# Criterion C — Development

## Techniques:

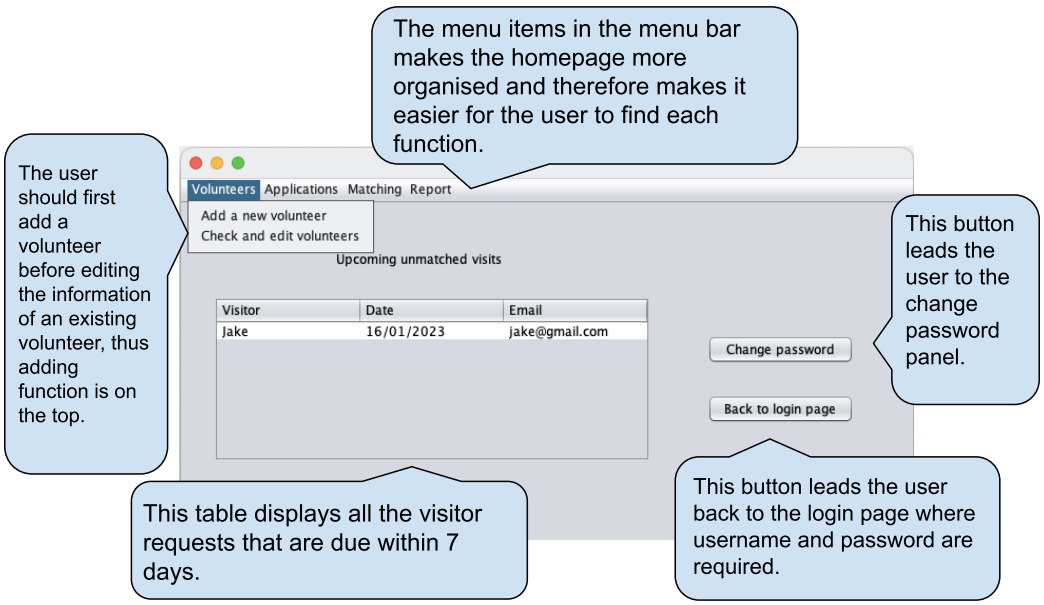
1. User friendly GUI
    a. Menu system and organization of panels
    b. Labels in the panels to guide user
    c. Disabling of radio buttons and combo boxes
    d. Minimal data entry
2. Modular development and organization
3. File handling
    a. Storing data to text files (writing files)
    b. Retrieving data from text files (reading files)
    c. Complex searches and editing (selection and report panels)
    d. Relational database model
4. Data validation and verification
    a. Presence check
    b. Range check
    c. Format check
    d. Uniqueness check
5. Algorithmic thinking
    a. Automatic filtration of volunteers when matching applications and volunteers
6. Use of existing libraries
    a. Date and time selection using JCalendar
    b. Dynamic JTables
    c. Sending emails via javax.mail.jar

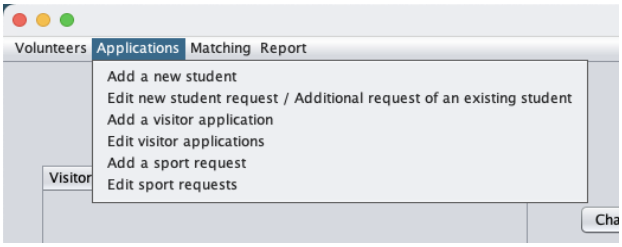
# User friendly GUI

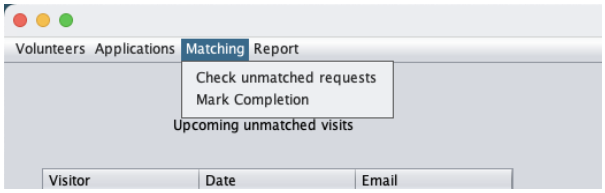
## a. <u>Menu system and organization of panels</u>

All the sub panels are linked to a single home page so that all these panels can be accessed through simple clicks on the dropdown menu at the top of the home page. The order of the menu items are organized in a way that follows the order of the working process from left to right, preventing the user from realizing that they need to first enter a sub panel before entering the panel that they are already in.

Example 1: homepage



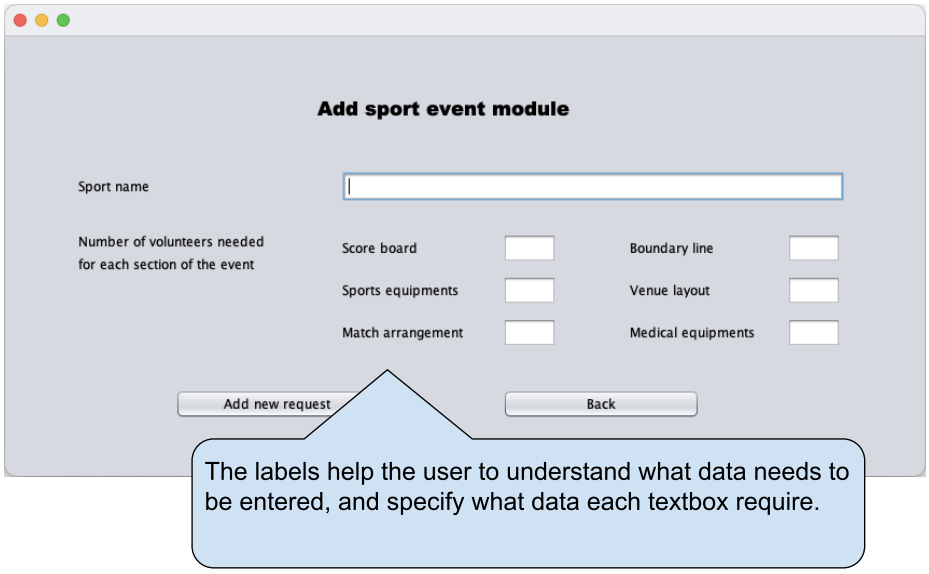




## b. Labels in the panels to guide user

There are labels throughout the program to guide the user on what should be done for each entry. Some are descriptions in sentences while others are short labels.

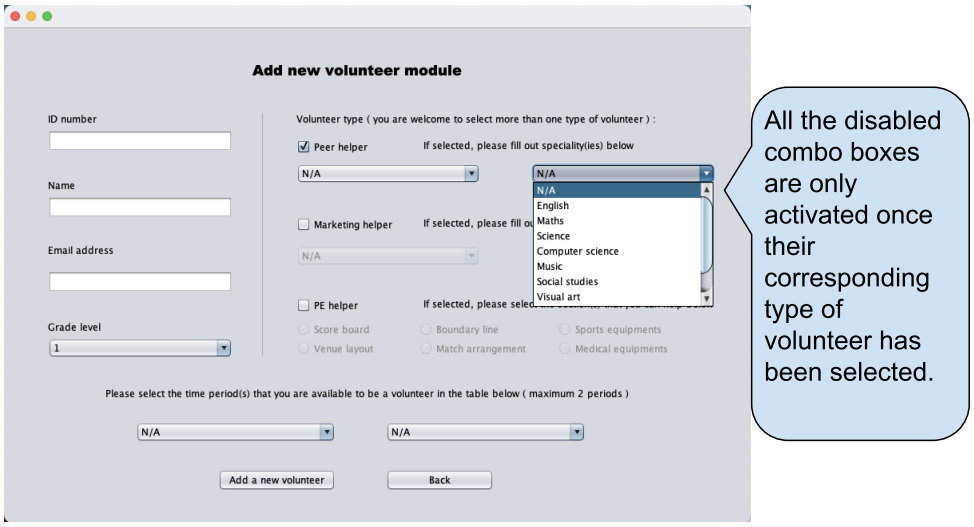
Example 2: add sports event




## c. Disabling of radio buttons and combo boxes

For the purpose of maintaining the consistency of data entry, certain radio buttons and combo boxes are disabled when the program is initialized and will only be accessible when appropriate options are chosen to prevent garbage data entry.

