Project Report on

TITLE: "PARTITIONING TECHNIQUES ON COLLEGE VACCINE DRIVE "

SUBJECT "Advances in DATABASE MANAGEMENT SYSTEM"

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ABSTRACT

When we talk about Covid vaccine drive data of various colleges, it is automatically considered that we need to deal with large data tables where different information is stored. For any organization, it is very important. To store data in such a way that the database provides scalability, performance, availability and security.

There are various ways to achieve the best suitable solution for high availability, scalability, and highly performing architecture; the key ingredient is partitioning. In a database, data in each table is stored in physical file groups. So by dividing this data table from a single file group to a multiple file group can reduce the file size and help us create a scalable and high performing database

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CHAPTER 1 INTRODUCTION ABOUT FRAGMENTATION

Fragmentation is a process of dividing the whole or full database into various subtables or sub relations so that data can be stored in different systems. The small pieces of sub relations or subtables are called fragments. These fragments are called logical data units and are stored at various sites. It must be made sure that the fragments are such that they can be used to reconstruct the original relation (i.e, there isn't any loss of data).

In the fragmentation process, let's say, If a table T is fragmented and is divided into a number of fragments say T1, T2, T3….TN. The fragments contain sufficient information to allow the restoration of the original table T. This restoration can be done by the use of UNION or JOIN operation on various fragments. This process is called data fragmentation. All of these fragments are independent which means these fragments can not be derived from others. The users needn't be logically concerned about fragmentation which means they should not concerned that the data is fragmented and this is called fragmentation Independence or we can say fragmentation transparency.

Advantages :

- As the data is stored close to the usage site, the efficiency of the database system will increase
- Local query optimization methods are sufficient for some queries as the data is available locally
- In order to maintain the security and privacy of the database system, fragmentation is advantageous

Disadvantages :

- Access speeds may be very high if data from different fragments are needed
- If we are using recursive fragmentation, then it will be very expensive

CHAPTER 2 VARIOUS METHODS OF DATA FRAGMENTATION

The 3 methods for data fragmenting of a table:

- Horizontal fragmentation
- Vertical fragmentation
- Mixed or Hybrid fragmentation

Horizontal fragmentation – Horizontal fragmentation refers to the process of dividing a table horizontally by assigning each row or (a group of rows) of relation to one or more fragments. These fragments are then be assigned to different sides in the distributed system. Some of the rows or tuples of the table are placed in one system and the rest are placed in other systems. The rows that belong to the horizontal fragments are specified by a condition on one or more attributes of the relation. In relational algebra horizontal fragmentation on table T, can be represented as follows:

$\sigma_p(T)$ where, σ is relational algebra operator for selection,p is the condition satisfied by a horiz ontal fragment. Note that a union operation can be performed on the fragments to construct table T. Such a fragment containing all the rows of table T is called a complete horizontal fragment.
For example, consider an EMPLOYEE table (T) :

Eno	Ename	Desig	Salary	Dep
101	A	abc	3000	1
102	B	abc	4000	2
103	C	abc	5500	3
104	D	abc	5000	1
105	E	abc	2000	4

This EMPLOYEE table can be divided into different fragments like:

EMP 1 = σDep = 1 EMPLOYEE EMP 2 = σDep = 2 EMPLOYEE

These two fragments are: T1 fragment of Dep = 1

Eno	Ename	Desig	Salary	Dep
101	A	abc	3000	1
102	B	abc	4000	2

Similarly, T2 fragment on the basis of Dep = 2 will be :

Eno	Ename	Desig	Salary	Dep
103	C	abc	5500	3
104	D	abc	5000	1
105	E	abc	2000	4

Now, here it is possible to get back T as T = T1 ∪ T2 ∪ …. ∪ TN

Vertical Fragmentation – Vertical fragmentation refers to the process of decomposing a table vertically by attributes are columns. In this fragmentation, some of the attributes are stored in one system and the rest are stored in other systems. This is because each site may not need all columns of a table. In order to take care of restoration, each fragment must contain the primary key field(s) in a table. The fragmentation should be in such a manner that we can rebuild a table from the fragment by taking the natural JOIN operation and to make it possible we need to include a special attribute called **Tuple-id** to the schema. For this purpose, a user can use any super key. And by this, the tuples or rows can be linked together. The projection is as follows:

$\pi_{a1, a2,\ldots, an}(T)$ where, π is relational algebra operator **a1…., an** are the attributes of T,
T is the table (relation)

For example, for the EMPLOYEE table we have T1 as :

Eno	Ename	Desig	Tuple_id
101	A	abc	1
102	B	abc	2
103	C	abc	3
104	D	abc	1
105	E	abc	4

For the second. sub table of relation after vertical fragmentation is given as follows :

Salary	Dep	Tuple_id
3000	1	1
4000	2	2
5500	3	3
5000	1	4
2000	4	5

This is T2 and to get back to the original T, we join these two fragments T1 and T2 as $\pi_{EMPLOYEE}$ (T1 ⋈ T2)

Mixed Fragmentation – The combination of vertical fragmentation of a table followed by further horizontal fragmentation of some fragments is called mixed or hybrid fragmentation. For defining this type of fragmentation we use the SELECT and the PROJECT operations of relational algebra. In some situations, the horizontal and the vertical fragmentation isn't enough to distribute data for some applications and in that conditions, we need a fragmentation called a mixed fragmentation.

Mixed fragmentation can be done in two different ways:

The first method is to first create a set or group of horizontal fragments and then create vertical fragments from one or more of the horizontal fragments.

The second method is to first create a set or group of vertical fragments and then create horizontal fragments from one or more of the vertical fragments.
The original relation can be obtained by the combination of JOIN and UNION operations which is given as follows:

$\sigma_P(\pi_{a1, a2..,an}(T))$
$\pi_{a1,a2....,an}(\sigma_p(T))$

For example, for our EMPLOYEE table, below is the implementation of mixed fragmentation is $\pi_{Ename, Desig}$ ($\sigma_{Eno} > 102$(EMPLOYEE))

The result of this fragmentation is:

Ename	Desig
A	abc
B	abc
C	abc

CHAPTER 3 ADVANTAGES

Horizontal Fragmentation

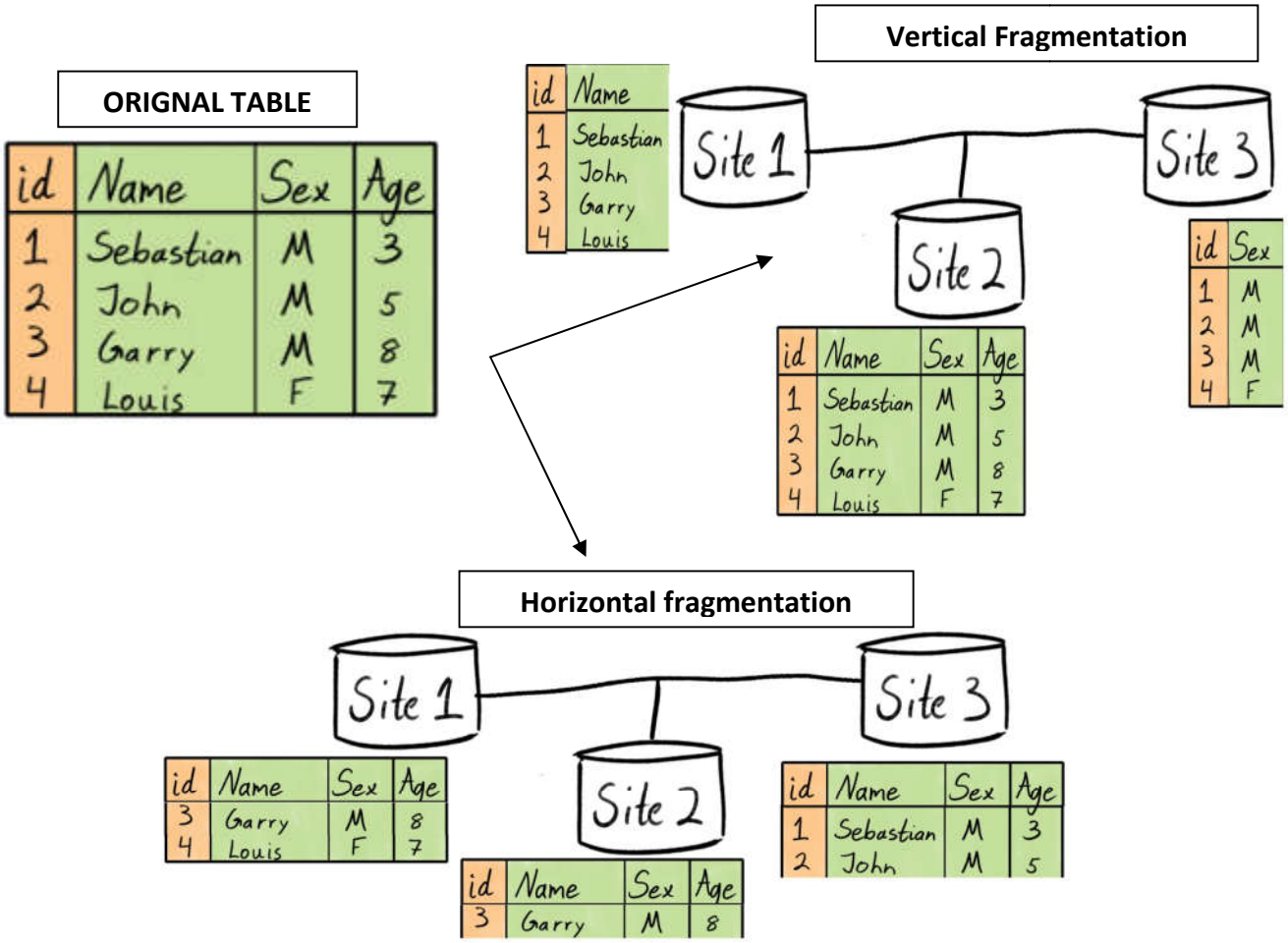
- allows parallel processing on fragments of a relation
- allows a relation to be split so that tuples are located where they
- are most frequently accessed.

Vertical Fragmentation

- allows tuples to be split so that each part of the tuple is stored
- where it is most frequently accessed
- tuple-id attribute allows efficient joining of vertical fragments
- allows parallel processing on a relation.

Mixed Fragmentation

- Fragments may be successively fragmented to an arbitrary depth. .



CHAPTER 4 STATEMENT OF THE PROBLEM, OBJECTIVES & SCOPE OF THE PROJECT

Statement of the Problem

To demonstrate the Horizontal Partitioning and Vertical Partitioning on covid vaccine drive data of various colleges of Karnataka.

Objectives:

- To perform horizontal partitioning based on City in which the colleges conducted the covid vaccine drive.
- To perform horizontal partitioning based on Type of vaccines(Covishield OR Covaxin).
- To perform monthly based horizontal partitioning.
- To Demonstrate the general vertical partitioning.

Scope:

- Gives clear partitioned tables based on different criteria with easy user interface.
- This project can further be expanded towards various districts or the entire state or entire nation.
- Can have partitioned tables based number of students vaccinated based on certain conditions.(for example: Two partitioned tables, where one table contains the records of college where vaccinated student is more than 250, other tables with less than 250)

