

JOINT SEAT ALLOCATION SYSTEM

UCS2201 – Fundamentals and Practice of Software Development

A PROJECT REPORT

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July 2023

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BONAFIDE CERTIFICATE

Certified that this project report titled **Joint Seat Allocation System** is the Bonafide work of Jetti Aashika 3122225001050, Krishnaraj N 3122225001065, Lavanya Vasudevan 3122225001067 who carried out the project work in the UCS2201 – Fundamentals and Practice of Software Development during the academic year 2022-23.

Internal Examiner

External Examiner

Date:

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Abstract

In this note, we offer a more straightforward technique to solve the joint seat allocation problem when there are multiple merit lists. The approach is simple and organic and is not (at least directly) based on Gale and Shapley's deferred acceptance algorithm. Only those at the top of each person's preference list can move up. As a result, the algorithm's entire process can be made public. This will increase the system's transparency and trustworthiness.

1. Introduction

Develop a software system for the engineering counselling and admission process for two sets of institutes - say IITs and NITs each having a set of different branches, each branch with a certain number of seats available.

Number of candidates can be assumed as 5 times the total number of seats available.

Admission to each set of institutes is based on its own qualifying exam. Each candidate will have a specific rank in one or both merit lists.

2. Extended Exploration

FEE WAIVING

This mechanism aims to provide financial assistance to students who come from economically disadvantaged backgrounds, allowing them to access education without being burdened by excessive financial constraints.

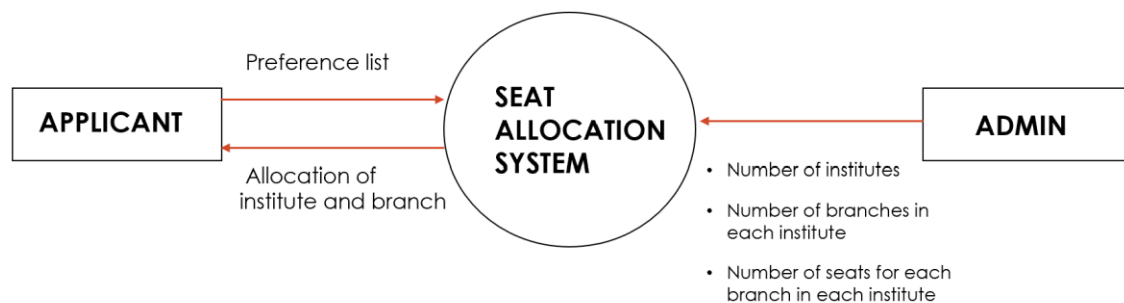
The students have been segregated into three categories based on income :

CATEGORY NUMBER	ANNUAL INCOME (INR)	TUTION-FEE WAIVER
1	Less than 50,000 Rupees	100 %
2	Between 50,000 to 2,00,000	75 %
3	Between 2,00,000 to 5,00,000	50 %