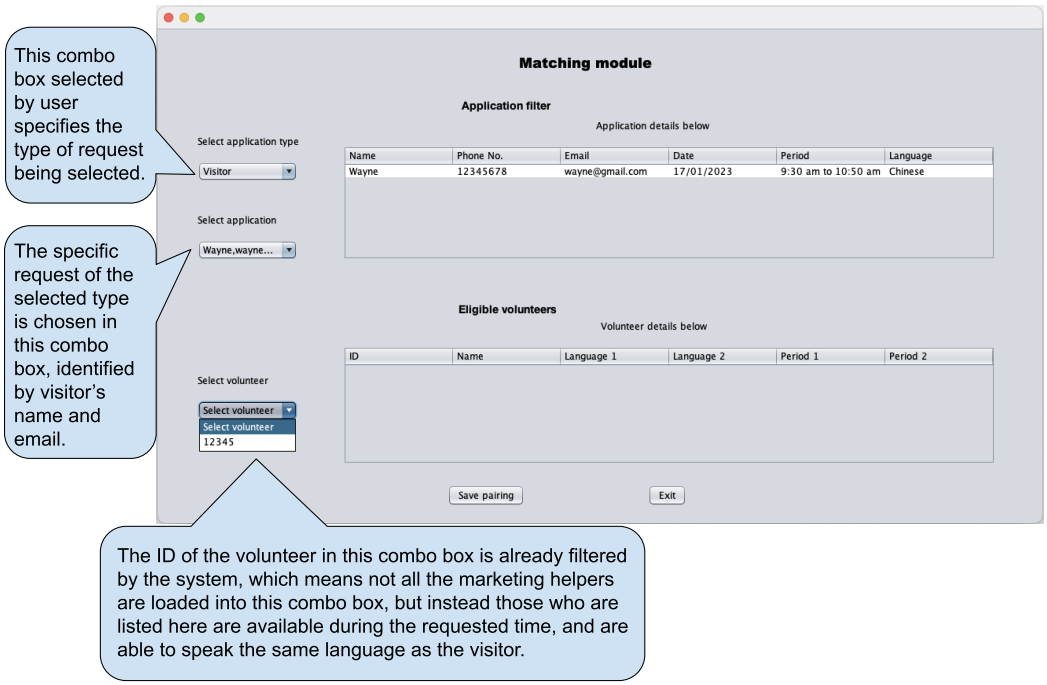
Example 3: add new volunteer



## d. Minimal data entry

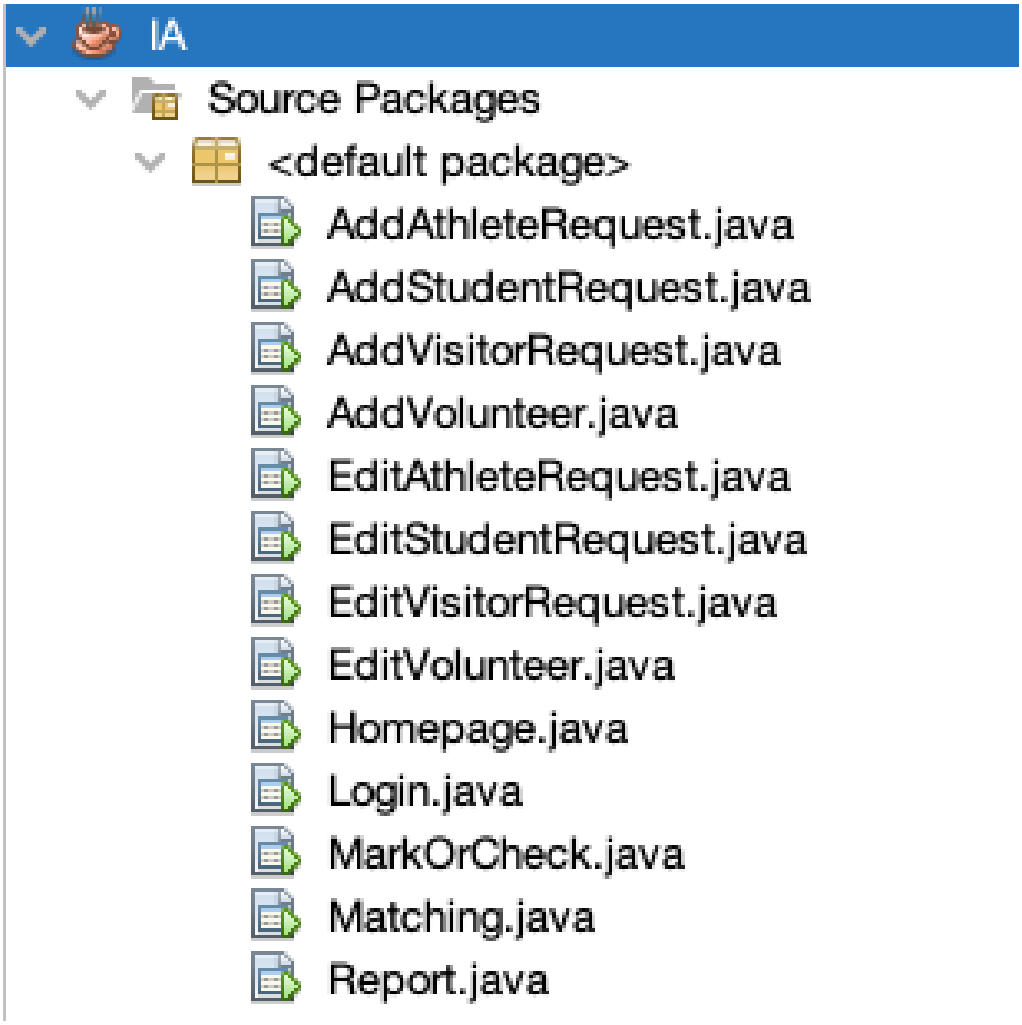
Based on the options the user has chosen, some options are removed from the comboboxes by filtering and thus the user doesn't have to worry about choosing the unsuitable volunteer. Meanwhile, selecting volunteers instead of typing prevents data entry errors.

Example 4: matching requests and volunteers



## Modular development and organization

All the functions within the program are connected to the menu options from the menu bar in the homepage. Each function within the program has their corresponding individual panels which allows them to function independently and does not interfere with each other. This leads to the easy modifiable and updatable characteristics of this program.

