UI using Flutter and trained it using Dialog-Flow.



- For the animations, we have used the Rive animator.



- Our written content is original, devised from a lot of online research.
- For the graphics used in the animations, we have used Photoshop.



4. RESULTS AND DISCUSSIONS

We have covered only AI/ML algorithms because heretofore applications that provide such algorithms were very scarce. The algorithms we've incorporated in as of now are SVM, Linear Regression, Logistic Regression, Decision Tree and some basic prerequisites of Machine Learning such as bias/variance tradeoff and cross validation. Our source code is available on GitHub. The costless availability of our application on Google Playstore effectuates our

motive to assist beginners learning AI/ML algorithms crystal clearly.

5. CONCLUSION AND FUTURE SCOPE

Our project is a fine resource for the AI/ML enthusiasts to get started. The application not only bridges the gap in the learner resource spectrum but also will motivate the community to come up with better ideas. We wish to upload it on Google Playstore and will also be available on Github, this might spark some ideas and opportunities for other developers and students to come up with more resource based apps. Students can feed this input data to the visualization, letting them learn whether their data set drives the pictures in the anticipated fashion but we don't provide input generators for the students to specify data for complicated problems yet. We will also build in visualisation for algorithms such as Regression Trees, Neural Networks, Random Forests and Clustering Algorithms. We also plan to regularly update our app in the future and thus, this will ensure its quality with time. This paper briefly describes the findings of a limited literature review and analysis conducted using research articles published in various digital libraries.

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