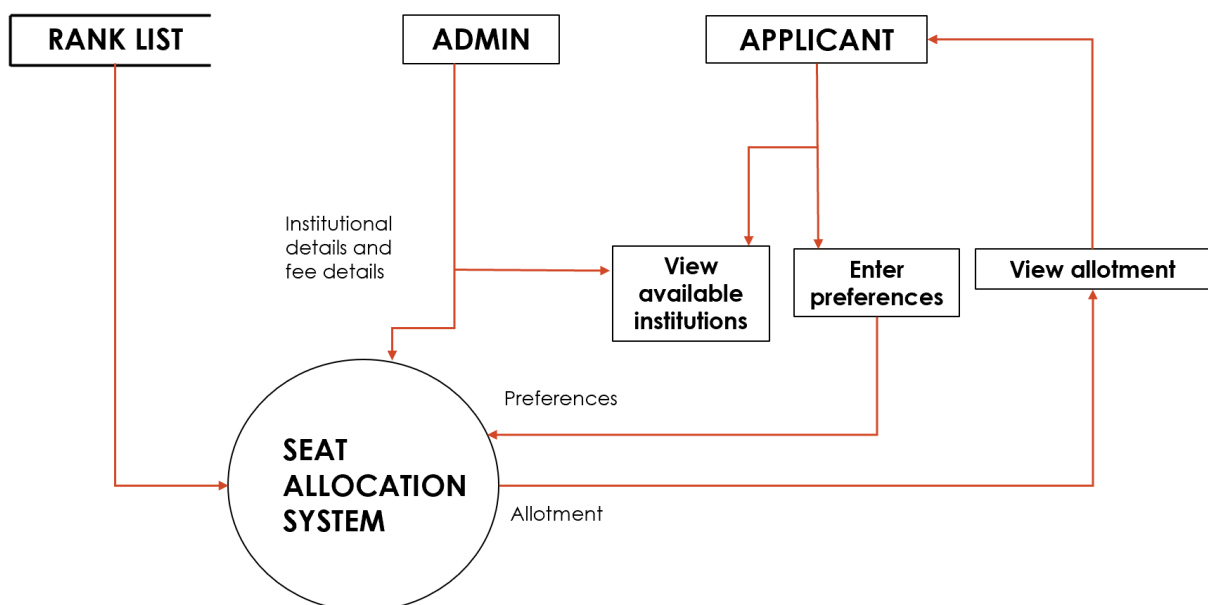
3. Analysis using diagrams

DATA FLOW DIAGRAM

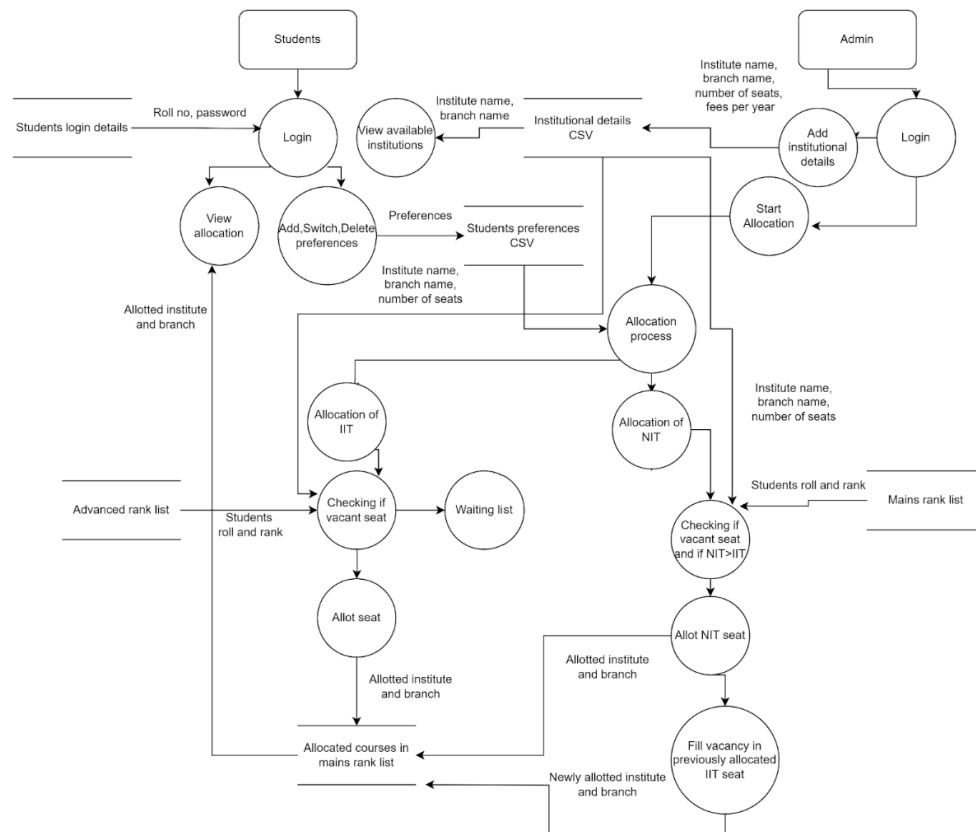
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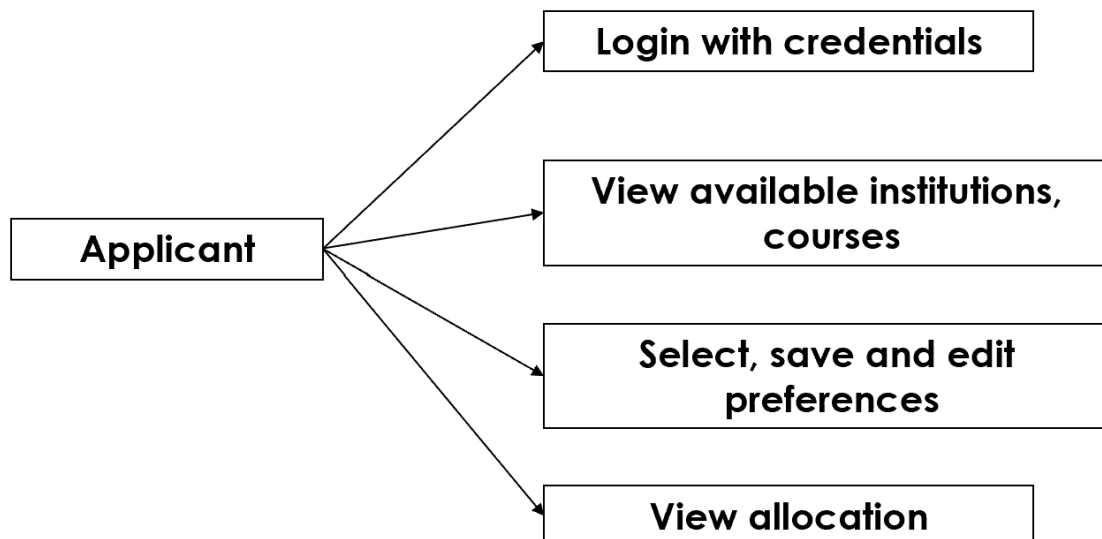
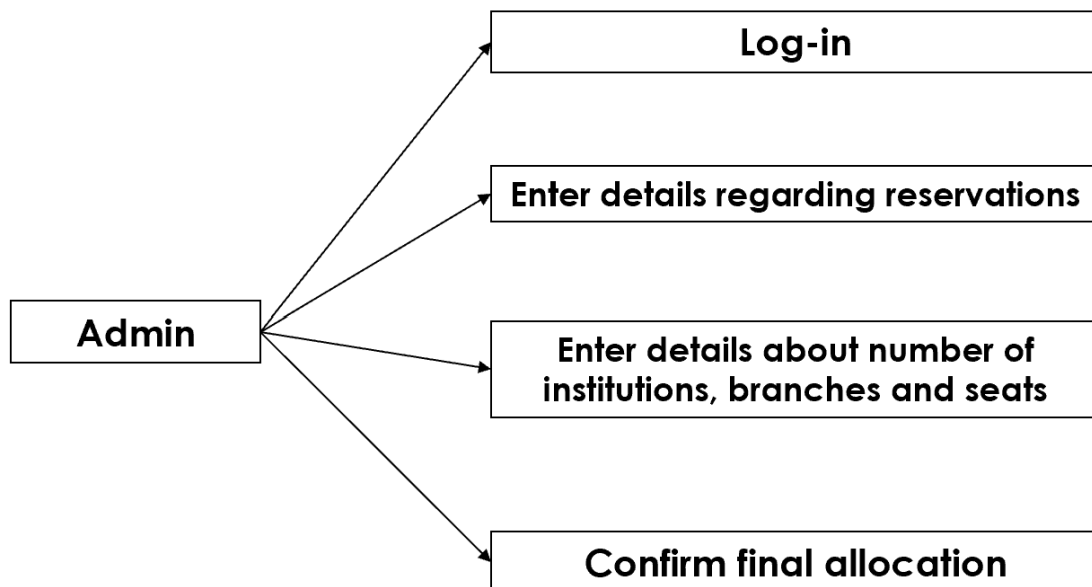
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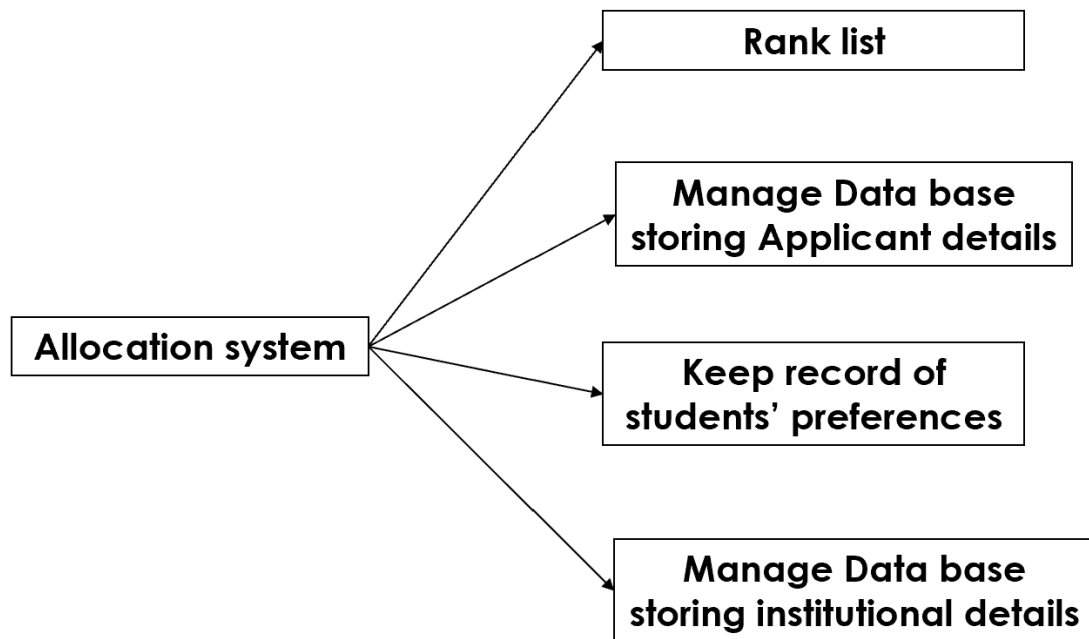