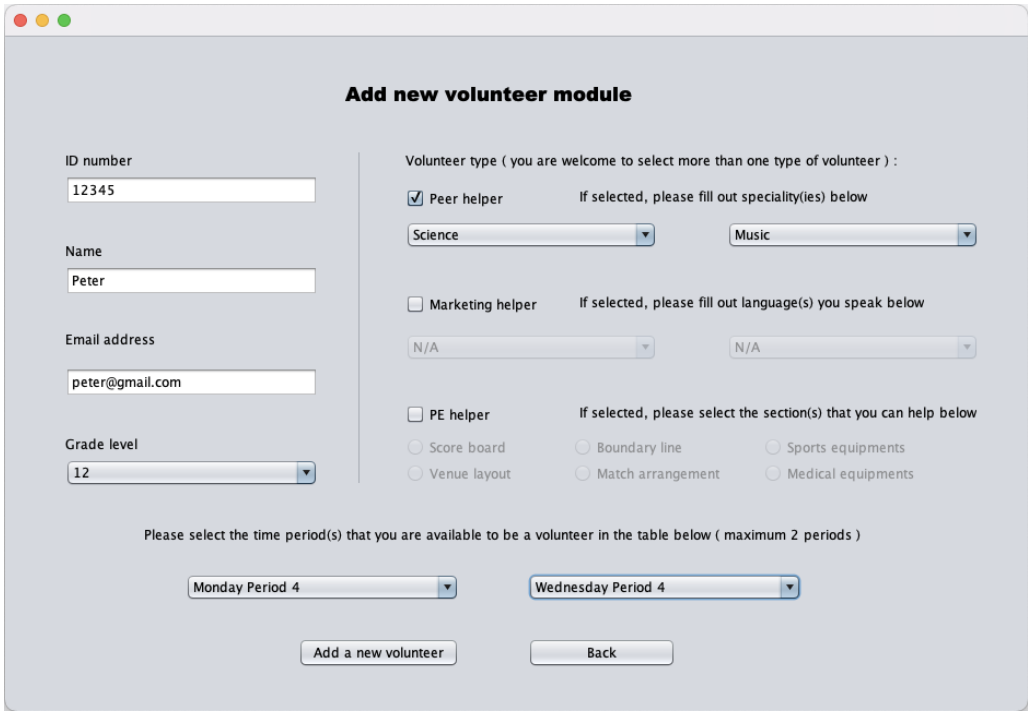


# File handling

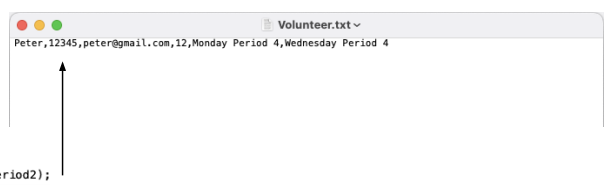
## a. Storing data to text files (writing files)

In order to utilize data of volunteers and applicants, data must be stored in a database. Using the FileWriter and PrintWriter method, the program takes the validated data inputted by the user and transforms it into a text of a consistent format.

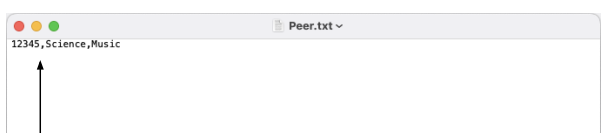
Example 5: add volunteer




```java
String na = name.getText();
int ID = Integer.parseInt(id.getText());
String em = email.getText();
int gr = Integer.parseInt(grade.getSelectedItem()+"");
```




```java
String period1 = p1.getSelectedItem()+"";
String period2 = p2.getSelectedItem()+"";


FileWriter vol = new FileWriter("Volunteer.txt", true);
PrintWriter volp = new PrintWriter(vol);
if(error == 0)
{
    volp.println(na+","+ID+","+em+","+gr+","+period1+","+period2);
}
volp.close();
```

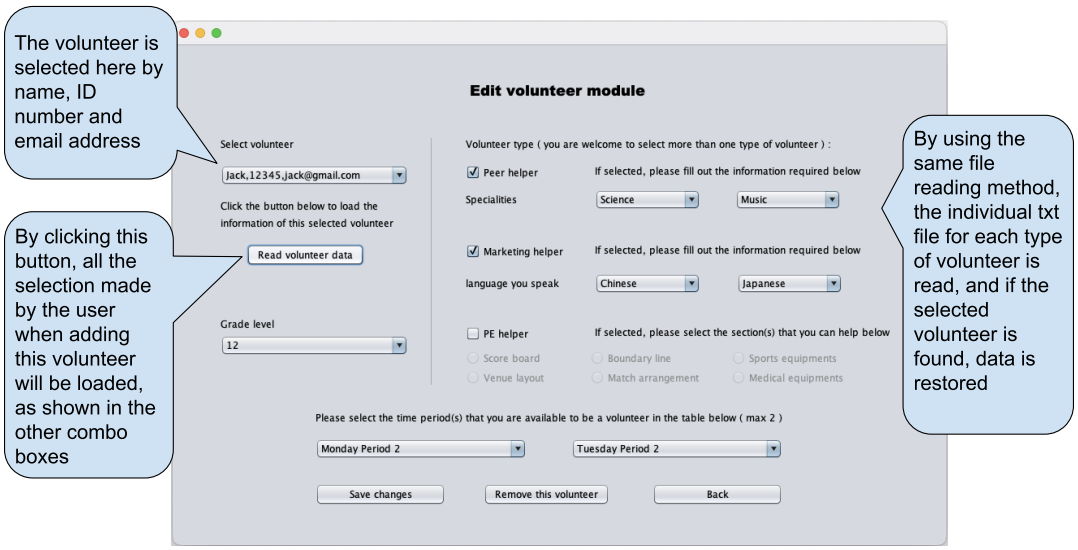



```java
if(peer.isSelected())
{
    String spe1 = s1.getSelectedItem()+"";
    String spe2 = s2.getSelectedItem()+"";


    FileWriter p = new FileWriter("Peer.txt", true);
    PrintWriter pp = new PrintWriter(p);

    if(error == 0) pp.println(ID+","+spe1+","+spe2);
    pp.close();
}
```

## b. Retrieving data from text files (reading files)

For the purpose of eliminating entry errors, and also for the convenience of the user, the program could restore the saved data of volunteers and applicants, which requires reading data from the database. Using the Filereader, BufferedReader, for loop and StrongTokenizer, the program is able to read, retrieve and parse the required data from the storage files.

Example 6: edit volunteer information

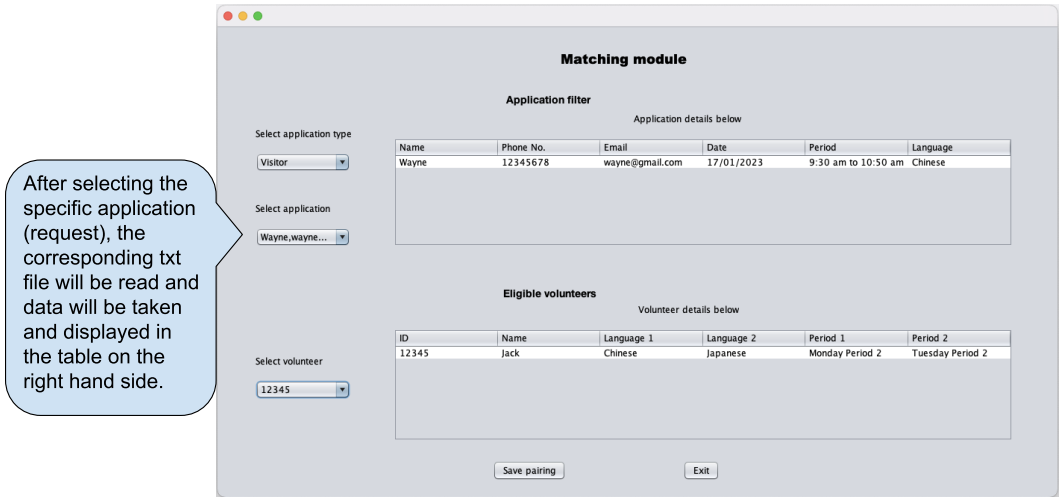



```java
FileReader readVul = new FileReader("Volunteer.txt");
BufferedReader rr = new BufferedReader(readVul);

String temp = "";

while((temp=rr.readLine())!=null)
{
    StringTokenizer tok = new StringTokenizer(temp, ",");

    String na = tok.nextToken();
    int id = Integer.parseInt(tok.nextToken());
    String em = tok.nextToken();

    String gr = tok.nextToken();
    String pr1 = tok.nextToken();
    String pr2 = tok.nextToken();


    if((id+"").equals(idnum))
    {

        grade.setSelectedItem(gr);
        p1.setSelectedItem(pr1);
        p2.setSelectedItem(pr2);


    }
}
rr.close();
```

## c. Complex searches and editing (selection and report panels)

Using the methods introduced in the previous section (section b), the program is able to conduct complex searches by parsing data from the database and displaying them into the tables, and in turn allowing the user to easily conduct viewing and filtration.