CHAPTER 5 SNAPSHOTS OF THE PROJECT

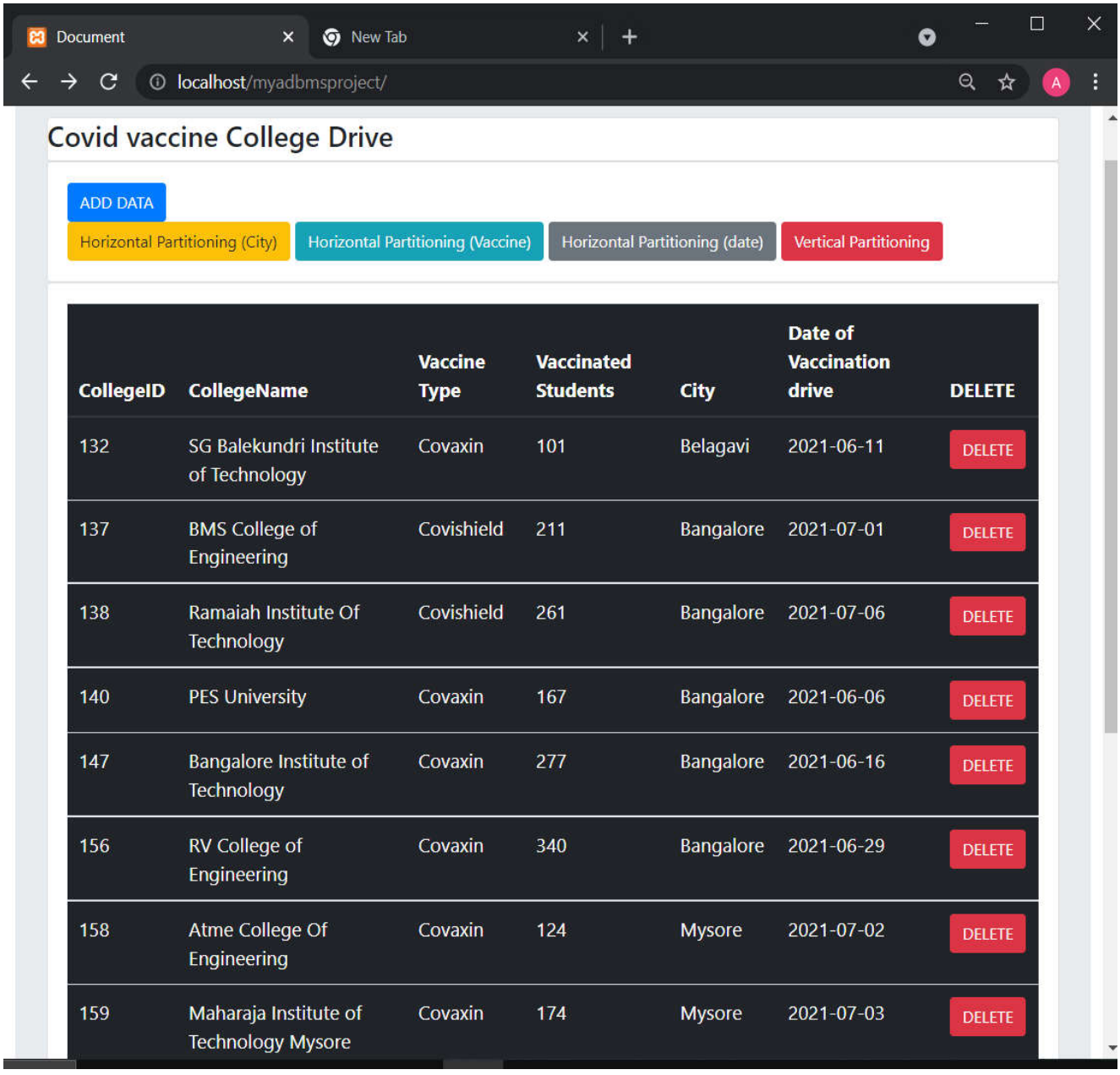