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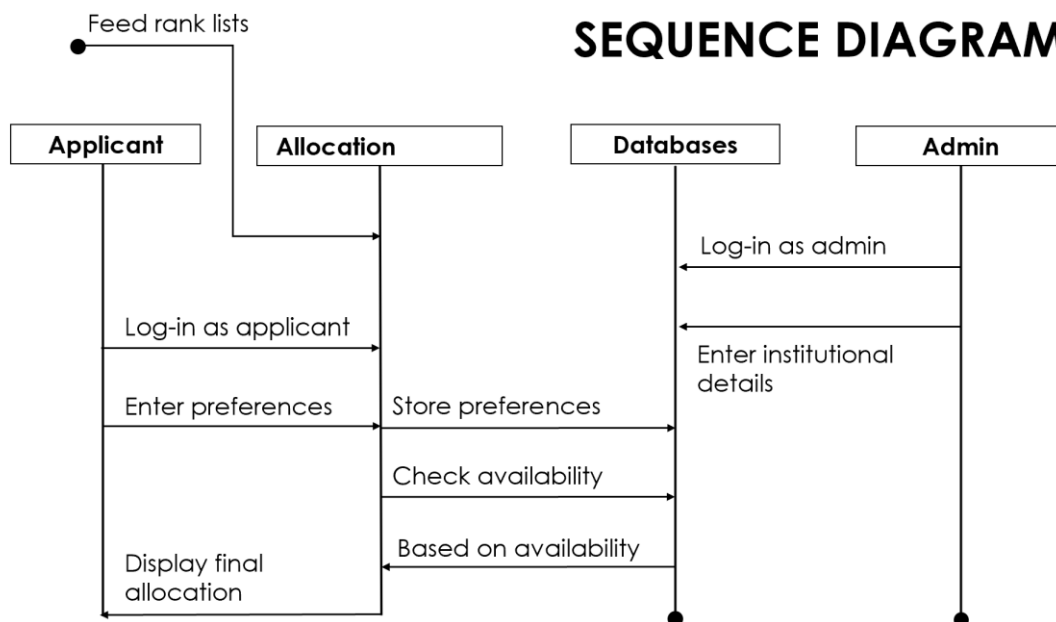