Example 7: matching volunteer and request

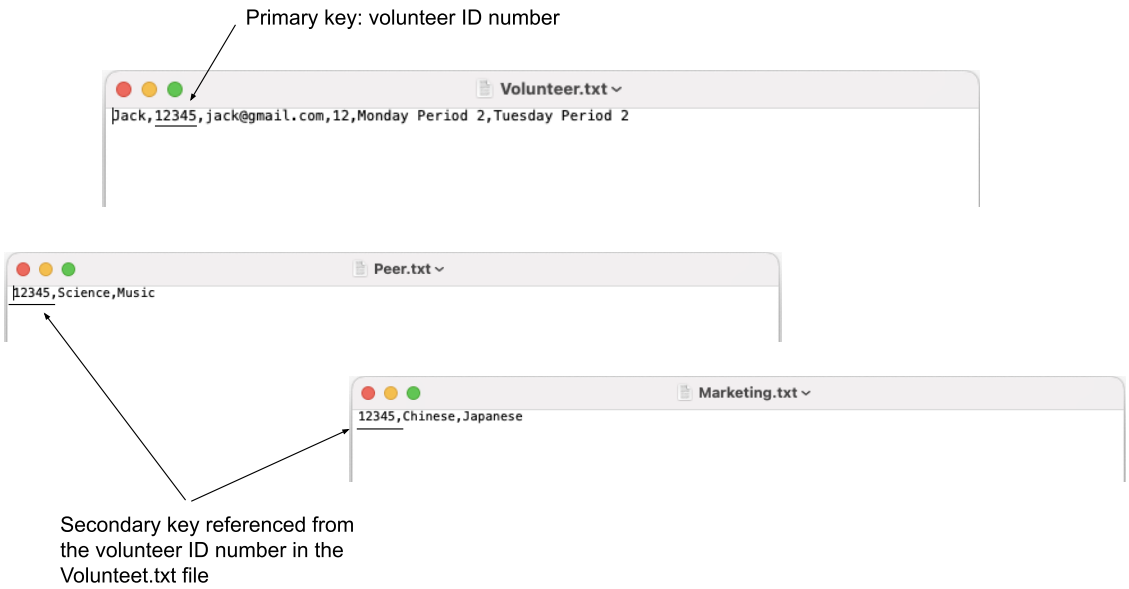



```java
FileReader readSR = new FileReader("Visitor.txt");
BufferedReader SR = new BufferedReader(readSR);

String temp = "";

while ((temp = SR.readLine()) != null) {
    String[] arr = temp.split(",");

    if ((appkey.getSelectedItem() + "").equals(arr[0]+","+arr[2])) {
        res = arr;
        break;
    }

}
SR.close();

tab.insertRow(tab.getRowCount(), new Object[]{res[0], res[1], res[2], res[3], res[4], res[5]});
```

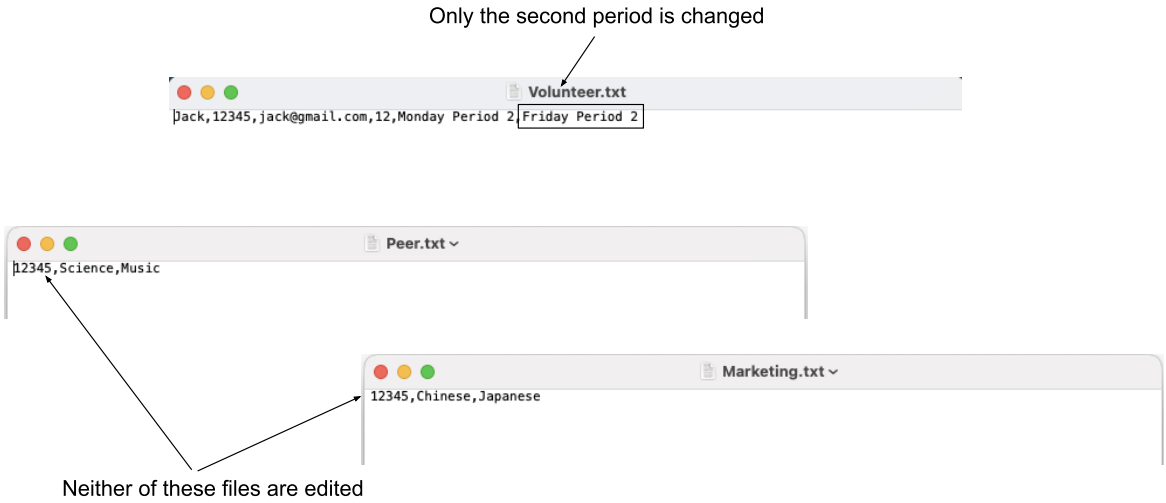
## d. Relational database model

Relational database is employed in this system to help eliminate data redundancy and therefore save storage space. In addition, it also saves users from the trouble of changing a single data repeatedly over multiple files, and therefore makes the editing process earlier.

Example 8: interlinkled Volunteer.txt, Peer.txt and Marketing.txt files




If the volunteer changes his second period from “Tuesday Period 2” to “Friday Period 2”, only the file containing time periods is changed, no editing is done on any other files, as demonstrated below:

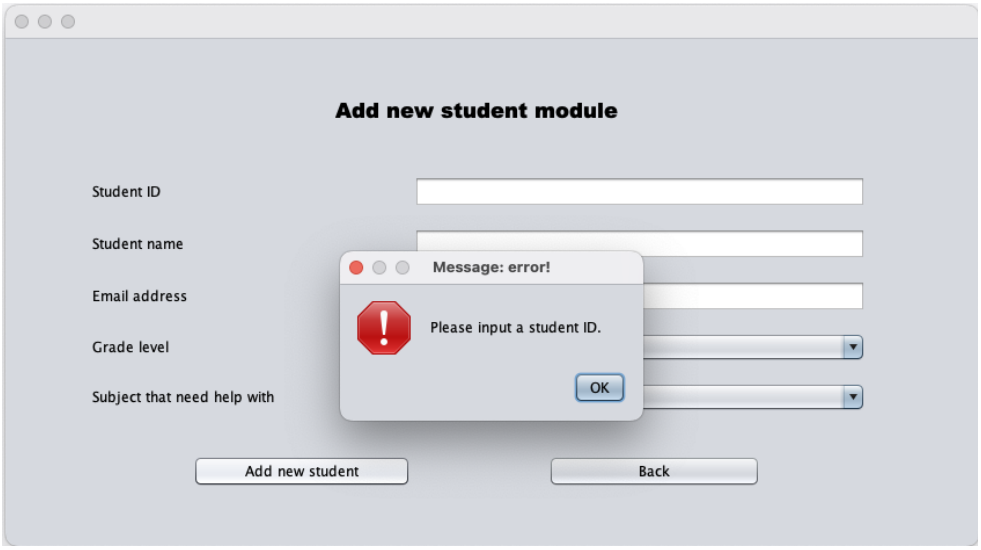


# Data validation and verification

## a. <u>Presence check</u>

This data validation technique is employed to prevent the user from leaving necessary fields blank and thus ensures data consistency. Data is stored only if it is complete.