FIGURE 1: INDEX PAGE

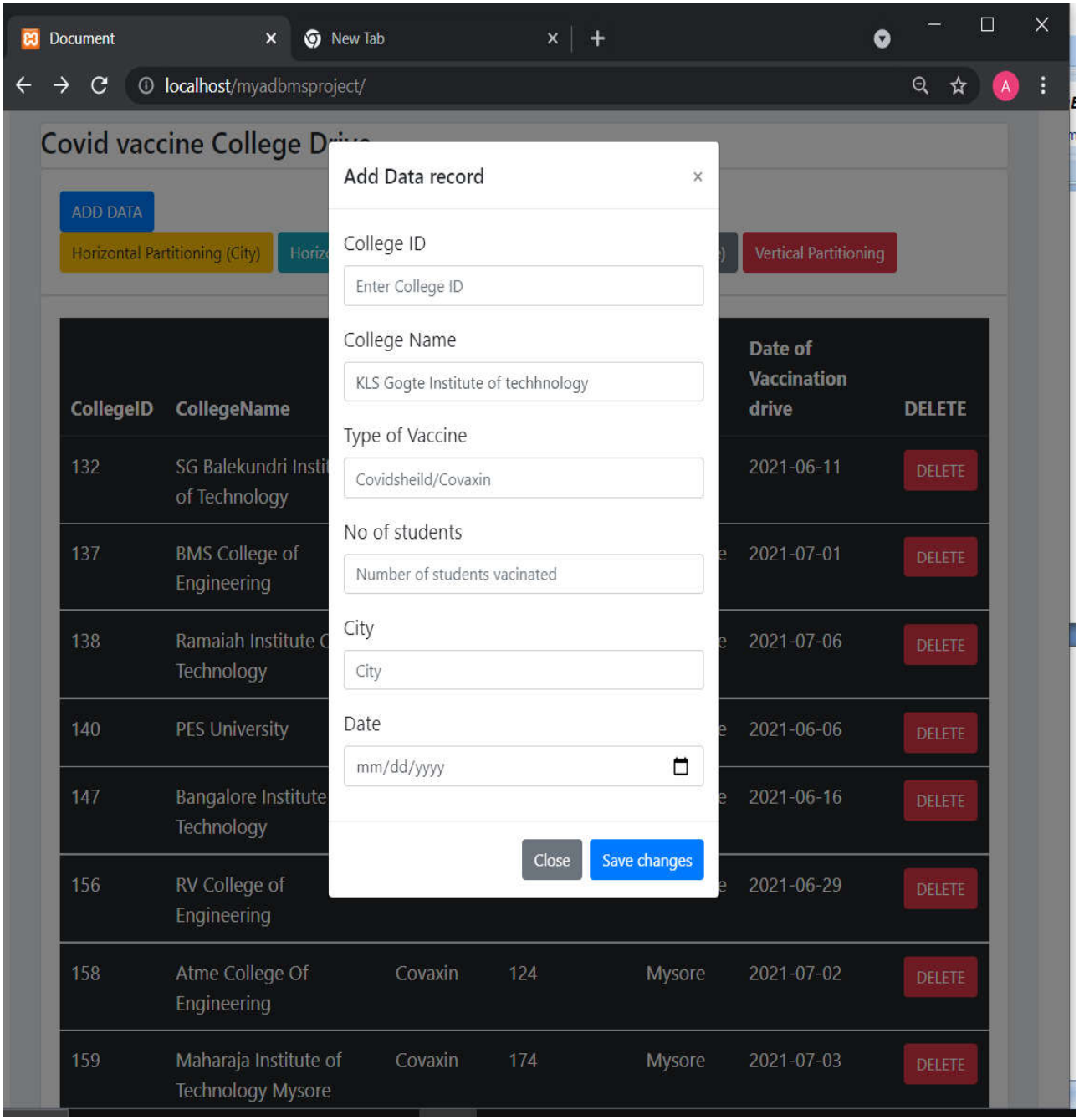


FIGURE 2: ADD NEW RECORD (TUPLE)