USE CASE DIAGRAMS



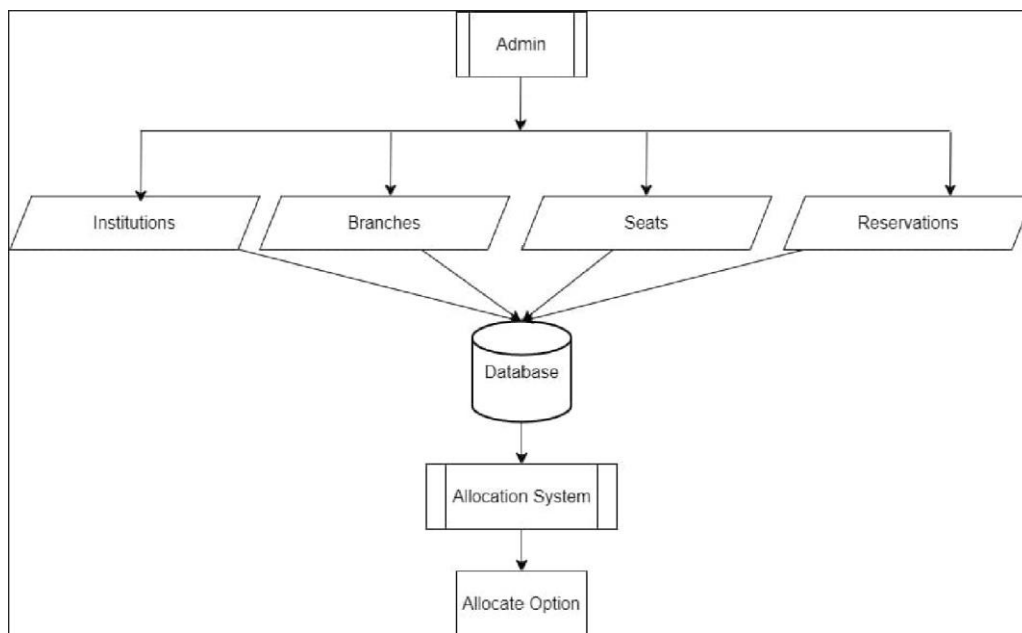


SEQUENCE DIAGRAM

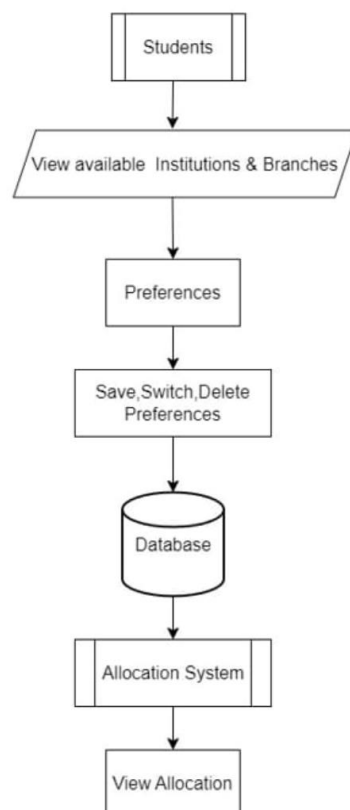


MODULE DIAGRAMS

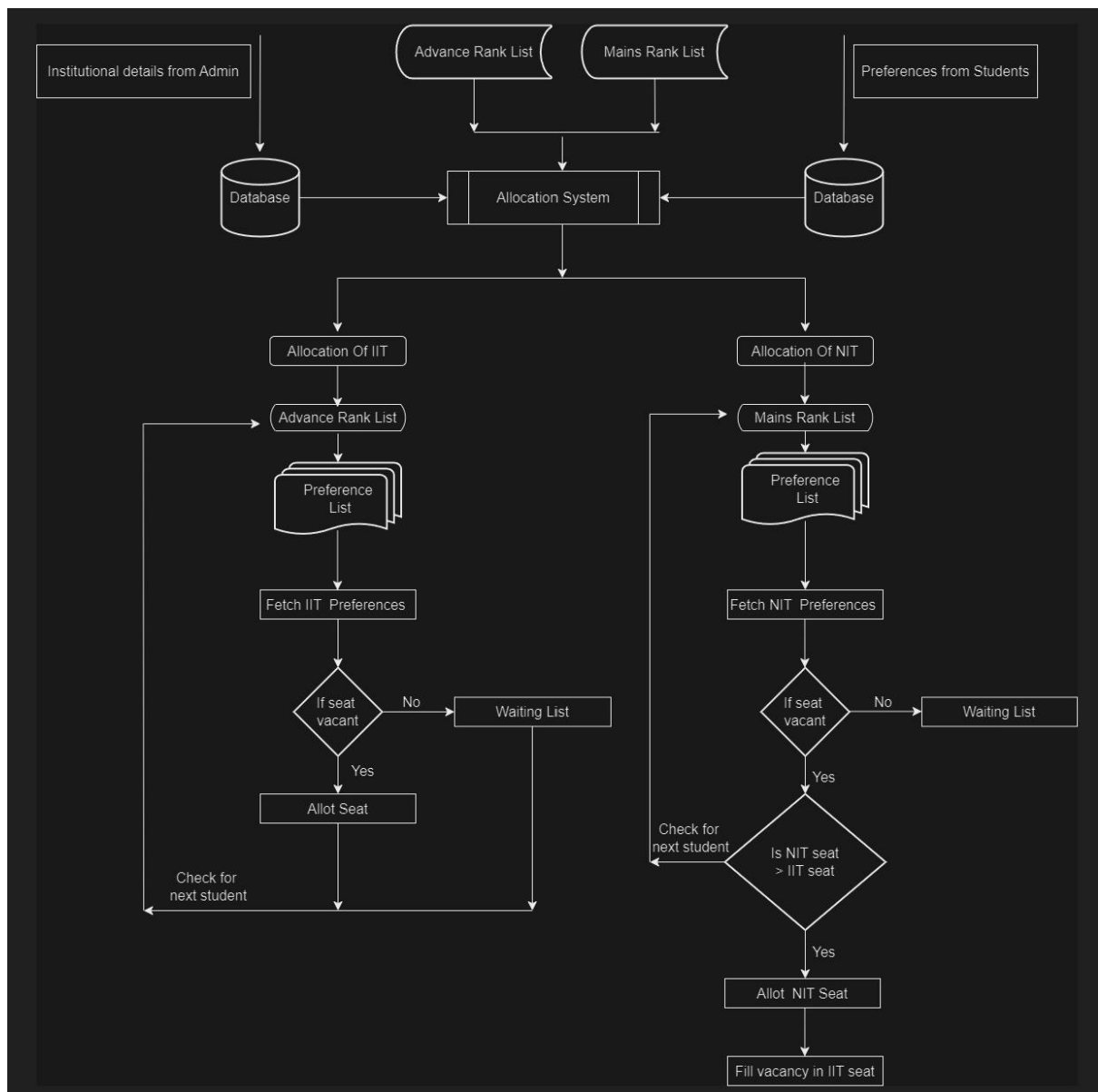
RETRIEVAL OF INSTITUTIONAL DETAILS



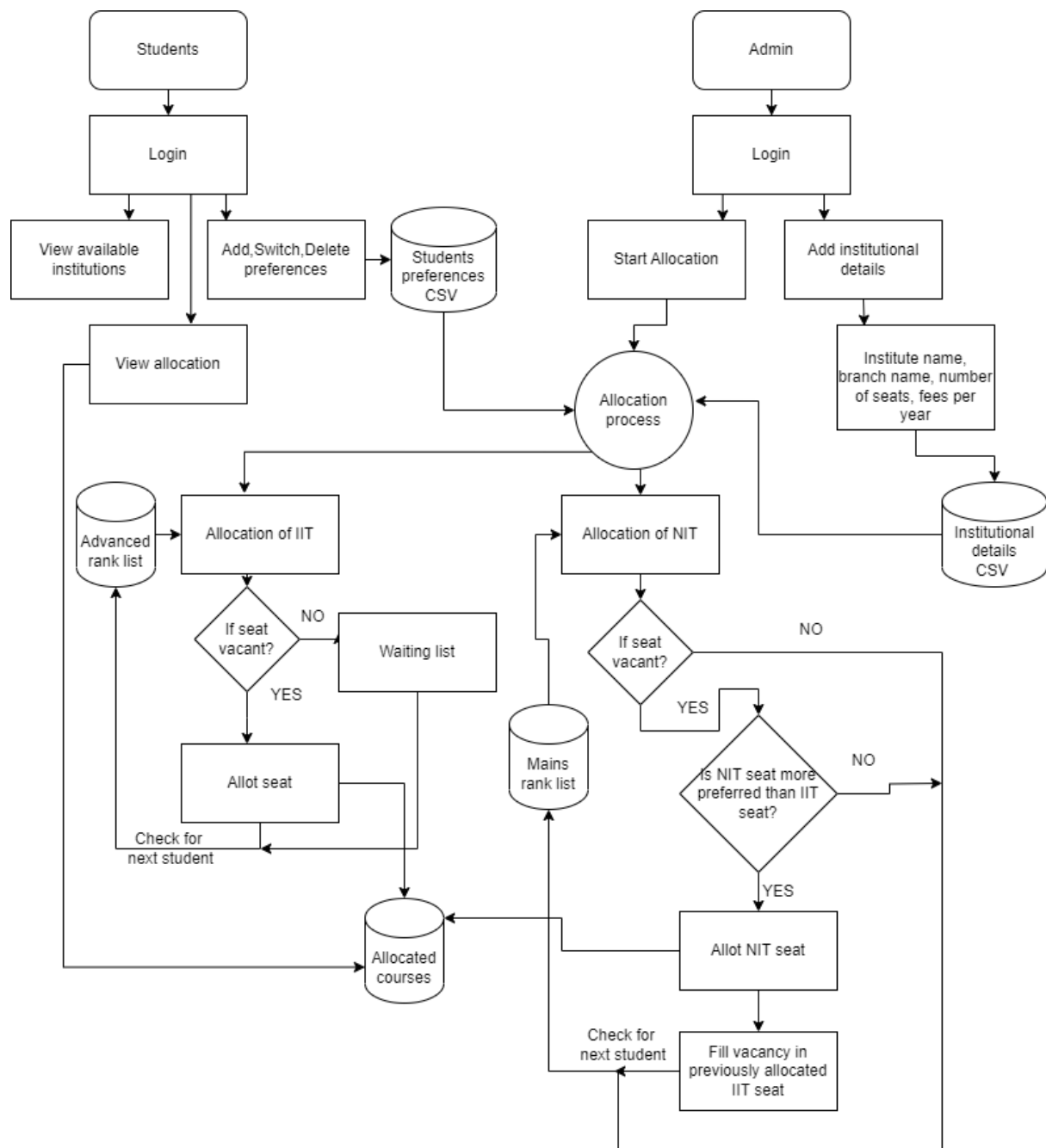
RETRIEVAL OF STUDENT PREFERENCES



ALLOCATION OF IIT SEATS AND NIT SEATS FLOWCHART



4. Architecture diagram



5. Module description

RETRIEVAL OF INSTITUTIONAL DETAILS

First important step in the counselling process.

The following details are fetched from the admin ;

- The names of the institutions (IITs and NITs)
- The branches offered in each institution
- The number of seats in each branch

All of the above details are stored in a single database for access by the allocation system during later stages of the allocation process. A copy of the database is saved as a permanent record.

```
void read_inst_details(const char *filename, int details_len,
struct institution inst_details[])
```

```
void store_inst_details(char filename[], int inst_details_len,
struct institution inst_details[])
```

INSTITUTE BRANCH MANAGEMENT

The system should maintain a database of the participating institutes, including IITs and NITs, along with their respective branches and the number of seats available in each branch.

The system should allow administrators to add, update, or remove institutes and branches as per requirements.

```
int admin_login()
```

```
void store_inst_details(char filename[], int inst_details_len,
struct institution inst_details[])
```

```
void set_values(struct institution s[], int i, char inst[], char
branch[], int seats,int fees)
```

RETRIEVAL OF STUDENT PREFERENCES

This module consists of functionalities where the student logs in and fills in their preferences.

LOG-IN

The applicant is expected to login with details such as their hall ticket number and password. These are checked with the existing database containing the students' details before proceeding to the next step.

```
int student_login(int *reqd_roll_no, int students_only_len,
struct Student students_only[])
```

```
int cleared_adv(int roll, int adv_cleared_len, struct
adv_cleared_struct adv_cleared[100])
```

CHOICE-FILLING

For the students to fill in their preferences, a menu driven algorithm is used. The available institutions and branches (in IITs and NITs) are retrieved from the database and displayed.

The selected choice is updated immediately in the students' preferences structures.

The records can be deleted or edited by the student and these changes are stored in the database as well.

There is no limit to the number of choices that the applicant can add to their list. The preferences are added to the files towards the end of the program.

```
void display_options(int details_len, struct institution
inst_details[details_len], int saved_len, char
saved[100][2][10])
```

```
void display_preferences(int saved_len, char saved[][2][10])
```

```
void get_option(int num, int details_len, struct institution
inst_details[50], int saved_len, char saved[100][2][10])
```

```
void del_preference(int num, int *len, char saved[100][2][10])
```

```
void switch_preferences(int pref_1, int pref_2, char
saved[][2][10])
```

ALLOCATION OF IIT SEATS

Iterate through the advanced rank list in order of rank.