Example 9: add new student

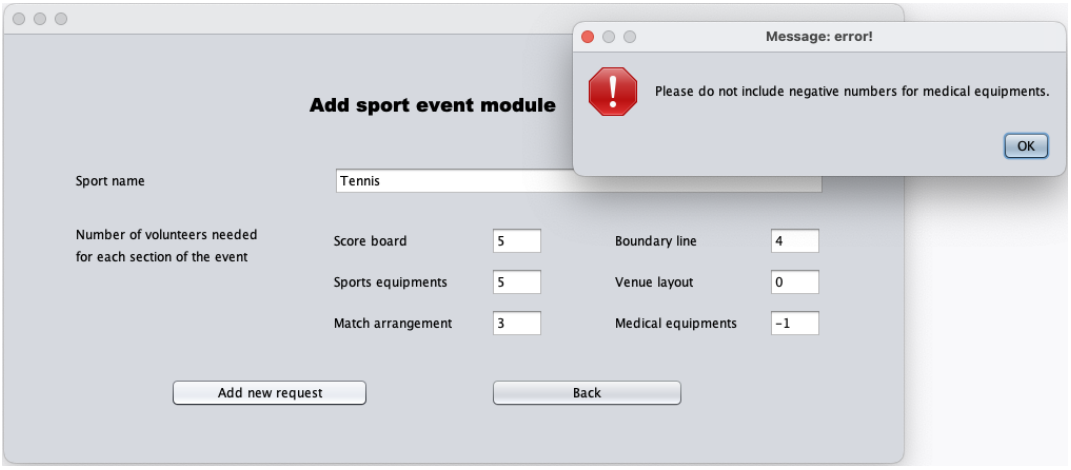



```
if(stuid.getText().equals(""))
{
    javax.swing.JOptionPane.showMessageDialog(null, "Please input a student ID.", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
    error++;
}
if(name.getText().equals(""))
{
    javax.swing.JOptionPane.showMessageDialog(null, "Please input the student's name.", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
    error++;
}
if((grade.getSelectedItem()+"").equals("Select grade"))
{
    javax.swing.JOptionPane.showMessageDialog(null, "Please select a grade level.", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
    error++;
}
if((help.getSelectedItem()+"").equals("Select subject"))
{
    javax.swing.JOptionPane.showMessageDialog(null, "Please select a subject.", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
    error++;
}
```

## b. Range check

This data validation technique checks if the inputted numerical data is within the reasonable range.

Example 10: add sports event

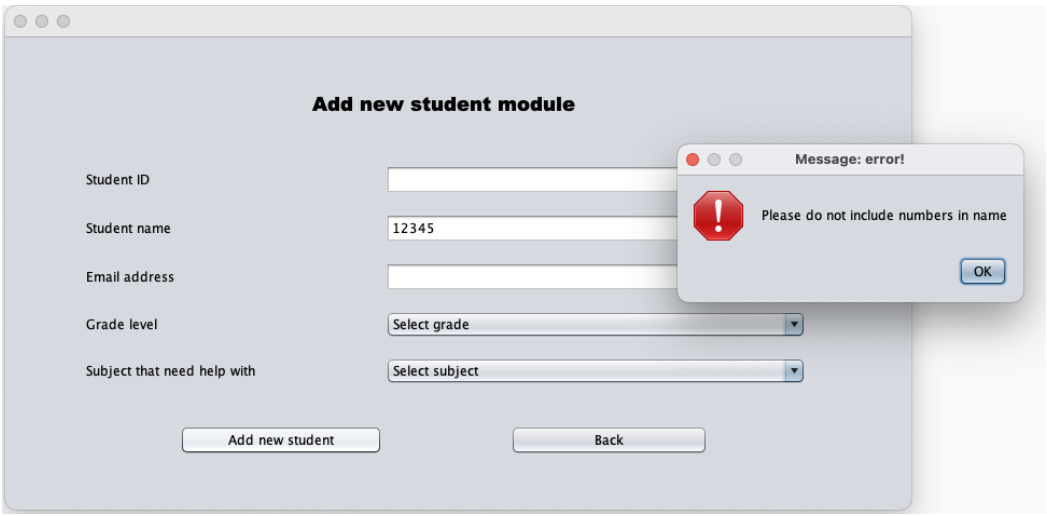



```
if(Integer.parseInt(score.getText())<0 || Integer.parseInt(boundary.getText())<0 || Integer.parseInt(sports.getText())<0
|| Integer.parseInt(venue.getText())<0 || Integer.parseInt(match.getText())<0 || Integer.parseInt(medical.getText())<0)
{
    javax.swing.JOptionPane.showMessageDialog(null, "Number of volunteers needed cannot be negative.", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
    error++;
}
```

## c. Format check

This data validation technique checks if the inputted data is of the reasonable type and only allows reasonable data to be entered into the database.

Example 11: add new student

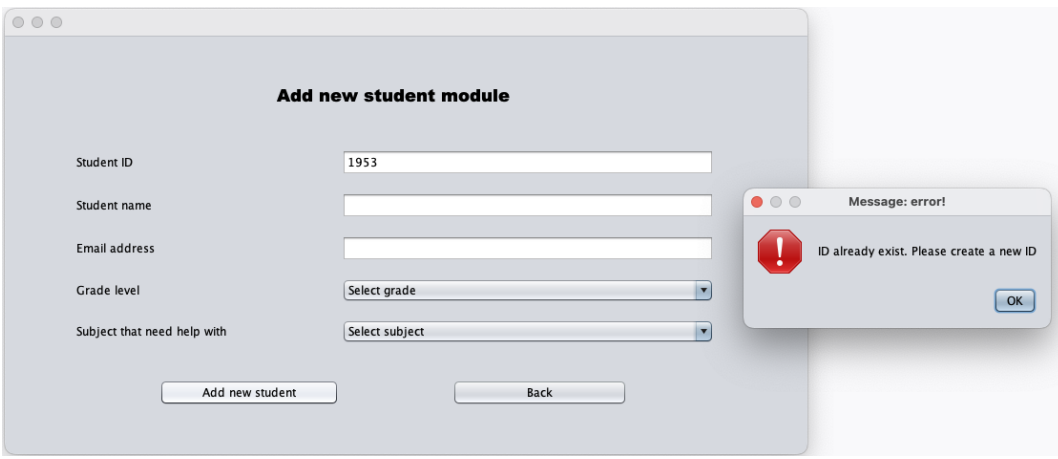


```java
boolean containNum = false;
for(int i = 0; i < 10; i++)
    {
        if(name.getText().contains(i+""))
        {
            containNum = true;
        }
    }
if(containNum==true)
{
    javax.swing.JOptionPane.showMessageDialog(null, "Please do not include numbers in name", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
            error++;
}
```

## d. Uniqueness check

This data validation technique ensures that certain data which are required to be unique cannot be entered when it is the same as any of the previously entered data.