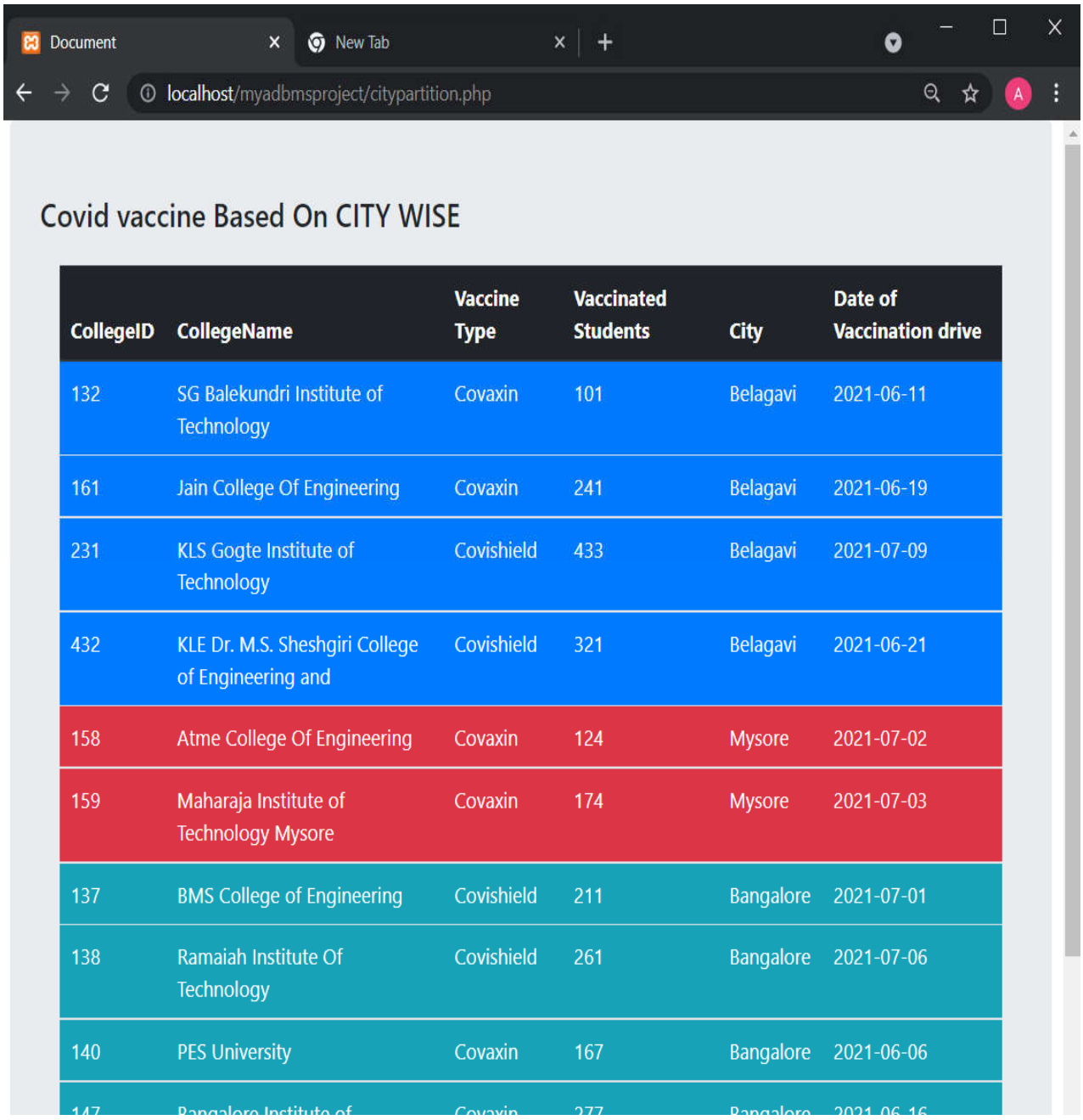


FIGURE 3:HORIZONTAL FRAGMENETATION BASED ON CITY WISE

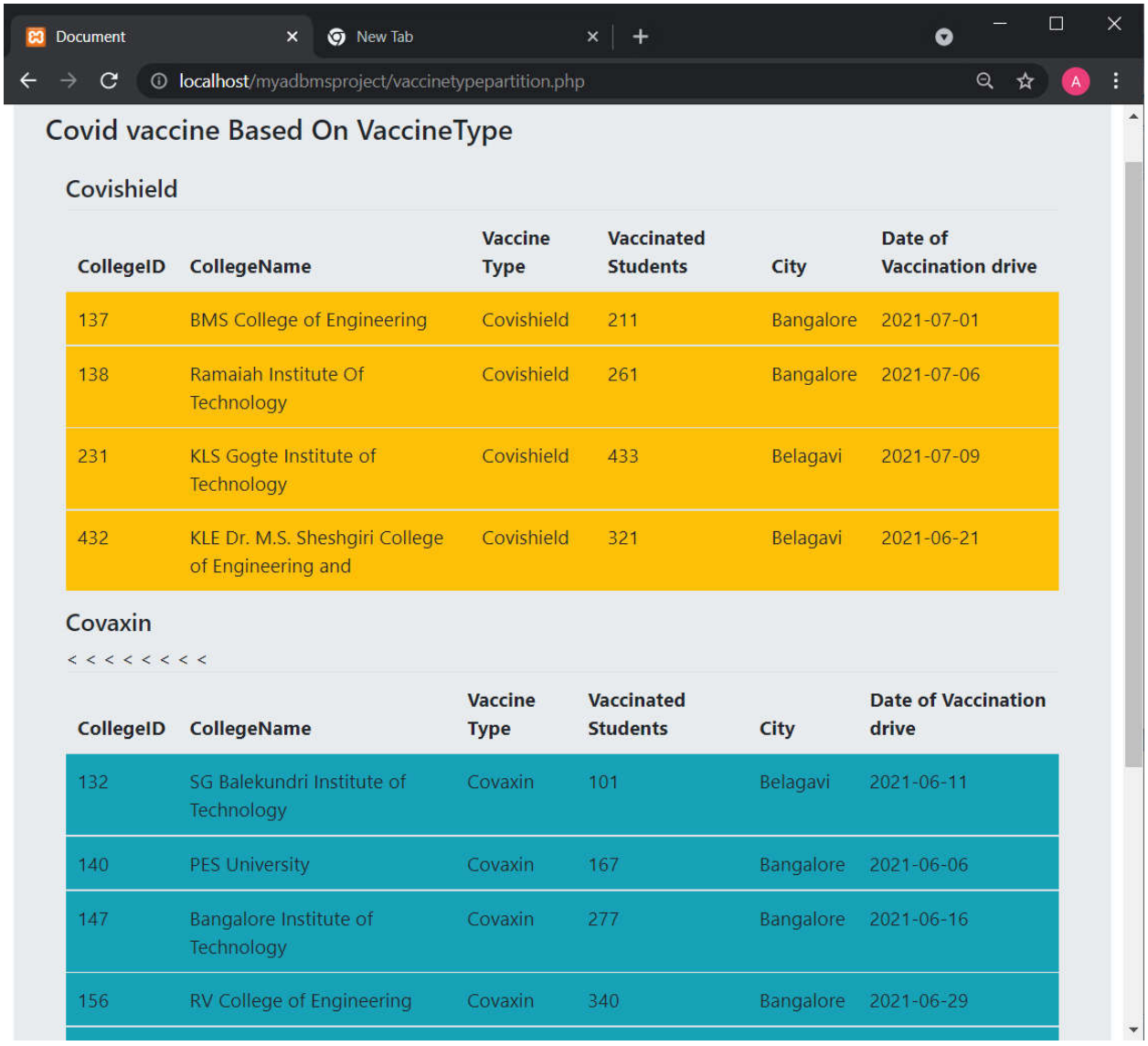


FIGURE 4:HORIZONTAL FRAGMENTATION BASED VACCINE TYPE

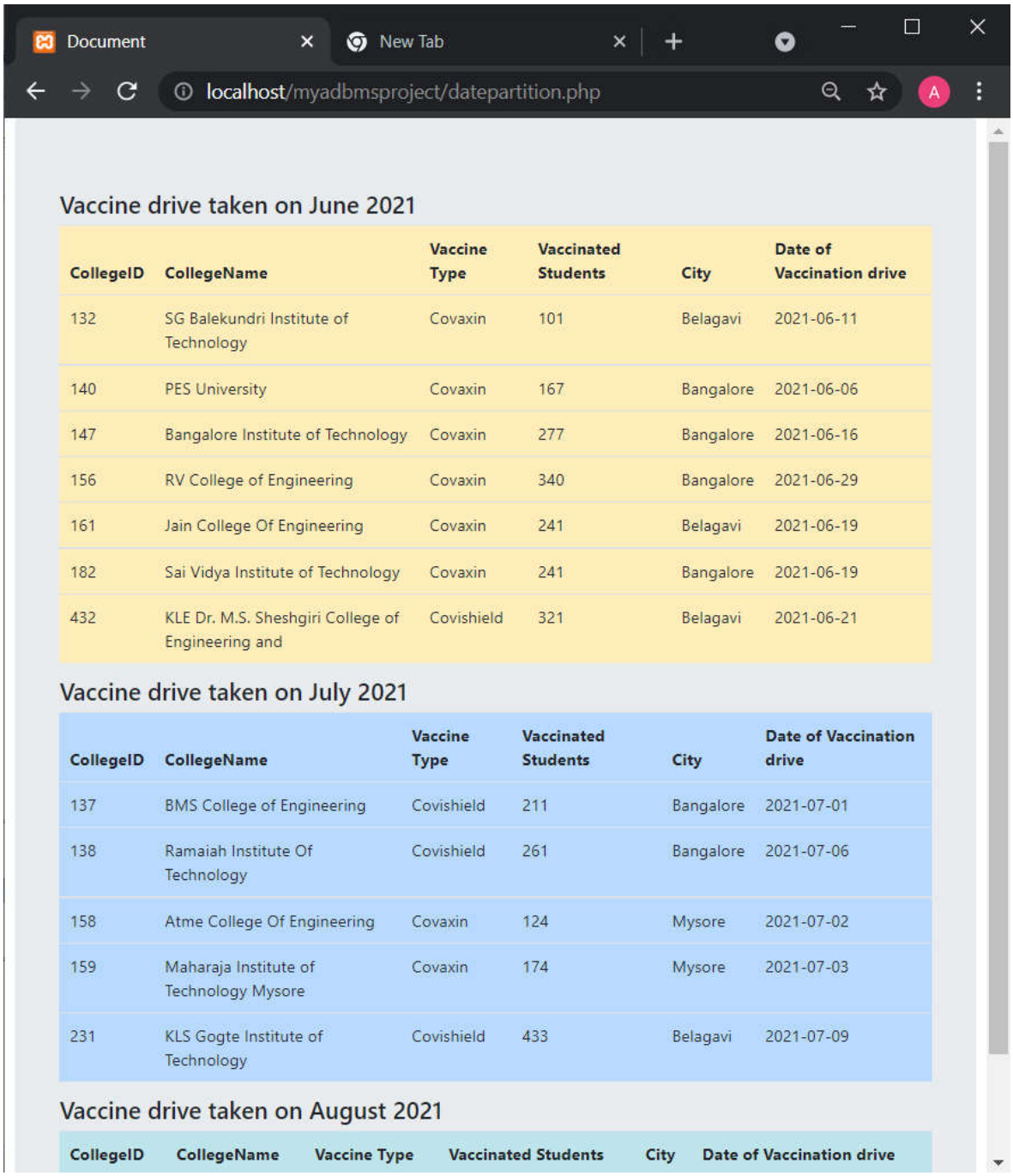


FIGURE 5:HORIZONTAL FRAGMENTATION BASED ON MONTHLY VACCINE DRIVES

FIGURE 6: SHOWING TWO SUB TABLES BY PERFORMING VERTICAL FRAGMENTATION

(HERE COLLEGE_ID WILL ACT AS A TUPLE_ID)

CONCLUSION

We have successfully illustrated and understand the Horizontal Partitioning and Vertical Partitioning on covid vaccine drives data of various colleges of Karnataka. This helps to improve the performance of distributed database design by increasing the efficiency since data is stored only where it is needed. So that the fragments can be allocated at different network sites in a process called as data allocation.

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