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Financially Assisted Student and Information Management System (FASIM) for Auto-Allocation of Funds Using Mean Stack Implementation

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ABSTRACT: Developing a client- server, cloud-based client-server application for an organization, for selection and monitoring of students, applying for financial assistance. We are developing a real time system for the financial assessment and monitoring of students, applying for financial help, instead of denoting a fixed amount to the students, we are auto-allocating the funds depending on the current need, available funds and financial background and various other factors. Shortfall of the students will be advertised which will be helping in inviting more donations. The clients include website and mobile app.This paper attempts to provide an auto-allocation algorithm for the fair distribution of funds amongst students. The motivation for this algorithm has been taken from the basic concept of page rank algorithm. The project will be implemented using the MEAN stack technology, which is a collection of JavaScript-based technologies-Node.js would be used for the server side along with Express.js as a node.js web application framework, whereas Angular JS for client side and MongoDB as database.

KEYWORDS: Auto-Allocation, Page Rank, Information Tracking, Analytics, MEAN Stack development

I. INTRODUCTION

Education is a freedom to all. Education is a medium of acquiring skills required to develop and rise above all the socio-economic differences. But the same socio-economic differences should not possess a barrier for the willing. Now a days, many organizations are providing financial help for the needy students but this a manual process. It is not accessible for everyone especially in rural areas. Therefore many websites have been developed nowadays for easy access and fast application processes. However, in this current system the process takes place in two stages first verification and then manual fund allocation which may lead to unfair and biased distribution of funds. Hence, in our proposed system we have developed a mechanism for auto-allocation of funds to the applied students taking into consideration various criteria predefined by the organization.

To build our mechanism we have taken motivation from the Google PageRank (PR) algorithm which makes use of the link structure of the web. It is used to determine a page's relevance or importance. Important pages receive a higher PageRank and are most likely to appear at the top of the search results.Google PageRank (PR) is based on backlinks. PageRank works by counting the number and quality of links to a page to determine a rough estimate of how important the page is. Fig.1 illustrates the PageRank (PR)

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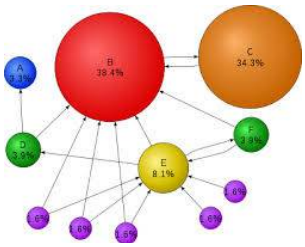

Fig. 1 PageRank (PR) of various items.

The PageRank of a page A is given as follows:
PR(A) = (1-d) +d (PR(T1)/C(T1) + …….. + PR (Tn)/C (Tn))------ (1)
PageRank or PR (A) can be calculated using a simple iterative algorithm.
Here,PR(Tn): PageRank of page Tn,
C(Tn): count of total number of outgoing links for page Tn,
d: damping factor, which can be set between 0 and 1, usually it set to 0.85.
In this paper, we consider a graphical model to determine optimal matches for the donation and needy students.

II. RELATED WORK

In [1] authorsfocused on computing importance of a web page in an efficient way. It shows how Web page ranking is an essential factor in web search. Many modules and algorithms have been proposed using different resources with different assumptions. The algorithms proposed include Page Rank, Browse Rank, Browse Rank Plus, HITS and many more. In [2] author has illustrated the model of dynamic ranking in web pages. In [8] the author explains fairness, efficiency and flexibility in organ allocation for kidney transplantation. Our proposed system could be used for variants for systems with similar purpose. In [6] the author has incorporated the use of graph structures for computing personalized PageRank quickly.

III. PROPOSED ALGORITHM

A. *Description of the Proposed Algorithm:*

The fund auto-allocation program can be represented as a directed graph G= (V, E). Fig. 2 shows an example.

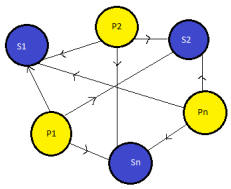

Fig. 2

Let |V| be the number of vertices (nodes) and |E| the number of edges in the graph, where |.| denotes cardinality. Each vertex in the graph either represents a student or their properties. Each directed edge from vertex j (Property node) to vertex i (Student node) indicates the value of the student for that particular property. In this directed graph each edge can be assigned a weight representing the edge utility u_{ij}. Edge utility could be obtained from the weights obtained with respect to the corresponding values of student attributes.