Example 12: add new student




```java
FileReader r = new FileReader("New.txt");
BufferedReader rr = new BufferedReader(r);

String current = "";
while ((current = rr.readLine()) != null) {
    String[] arr = current.split(",");

    if(arr[0].equals(stuid.getText()))
    {
        javax.swing.JOptionPane.showMessageDialog(null, "ID already exist. Please create a new ID", "Message: error!", javax.swing.JOptionPane.ERROR_MESSAGE);
        error++;
    }
}
```

# Algorithmic thinking

a. **<u>Automatic filtration of volunteers when matching applications and volunteers</u>**

The program allows the user to match the applications and volunteers. However, the user doesn't randomly pick volunteers; instead, he needs to ensure that suitable volunteers are selected. This is done by finding marketing helpers with the same free period and language as a visitor, finding peer helpers in the same grade and same subject as a new student, etc. The algorithm in the program does this automatically in order to simplify the matching process for the user.

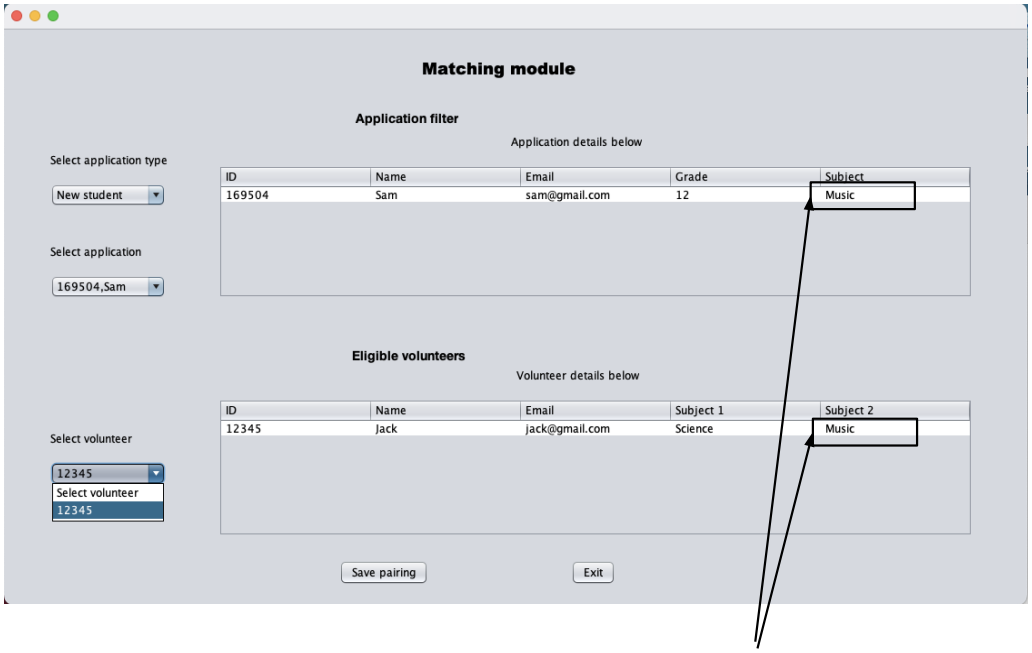
Example 13: pseudocode algorithm for automatic filtration of volunteers

```
eligible // an empty list that will be filled by the records of filtered volunteers
language // a given string indicating the language that the visitor speaks
period // a given string indicating the time period that the visitor requested, transferred into
        school class periods (i.e. Period 1)
date // the date that the visitor asked for a visit, transferred to the form of weekdays (i.e Monday)

n // integer value indicating number of lines in the file “Marketing.txt”

fileVariable openread(“Marketing.txt”)
Loop i from 1 to n
        fileVariable.ReadLine(i)

        arr[] = fileVariable.ReadLine(i).split(“,”)
        arr[0] // the field recording the ID number of the volunteer
        arr[1] // the field recording the 1st language that the volunteer speaks
        arr[2] // the field recording the 2nd language that the volunteer speaks

        If arr[1] equals language
        or arr[2] equals language
        then
                fileVariable openread(“Volunteer.txt”)

                p // integer value indicating number of lines in the file “Volunteer.txt”
                Loop k from 1 to p
                        fileVariable.ReadLine(k)

                        colle[] = fileVariable.ReadLine(k).split(“,”)

                        colle[1] // recording the ID number of the volunteer
                                *will be compared with arr[0] to parse the right volunteer
                        colle[4] // a time period that the volunteer is available
```

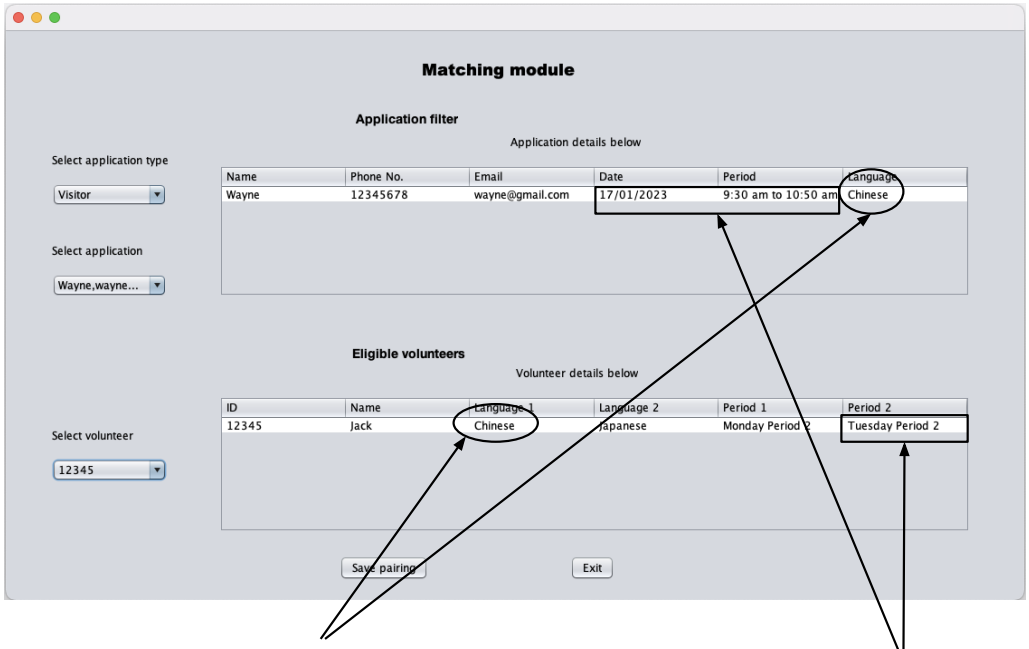
```
                    colle[5] // another period that the volunteer is available

                    If arr[0] equals colle[1]
                    and colle[4] equals period
                    or colle[5] equals period
                    then
                            eligible.addItem(arr[0])
                    end if
            end loop
    end if
end loop
output eligible
```

Below is part of the actual code of automatic filtration of volunteers

```java
    public ArrayList getMktHelpers(String lang, String period, String date) {
    ArrayList<String> eligible = new ArrayList<String>();
    try {
        FileReader read = new FileReader("Marketing.txt");
        BufferedReader rr = new BufferedReader(read);

        String curr = "";
        while ((curr = rr.readLine()) != null) {
            String[] arr = curr.split(",");

            if (arr[1].equals(lang) || arr[2].equals(lang)) {
                FileReader readMain = new FileReader("Volunteer.txt");
                BufferedReader rrr = new BufferedReader(readMain);

                String cu = "";
                while ((cu = rrr.readLine()) != null) {
                    String[] colle = cu.split(",");

                    Date weekday = new SimpleDateFormat("dd/MM/yyyy").parse(date);
                    SimpleDateFormat form = new SimpleDateFormat("EEEE");
                    String wd = form.format(weekday);

                    String per = "";
                    if (period.equals("8:00 am to 9:20 am")) {
                        per = "Period 1";
                    } else if (period.equals("9:30 am to 10:50 am")) {
                        per = "Period 2";
                    } else if (period.equals("12:10 pm to 13:30 pm")) {
                        per = "Period 3";
                    } else if (period.equals("13:40 pm to 15:00 pm")) {
                        per = "Period 4";
                    }

                    String dape = wd + " " + per;

                    if (arr[0].equals(colle[1]) && (colle[4].equals(dape) || colle[5].equals(dape))) {
                        eligible.add(arr[0]);
                    }
                }
            }
        }
        rr.close();
    } catch (Exception e) {

    }
    return eligible;
}
```