For each student in the rank-list, fetch the student's preference list. In the preference list, consider only the IIT courses where admission is based on advanced rank-list.

If a course at the current preference position is not completely filled, assign the candidate to the course.

Add the candidate to the waiting list of the more preferable courses that are completely filled.

During step 1 only IIT seats are filled and the waiting lists are used to track candidates who couldn't get their preferred courses due to seat unavailability.

```
int getj_adv(int roll, int adv_cleared_len, struct
adv_cleared_struct adv_cleared[])
```

```
int getj_mains(int roll, int mains_cleared_len, struct
mains_cleared_struct mains_cleared[])
```

```
void start_allocation(int adv_cleared_len, struct
adv_cleared_struct adv_cleared[],...struct
student_allotment_struct allocated_seats[])
```

ALLOCATION OF NIT SEATS

Iterate through the NIT rank list in order of rank.

For each student in the rank-list, fetch the student's preference list. In the preference list, consider only the NIT courses where admission is based on mains rank-list.

Find the first NIT course in the preference list with seats still available

If the NIT course is less preferred than the currently allotted course, move to the next person in the list.

If the course at the current preference is more preferred than the currently allotted course, reassign the candidate to the higher-preference course.

The previously allotted course of the candidate is then offered to the first person in that course's waiting list.

If that person prefers the course, the reassignment process continues.

Otherwise, the course is offered to the next person in the waiting list until a candidate accepts it or the waiting list is exhausted.

```
void remove_roll_from_q(int course, struct waiting_list  
queues[])
```

```
void update1_mains_cleared(int roll_num, char inst[], char  
branch[], struct mains_cleared_struct mains_cleared[], int  
mains_cleared_len)
```

```
void update_mains_cleared(int allocated_len, struct  
student_allotment_struct allocated_seats[],int  
mains_cleared_len, struct mains_cleared_struct  
mains_cleared[])
```

```
int find_pref_number(char inst[], char branch[], int roll_num,  
int adv_cleared_len, struct adv_cleared_struct adv_cleared[])
```

```
int fill_vacancies(char inst[], char branch[]... int  
nit_details_len, struct institution nit_details[],int  
iit_details_len, struct institution iit_details[])
```

```
int allotment_2(struct mains_cleared_struct mains_cleared[]...  
struct waiting_list queues[])
```

6. Implementation

Data organisation

- Csv files are being used to store all data like institutional details, students preferences and students login details because of its readability, straightforward structure and compatibility across multiple platforms.
- Most of the data is organised using arrays of structures because it involves several data types. The structure/row itself consists of multiple fields like integers, strings, arrays and ,sometimes, other structure arrays.

STRUCTURES:

```
• struct Student
• {
•     char firstName[50];
•     char lastName[50];
•     int rollNumber;
•     char password[50];
•     int mainsRank;
•     int advancedRank;
•     char email[50];
•     char dob[15];
•     int income;
• };
•
• struct adv_cleared_struct
• {
•     int adv_rank;
•     int roll;
•     int pref_len;
•     char pref[100][2][10];
•     int iit_pref_len;
•     char iit_pref[100][2][10];
• };
•
• struct mains_cleared_struct
• {
•     int mains_rank;
•     int roll;
•     int nit_pref_len;
•     char nit_pref[100][2][10];
•     char allocated_inst[10];
•     char allocated_branch[10];
• };
•
• struct institution
```

```

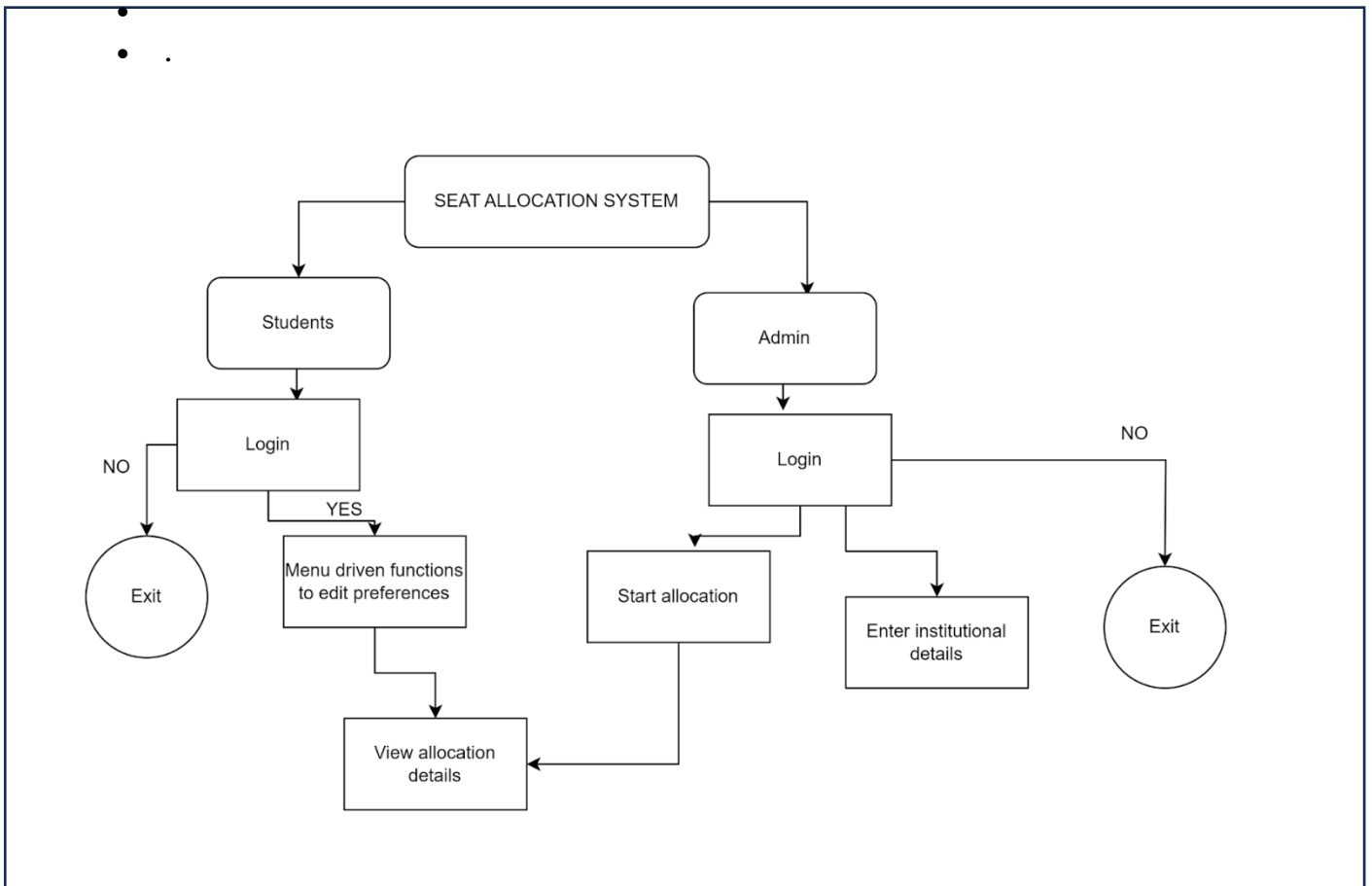
• {
•     char inst[10];
•     char branch[10];
•     int seats;
•     int fees;
• };
• struct waiting_list
• {
•     char inst[10];
•     char branch[10];
•     int roll_len;
•     int roll_arr[100];
• };
•
• struct student_allotment_struct
• {
•     int roll;
•     char inst[10];
•     char branch[10];
• };
•
• struct branch_roll_struct
• {
•     char branch[10];
•     int roll_len;
•     int roll_arr[100];
• };
•
• struct inst_wise_allotment_struct
• {
•     char inst[10];
•     int branch_len;
•     struct branch_roll_struct branch_roll[20];
• };
•