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The goal of optimization for fund allocation is to achieve maximum utility on the graph G. Therefore the task of optimizing matches on graph can be realized by solving the following problem:

If there is an directed edge from node i to node j **then**

$$Rank\ of\ student(i) = \sum_{i=0}^{n} \sum_{j=0}^{m} W_{i} \quad \text{------(2)}$$

Where,

n=total number of students applied for scholarship,
m=total number attributes,
W□ᵢ is the weight of the directed link from node j to node i.

Step 2: Selection Criteria:

The selection criteria would be the various attributes from the personal, financial and academic details of the student such as GPA/aggregate, family income or self-income, whether students is physically challenged or not etc.

IV. PSEUDO CODE

Step 1: Calculate all possible weights for each attribute for a student node.
Step 2: Calculate the sum weight for a particular student node. (Equation (2))
Step 3: Sort the students according to their weights. The students with maximum weight will have highest priority.
Step 4: Allocate the funds accordingly.
Step 5: If allocated funds is less than required then advertise shortfall
Step 6: After enough funding from more donors.
Step 7: Go to step 1.
Step 8: End.

if rank(i) is greater than rank(i+1)
then priority(i) >priority(i+1)

```
if (allocated<required)
   advertise;
reallocate ();
```

V. SIMULATION RESULTS

After the successfully completion of proposed research work in MEAN Stack(MongoDB, Express JS, Angular JS, Node.js) we evaluated our system with some existing approaches. We evaluate the system in four different experiments, the below figures shows the overall performance of proposed system vs existing systems

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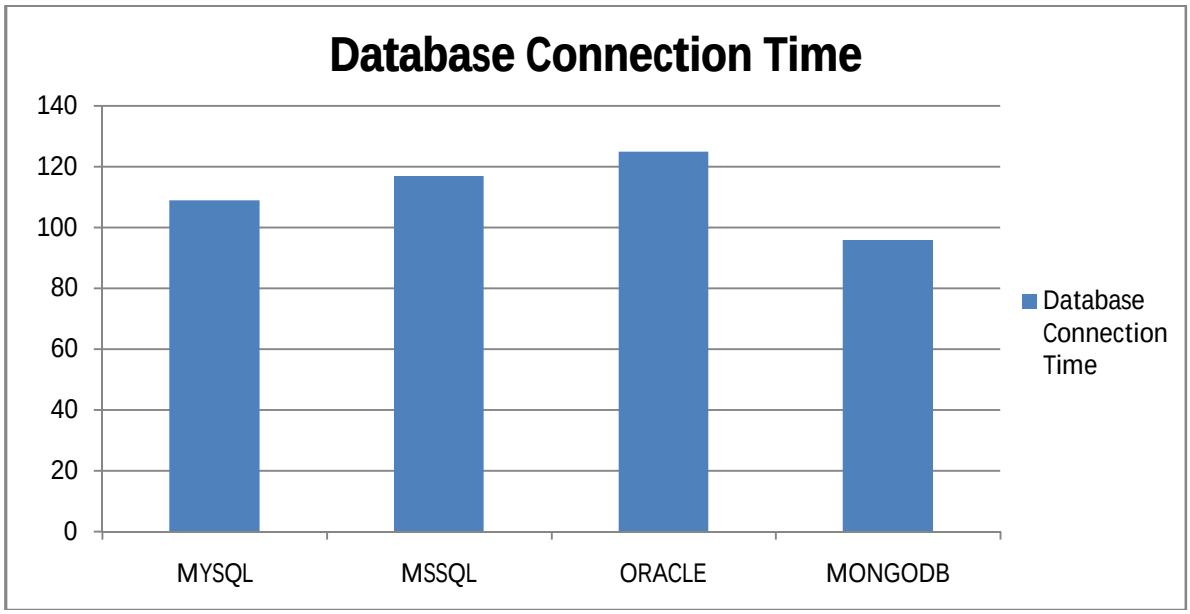