The peer helper must have a same subject as the new student




The marketing helper and visitor must be able to speak the same language

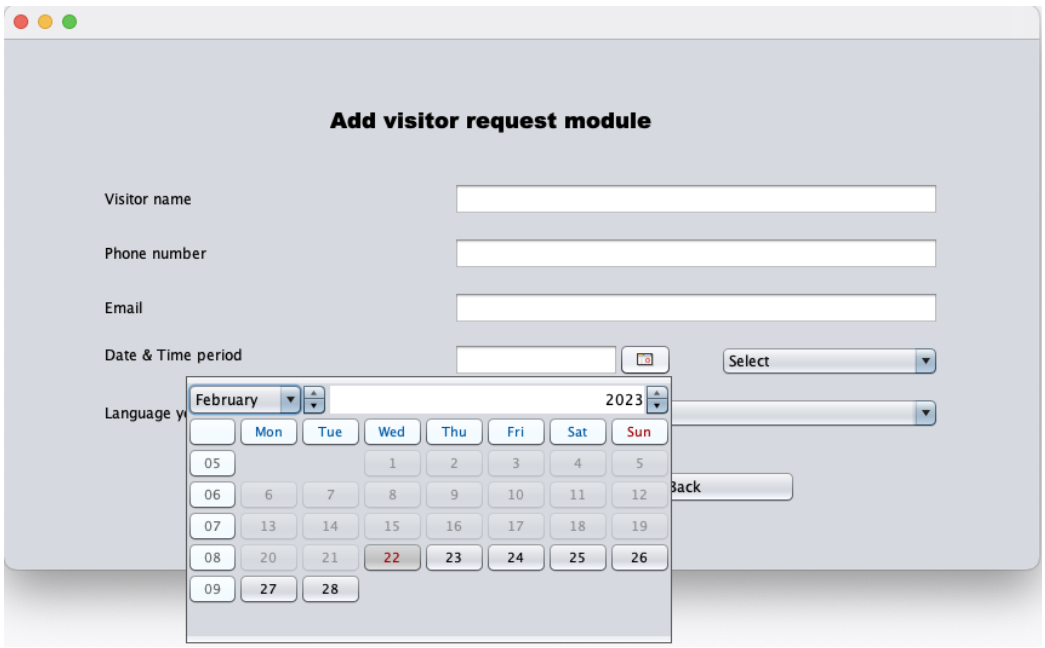
The marketing helper and visitor must share the same free period

# Use of existing libraries

## a. <u>Date and time selection using JCalendar</u>

A date has 3 components: day, month and year, and the arrangement of these components may vary due to different habits of people from different regions. The program utilizes the JCalendar library which allows the user to select the dates on a calendar instead of manually inputting the date, and in turn eliminates entry errors as well as the trouble of validating dates of different formats.

Example 14: add visitor



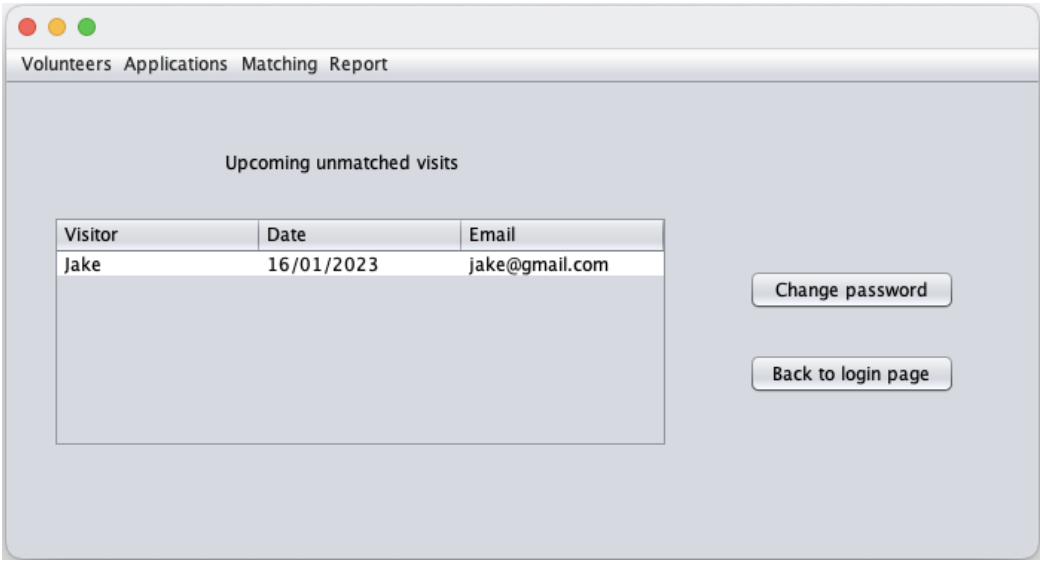

```
Date t = sdate.getDate();
SimpleDateFormat sdf = new SimpleDateFormat("dd/MM/yyyy");
String ti = sdf.format(t);
```

Code to disable dates prior to the current date to maintain data integrity:

```
sdate.setMinSelectableDate(new Date());
```

The date function is also used in the homepage, which loads all the visitor requests due in 7 days in a table.