```

Libraries Used

- `stdlib.h` is a header file and also the Standard Library of C programming language that declares various utility functions for type conversions, memory allocation, algorithms, and other similar use cases.
- `stdio.h` is a header file which has the necessary information to include the input/output related functions in our program. Example `printf`, `scanf` etc.
- `string.h` is a standard header file in the C language that contains functions for manipulating strings (arrays of characters). `<string.h>` header file contains some useful string functions like `strlen()`, `strcpy()`, `strcmp()`

USER INTERFACE DIAGRAM



CODE DEVELOPMENT PLATFORMS

- Visual Studio Code
- Replit

7. Validation through Test Cases

1. ADMIN LOGIN MODULE

Code execution

```
PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit
Enter choice:1
Enter the password: Admin7
  You are logged in as an admin.

MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin
Enter choice:1

Institutions:
1-IITs
2-NITs
3-Done

Enter your choice: 1
```

2. ADDITION OF INSTITUTIONAL DETAILS

Code execution

```
PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit
Enter choice:1
Enter the password: Admin7
You are logged in as an admin.

MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin
Enter choice:1

Institutions:
1-IITs
2-NITs
3-Done

Enter your choice: 1

PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit
Enter choice:1
Enter the password: Admin7
You are logged in as an admin.

MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin
Enter choice:1

Institutions:
1-IITs
2-NITs
3-Done

Enter your choice: 1
```

Addition of IIT details

```
Enter IIT Name: IIT-A
Enter no. of branches:3

    Enter Branch name: ECE
    Enter number of seats: 3

    Enter Branch name: EEE
    Enter number of seats: 4

    Enter Branch name: CSE
    Enter number of seats: 4

Add more IITs? y/n:Y

Enter IIT Name: IIT-B
Enter no. of branches:2

    Enter Branch name: MECH
    Enter number of seats: 5

    Enter Branch name: CIVIL
    Enter number of seats: 3

Add more IITs? y/n:Y
```

Addition of NIT details

```
Institutions:
1-IITs
2-NITs
3-Done

Enter your choice: 2

Enter NIT Name: NIT-A
Enter no. of branches:3

    Enter Branch name: IT
    Enter number of seats: 4

    Enter Branch name: CSE
    Enter number of seats: 3

    Enter Branch name: CIVIL
    Enter number of seats: 4

Add more NITs? y/n:Y

Enter NIT Name: NIT-B
Enter no. of branches:4

    Enter Branch name: MECH
    Enter number of seats: 4

    Enter Branch name: AI
    Enter number of seats: 3
```


3. STUDENT PREFERENCE RETRIEVAL

Viewing selected options

```
MENU:
1-Admin
2-Student
3-Exit
Enter choice:2
Enter username: Veer
Enter rollnumber: 535300
Enter password: VUJpHL6a
Login successful!

MENU:
(1)    View available options
(2)    Add option
(3)    Switch options
(4)    View selected options
(5)    Delete option
(6)    Log out as Student

Enter your choice: 4

Your preference list:
1-IIT-C CHEM
2-NIT-B AI
3-IIT-A ECE
```

Addition of IIT details

```
MENU:  
(1)    View available options  
(2)    Add option  
(3)    Switch options  
(4)    View selected options  
(5)    Delete option  
(6)    Log out as Student
```

```
Enter your choice: 1
```

```
Institutions:  
1-IITs  
2-NITs  
3-Go back
```

```
Enter your choice: 1
```

```
IITs:  
2-IIT-A EEE  
3-IIT-A CSE  
4-IIT-B MECH  
5-IIT-B CIVIL  
6-IIT-C CSE  
8-IIT-C CIVIL  
9-IIT-D CHEM  
10-IIT-D MECH  
11-IIT-D EEE
```

Addition of NIT details

```
MENU:  
(1)    View available options  
(2)    Add option  
(3)    Switch options  
(4)    View selected options  
(5)    Delete option  
(6)    Log out as Student
```

```
Enter your choice: 1
```

```
Institutions:
```

```
1-IITs  
2-NITs  
3-Go back
```

```
Enter your choice: 1
```

```
IITs:
```

```
2-IIT-A  EEE  
3-IIT-A  CSE  
4-IIT-B  MECH  
5-IIT-B  CIVIL  
6-IIT-C  CSE  
8-IIT-C  CIVIL  
9-IIT-D  CHEM  
10-IIT-D MECH  
11-IIT-D EEE
```

```
Institutions:
```

```
1-IITs  
2-NITs  
3-Go back
```

```
Enter your choice: 2
```

```
NITs:  
1-NIT-A IT  
2-NIT-A CSE  
3-NIT-A CIVIL  
4-NIT-B MECH  
6-NIT-B CIVIL  
7-NIT-B IT  
8-NIT-W EEE  
9-NIT-W AI  
10-NIT-W ECE  
Enter number to add:3
```

```
inside: saved_len=4
```

```
1-IIT-C CHEM  
2-NIT-B AI  
3-IIT-A ECE  
4-NIT-A CIVIL
```

```
Added Sucessfully
```

Switching preferences

```
MENU:
(1)    View available options
(2)    Add option
(3)    Switch options
(4)    View selected options
(5)    Delete option
(6)    Log out as Student

Enter your choice: 3

Your preference list:
1-IIT-C CHEM
2-NIT-B AI
3-IIT-A ECE

Enter preference numbers to be switched : 2 3

1-IIT-C CHEM
2-IIT-A ECE
3-NIT-B AI

Switched Sucessfully
```

Deleting selected preferences

```
MENU:
(1)    View available options
(2)    Add option
(3)    Switch options
(4)    View selected options
(5)    Delete option
(6)    Log out as Student

Enter your choice: 5

1-IIT-C CHEM
2-NIT-B AI
3-IIT-A ECE
Enter number to delete:1

1-NIT-B AI
2-IIT-A ECE

Deleted Sucessfully
```

4. ALLOCATION TEST CASES

Case – 1

A student was not allocated any IIT seat

- The first NIT preference of the student has seats available
- The first NIT preference of the student doesn't have seats available

ADVANCED – CLEARED LIST

	A	B	C	D	E	F	G	H	I
1	1	148760	NIT-X MECH IIT-D CHEM NIT-Y EEE IIT-D MECH						
2	2	159844	NIT-X ECE IIT-M DS IIT-D MECH						
3	3	199148	IIT-D MECH IIT-D CHEM						
4	4	386991	NIT-W EEE NIT-X MECH						
5	5	703173	IIT-D CHEM IIT-B CIVIL						
6	6	803137							
7	7	913291							
8	8	944456							
9	9	991271							
10	10	350071							
11	11	552535							
12									
13									