Figure 1: Database connection pool load time for different type of datasets

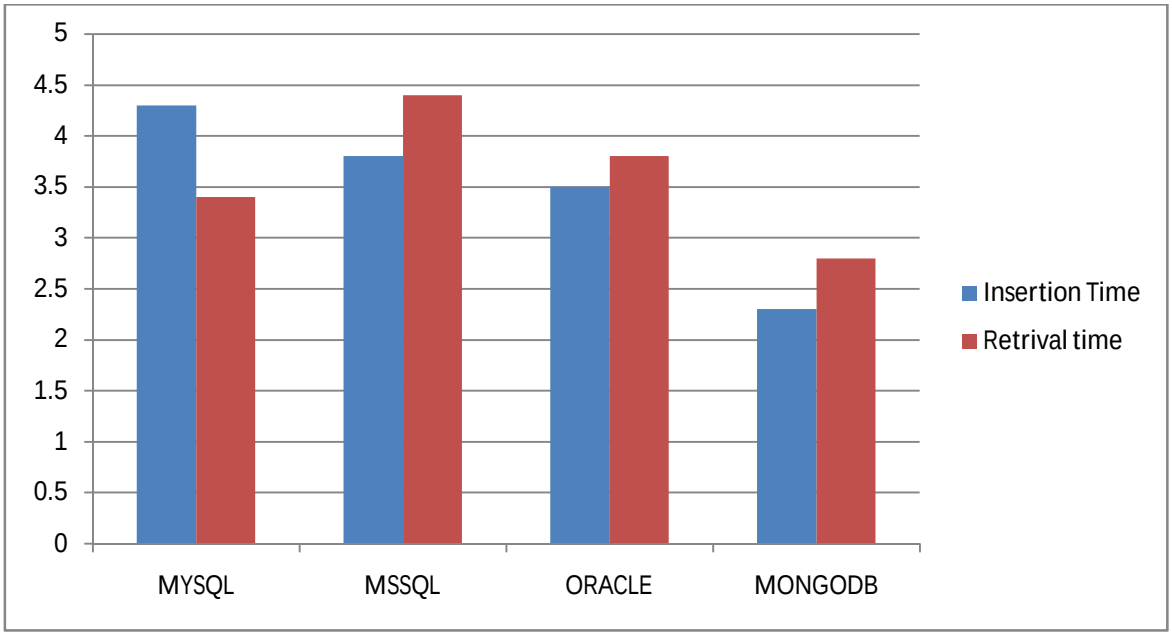

Figure 2: Database insertion and retrieval time for 1 MB data

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VI. CONCLUSION AND FUTURE WORK

In this paper, we investigated weighted graph to efficiently priorities applicant's request. The system is updated regularly so that by adding more and more parameters it can take optimal decisions. For the implementation we have used MEAN Stack.

Our Future plan, will focus on incorporation of additional existing or new auto-allocation algorithm into current system. It will be implemented on multi-platform (like mobile application) as we are using MEAN Stack so that it can be accessible to many applicants. Security wallet can be used to preserve privacy of documents of applicants.

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BIOGRAPHY

Shrushti Thorat is a student from AISSMS' IOIT, Pune pursuing Bachelor's degree in computer engineering. She will receive graduate in 2017. Her area of interest are systems & security, Neural Networks and robotics etc.**Aemal Shah** is also a student from AISSMS' IOIT, Pune pursuing Bachelor's degree in computer engineering and would graduate in 2017. **Amruta Gaikwad** is a student from AISSMS' IOIT, Pune in last year of her Bachelor's degree in computer engineering and would graduate in the year 2017. **Mrs. D.S Zingade** is our guide for this project. She is a professor in computer department of AISSMS' IOIT, Pune and a PhD in computer science.