Example 15: homepage

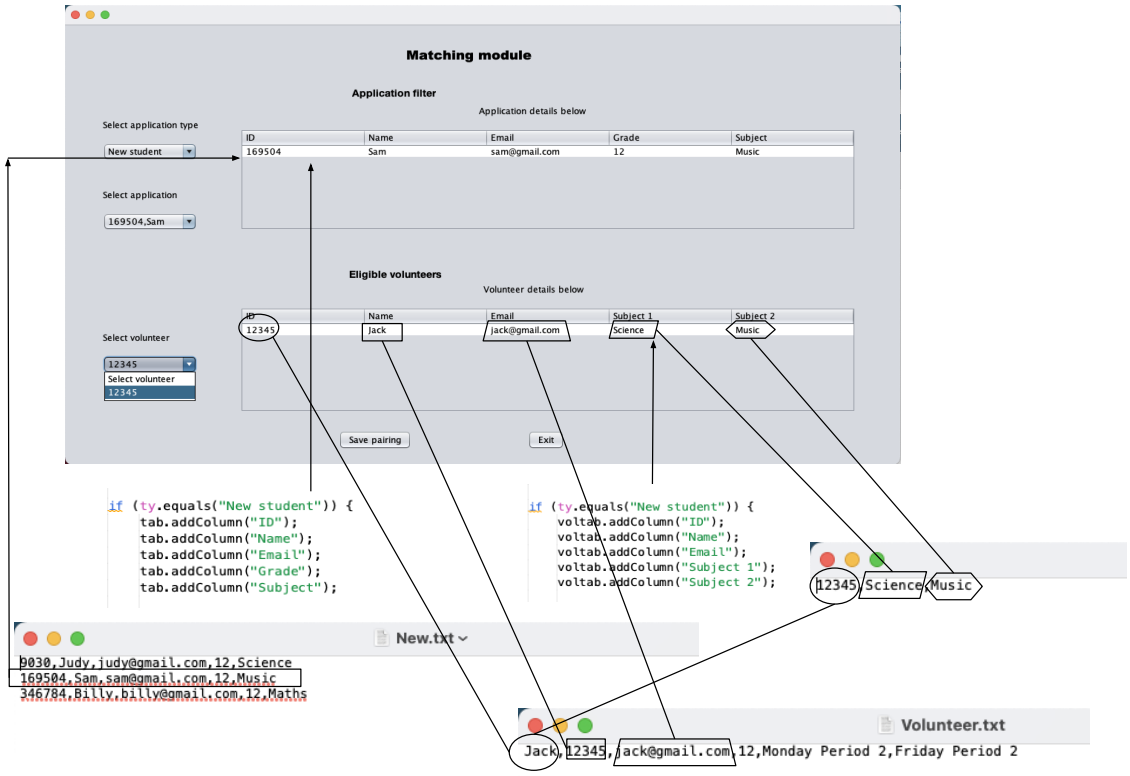



```
try
{
    DefaultTableModel mod = (DefaultTableModel) unmatched.getModel();
    mod.setRowCount(0);
    mod.setColumnCount(0);
    mod.addColumn("Visitor");
    mod.addColumn("Date");
    mod.addColumn("Email");

    FileReader read = new FileReader("Visitor.txt");
    BufferedReader rr = new BufferedReader(read);

    String x = "";

    while((x=rr.readLine())!=null)
    {
        String[] line = x.split(",");
        String rqtime = line[3];

        Date date = new SimpleDateFormat("dd/MM/yyyy").parse(rqtime);
        Date today = new Date();

        double days = 0;

        try
        {
            long diff = date.getTime() - today.getTime();
            days = diff/(1000*60*60*24);
        }
        catch(Exception e)
        {

        }

        if(days<=7 && days>=0)
        {
            mod.insertRow(mod.getRowCount(), new Object[]{line[0], line[3], line[2]});
        }
    }
}
catch(Exception e)
{

}
```

## b. Dynamic JTables

Data from different types of requests could be different. When they are displayed on a table, the title and number of the columns could vary. To prevent the user from the trouble of frequently switching between tables, the program contains a dynamic table that could flexibly change according to the type of requests or volunteers. This is achieved by manipulating the JTable function.

Example 16: matching module

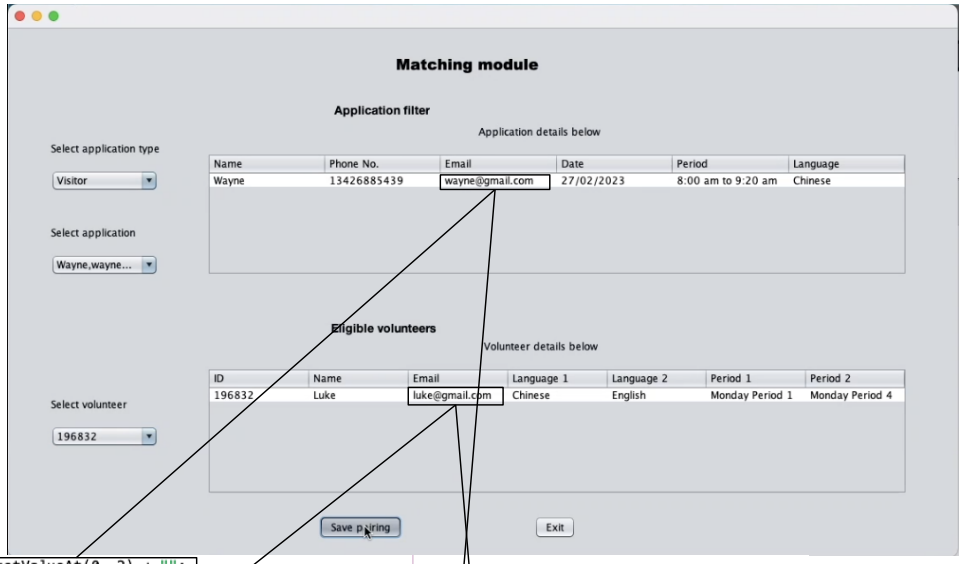


## c. Sending emails via javax.mail.jar

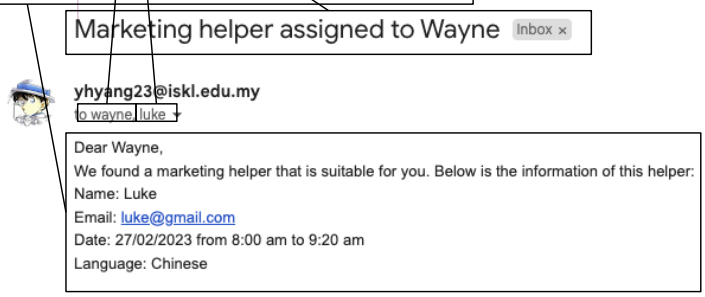
Once an application and volunteer are matched, a match is completed or canceled, the program is able to send email to both the applicant and volunteer to notify them.

Example 17: code for function SendEmail

```java
public class SendEmail {

    public static void sendingEmail(String toApplicant, String toVolunteer, String subject, String content) {
        final String username = "yhyang23@iskl.edu.my";
        final String password = "odkbgnoiwcguziyc";

        Properties prop = new Properties();
        prop.put("mail.smtp.host", "smtp.gmail.com");
        prop.put("mail.smtp.port", "465");
        prop.put("mail.smtp.auth", "true");
        prop.put("mail.smtp.socketFactory.port", "465");
        prop.put("mail.smtp.socketFactory.class", "javax.net.ssl.SSLSocketFactory");

        Session session = Session.getInstance(prop,
                new javax.mail.Authenticator() {
            protected javax.mail.PasswordAuthentication getPasswordAuthentication() {
                return new javax.mail.PasswordAuthentication(username, password);
            }
        });

        try {
            Message message = new MimeMessage(session);
            message.setFrom(new InternetAddress("yhyang23@iskl.edu.my"));
            message.setRecipients(
                    Message.RecipientType.TO,
                    InternetAddress.parse(toApplicant)
            );
            message.setRecipients(
                    Message.RecipientType.CC,
                    InternetAddress.parse(toVolunteer)
            );
            message.setSubject(subject);
            message.setText(content);

            javax.mail.Transport.send(message);

        } catch (Exception e) {
            e.printStackTrace();
        }
    }
```




```
String to = tab.getValueAt(0, 2) + "";
String cc = voltab.getValueAt(0, 2) + "";
String subj = "Marketing helper assigned to " + tab.getValueAt(0, 0);
String cont = "Dear " + tab.getValueAt(0, 0) + ","
        + "\nWe found a marketing helper that is suitable for you. Below is the information of this helper:"
        + "\nName: " + voltab.getValueAt(0, 1)
        + "\nEmail: " + voltab.getValueAt(0, 2)
        + "\nDate: " + tab.getValueAt(0, 3) + " from " + tab.getValueAt(0, 4)
        + "\nLanguage: " + tab.getValueAt(0, 5);
SendEmail.sendingEmail(to, cc, subj, cont);
```




Word count: 836

## Works cited:


Mkyong. “JavaMail API - Sending Email via GMAIL SMTP Example.” *Mkyong.com*, 10 Apr. 2019, https://mkyong.com/java/javamail-api-sending-email-via-gmail-smtp-example/.

“Send Mail to Multiple Recipients in Java.” *Stack Overflow*, 1 Nov. 1959, https://stackoverflow.com/questions/13854037/send-mail-to-multiple-recipients-in-java.