MAINS – CLEARED LIST

	A	B	C	D	E	F
1	1	729694	NIT-X MECH NIT-Y EEE			
2	2	991271				
3	3	350071				
4	4	159844				
5	5	803137				
6	6	924560	NIT-W EEE			
7	8	944456				
8	9	790744	NIT-X ECE NIT-Y EEE			
9	10	837913				
10	11	386991				
11	12	380787				
12	13	199148				
13	14	462852				
14	15	687208				
15	16	363794				
16	17	151854				
17	18	552535				
18	19	703173				
19	20	913291				

IIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F	G	H
1	IIT-A	ECE	0					
2	IIT-A	EEE	0					
3	IIT-A	CSE	0					
4	IIT-B	MECH	0					
5	IIT-B	CIVIL	0					
6	IIT-C	CSE	0					
7	IIT-C	CHEM	0					
8	IIT-C	CIVIL	0					
9	IIT-D	CHEM	0					
10	IIT-D	MECH	0					
11	IIT-D	EEE	0					
12	IIT-M	DS	0					
13								
14								
15								
16								
17								

NIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F	G	H
4	NIT-B	MECH	0					
5	NIT-B	AI	0					
6	NIT-B	CIVIL	0					
7	NIT-B	IT	0					
8	NIT-W	EEE	0					
9	NIT-W	AI	0					
10	NIT-W	ECE	0					
11	NIT-X	MECH	2					
12	NIT-Y	EEE	1					
13	NIT-X	ECE	1					
14								
15								
16								
17								

ACTUAL OUTPUT

```
PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit

Enter choice:1

Enter the password: Admin7

                               Logged in!

MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin

Enter choice:2
Are you sure you want to start allocation? 1-Yes 2-No:1

Allocating....

Allocated Seats:
148760-NIT-X MECH
159844-NIT-X ECE
199148-IIT-D MECH
386991-IIT-A CSE
703173-IIT-D CHEM
```

Case – 2

A student was allocated an IIT seat

- The student prefers an IIT course over an NIT course
- The student prefers an NIT course over an IIT course

ADVANCED – CLEARED LIST

	A	B	C
1	1	148760	NIT-X MECH IIT-D CHEM NIT-Y EEE IIT-D MECH
2	2	159844	NIT-X ECE IIT-M DS IIT-D MECH
3	3	199148	IIT-D MECH IIT-D CHEM NIT-X ECE
4	4	386991	
5	5	703173	IIT-D CHEM IIT-B CIVIL
6	6	803137	IIT-D MECH NIT-W EEE
7	7	913291	
8	8	944456	
9	9	991271	
10	10	350071	
11	11	552535	
12			

MAINS – CLEARED LIST

	A	B	C	D	E	F	G
1	1	729694	NIT-X MECH NIT-Y EEE				
2	2	991271					
3	3	350071					
4	4	159844					
5	5	803137					
6	6	924560	NIT-W EEE				
7	7	148760					
8	8	944456					
9	9	790744	NIT-X ECE NIT-Y EEE				
10	10	837913					
11	11	386991					
12	12	380787	NIT-W AI NIT-B IT				
13	13	199148					
14	14	462852					
15	15	687208					
16	16	363794					
17	17	151854					
18	18	552535					
19	19	703173					
20	20	913291					

IIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F	G	H
1	IIT-A	ECE	0					
2	IIT-A	EEE	0					
3	IIT-A	CSE	1					
4	IIT-B	MECH	0					
5	IIT-B	CIVIL	1					
6	IIT-C	CSE	0					
7	IIT-C	CHEM	0					
8	IIT-C	CIVIL	0					
9	IIT-D	CHEM	2					
10	IIT-D	MECH	1					
11	IIT-D	EEE	0					
12	IIT-M	DS	1					
13								
14								
15								
16								

NIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F	G	H
4	NIT-B	MECH	0					
5	NIT-B	AI	0					
6	NIT-B	CIVIL	0					
7	NIT-B	IT	0					
8	NIT-W	EEE	0					
9	NIT-W	AI	0					
10	NIT-W	ECE	0					
11	NIT-X	MECH	2					
12	NIT-Y	EEE	1					
13	NIT-X	ECE	1					
14								
15								
16								
17								

OUTPUT

```
PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit

Enter choice:1

Enter the password: Admin7

                        Logged in!

MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin

Enter choice:2
Are you sure you want to start allocation? 1-Yes 2-No:1

Allocating....

Allocated Seats:
148760-NIT-X MECH
159844-NIT-X ECE
199148-IIT-D MECH
386991-IIT-A CSE
703173-IIT-D CHEM
```

Case – 3

No seats are available in any of the courses in the preference list of the student

ADVANCED – CLEARED LIST

	A	B	C
1	1	148760	NIT-X MECH IIT-D CHEM NIT-Y EEE IIT-D MECH
2	2	159844	NIT-X ECE IIT-M DS IIT-D MECH
3	3	199148	IIT-D MECH IIT-D CHEM NIT-X ECE
4	4	386991	
5	5	703173	IIT-D CHEM IIT-B CIVIL
6	6	803137	IIT-D MECH NIT-W EEE
7	7	913291	
8	8	944456	
9	9	991271	
10	10	350071	
11	11	552535	
12			
13			
14			
15			
16			
17			

MAINS – CLEARED LIST

	A	B	C	D	E	F
1	1	729694	NIT-X MECH NIT-Y EEE			
2	2	991271				
3	3	350071				
4	4	159844				
5	5	803137				
6	6	924560	NIT-W EEE			
7	7	148760				
8	8	944456				
9	9	790744	NIT-X ECE NIT-Y EEE			
10	10	837913				
11	11	386991				
12	12	380787	NIT-W AI NIT-B IT			
13	13	199148				
14	14	462852				
15	15	687208				
16	16	363794				
17	17	151854				
18	18	552535				
19	19	703173				
20	20	913291				

IIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F
1	IIT-A	ECE	0			
2	IIT-A	EEE	0			
3	IIT-A	CSE	1			
4	IIT-B	MECH	0			
5	IIT-B	CIVIL	1			
6	IIT-C	CSE	0			
7	IIT-C	CHEM	0			
8	IIT-C	CIVIL	0			
9	IIT-D	CHEM	2			
10	IIT-D	MECH	1			
11	IIT-D	EEE	0			
12	IIT-M	DS	1			
13						

NIT INSTITUTIONAL DETAILS

	A	B	C	D	E	F
1	NIT-A	IT	0			
2	NIT-A	CSE	0			
3	NIT-A	CIVIL	0			
4	NIT-B	MECH	0			
5	NIT-B	AI	0			
6	NIT-B	CIVIL	0			
7	NIT-B	IT	0			
8	NIT-W	EEE	0			
9	NIT-W	AI	0			
10	NIT-W	ECE	0			
11	NIT-X	MECH	2			
12	NIT-Y	EEE	1			
13	NIT-X	ECE	1			
14						

OUTPUT

```
PS C:\Users\Aashi\Documents\Cproject_sem2> ./menu

MENU:
1-Admin
2-Student
3-Exit

Enter choice:1

Enter the password: Admin7

                        Logged in!
MENU:
1-Add institutional details
2-Start Allocation
3-Log out as Admin

Enter choice:2
Are you sure you want to start allocation? 1-Yes 2-No:1

Allocating....

Allocated Seats:
148760-NIT-X MECH
159844-NIT-X ECE
199148-IIT-D MECH
703173-IIT-D CHEM
```

Case – 4

Student with an allocated seat is eligible for fee waiving

IIT INSTITUTIONAL DETAILS

	A	B	C	D	E
1	Institution	Branch	Seats Available	Fee PA	
2	IIT-A	ECE	0	90000	
3	IIT-A	EEE	0	90000	
4	IIT-A	CSE	1	90000	
5	IIT-B	MECH	0	115000	
6	IIT-B	CIVIL	1	115000	
7	IIT-C	CSE	0	120000	
8	IIT-C	CHEM	0	120000	
9	IIT-C	CIVIL	0	120000	
10	IIT-D	CHEM	2	100000	
11	IIT-D	MECH	1	100000	
12	IIT-D	EEE	0	100000	
13	IIT-M	DS	1	95000	
14					

NIT INSTITUTIONAL DETAILS

	A	B	C	D	E
1	Institution	Branch	Seats Available	Fee PA	
2	NIT-A	IT	0	70000	
3	NIT-A	CSE	0	70000	
4	NIT-A	CIVIL	0	70000	
5	NIT-B	MECH	0	68000	
6	NIT-B	AI	0	68000	
7	NIT-B	CIVIL	0	68000	
8	NIT-B	IT	0	68000	
9	NIT-W	EEE	0	80000	
10	NIT-W	AI	0	80000	
11	NIT-W	ECE	0	80000	
12	NIT-X	MECH	2	95000	
13	NIT-Y	EEE	1	95000	
14	NIT-X	ECE	1	95000	
15					

STUDENTS DETAILS

	A	B	C	D	E	F	G	H	I
1	Aarav	Punia	148760	1QjqoJF2	7	1	aaravpunia@gmail.com	11-01-2004	160000
2	Nandini	Sharma	151854	\$w8TFB#!	17	0	nandinisharma@gmail.com	25-01-2004	200000
3	Rohan	Verma	159844	JZA81St7	4	2	rohanverma@gmail.com	01-04-2004	3500000
4	Kavya	Das	199148	VYDU1srL	13	3	kavya1d@gmail.com	09-09-2004	4000000
5	Advait	Singh	350071	TI7grQ2H	3	10	advaitsingh@gmail.com	10-10-2004	300000
6	Ria	Gupta	363794	HNK7RDZG	16	0	ria.g@gmail.com	05-12-2004	450000
7	Aryan	Reddy	380787	6#kyb@Nj	12	0	aryanreddy@gmail.com	13-03-2005	600000
8	Diya	Chatterjee	386991	Bj0aZsNA	11	4	diyachatterjee@gmail.com	25-03-2005	10000000
9	Arjun	Malhotra	462852	\$AmZkN6J	14	0	arjunmalhotra@gmail.com	18-04-2005	5700000
10	Anika	Malhotra	552535	ElJ\$1aF9	18	11	anikamalhotra@gmail.com	31-08-2005	30000000
11	Vidisha	Desai	687208	wgnxsjAe	15	0	vidishadesai@gmail.com	10-10-2005	210000
12	Esha	Agnes	703173	0mZLA\$NP	19	5	eshaagnes@gmail.com	14-12-2005	35000
13	Dhruv	Joshi	729694	HTOcLDY1	1	0	dhruvjoshi@gmail.com	26-01-2006	40000
14	Rohan	Kumar	790744	RCnxq8P7	9	0	rohankumar@gmail.com	06-04-2006	530000
15	Shaan	Mishra	803137	SrLoWO!Q	5	6	shaanmishra@gmail.com	21-05-2006	250000
16	Aanya	Ahuja	837913	LCAcHEIS	10	0	aanyaahuja@gmail.com	29-09-2006	2000000
17	Veer	Rana	913291	VUJpHL6a	20	7	veerrana@gmail.com	06-11-2006	7500000
18	Myra	Thakur	924560	T2mSbGuo	6	0	myrathakur@gmail.com	20-11-2006	45000
19	Ishan	Pandey	944456	dvY7splB	8	8	ishanpandey@gmail.com	21-11-2006	2200000
20	Saanvi	Shetty	991271	r0n#NfX!	2	9	saanvi32s@gmail.com	25-11-2006	35000

OUTPUT

After allocation of seat for student in income category – 1

```

MENU:
1-Admin
2-Student
3-Exit

Enter choice:2
Enter rollnumber: 729694
Enter password: HTOcLDY1
Hello Dhruv Joshi!

                Logged in!

CONGRATULATIONS!!
You have been allotted MECH in NIT-X
Based on your income status you have been given a 100% waiver on your tuition fee!
Tuition fee per year = 0

Enter 0 to logout:

```

After allocation of seat for student in income category – 2

```
MENU:
1-Admin
2-Student
3-Exit

Enter choice:2
Enter rollnumber: 148760
Enter password: 1QjqoJF2
Hello Aarav Punia!

                Logged in!

CONGRATULATIONS!!
You have been allotted MECH in NIT-X
Based on your income status you have been given a 75% waiver on your tuition
Tuition fee per year = INR 23750.00

Enter 0 to logout:█
```

After allocation of seat for student in income category – 1

```
MENU:
1-Admin
2-Student
3-Exit

Enter choice:2
Enter rollnumber: 159844
Enter password: JZA81St7
Hello Rohan Verma!

                Logged in!

CONGRATULATIONS!!
You have been allotted ECE in NIT-X
Tuition fee per year = INR 95000.00

Enter 0 to logout:█
```

8. Limitations

1. Limited Seat Availability and Number of Institution:

We can give only limited number of seats and number of institutes as it becomes difficult for the system to manage large databases.

2. Proper Training:

The users and administrators need proper training to how to handle the system properly

3. Number of Rounds:

We can simulate the JOSAA counselling process with only one round as it is difficult to handle multiple rounds in admission process.

4. Reservations:

We would not be able to handle reservations like Home State Quota, Female Reservation, EWS, PWD etc as in real life scenarios.

9. Societal, Legal, Environmental Perspectives

SOCIETAL

- The online admission system provides greater accessibility and convenience to students from various regions.
- Allows students to upload documents and track their application status online.
- Students can apply to colleges without the need for physical presence, reducing geographical barriers

LEGAL

- The online admission system does not discriminate against applicants based on their race, gender, religion etc.
- It has category-based quotas in place to ensure equal opportunities to communities.

- Complies with government regulations and policies regarding reservations in educational institutions.

ENVIRONMENTAL

- The need for physical travel to colleges for application submission is eliminated. Reduces carbon emissions.
- The need for physical paperwork has also been reduced significantly.
- Resulting in decreased paper consumption which in turn minimizes deforestation and waste generation.

10. Learning outcome

By actively participating in the Joint Seat Allocation System (JSAS) college project, students will develop and enhance their teamwork skills through effective collaboration and communication. Throughout the project, students will work together in teams, fostering an environment that encourages cooperation, synergy, and shared responsibility.

Overall, participating in the project enable students to develop and refine their teamwork skills, equipping them with the necessary tools to collaborate effectively in future academic and professional endeavours.

11. References

- On seat allocation problem with multiple merit lists Rahul Kumar Singh and Sanjeev Saxena* Dept. of Computer Science and Engineering, Indian Institute of Technology, Kanpur, INDIA-208 016
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- S.Baswana, P. P. Chakrabarti, Y.Kanoria, U.Patange, S. Chandran, Joint Seat Allocation 2018: An algorithmic perspective. CoRR abs/1904.06698 (2019)
- D.Gale and L.S.Shapley, College admissions and the stability of marriage, Amer. Math. Monthly, 69(1): 9-15 (1962)
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