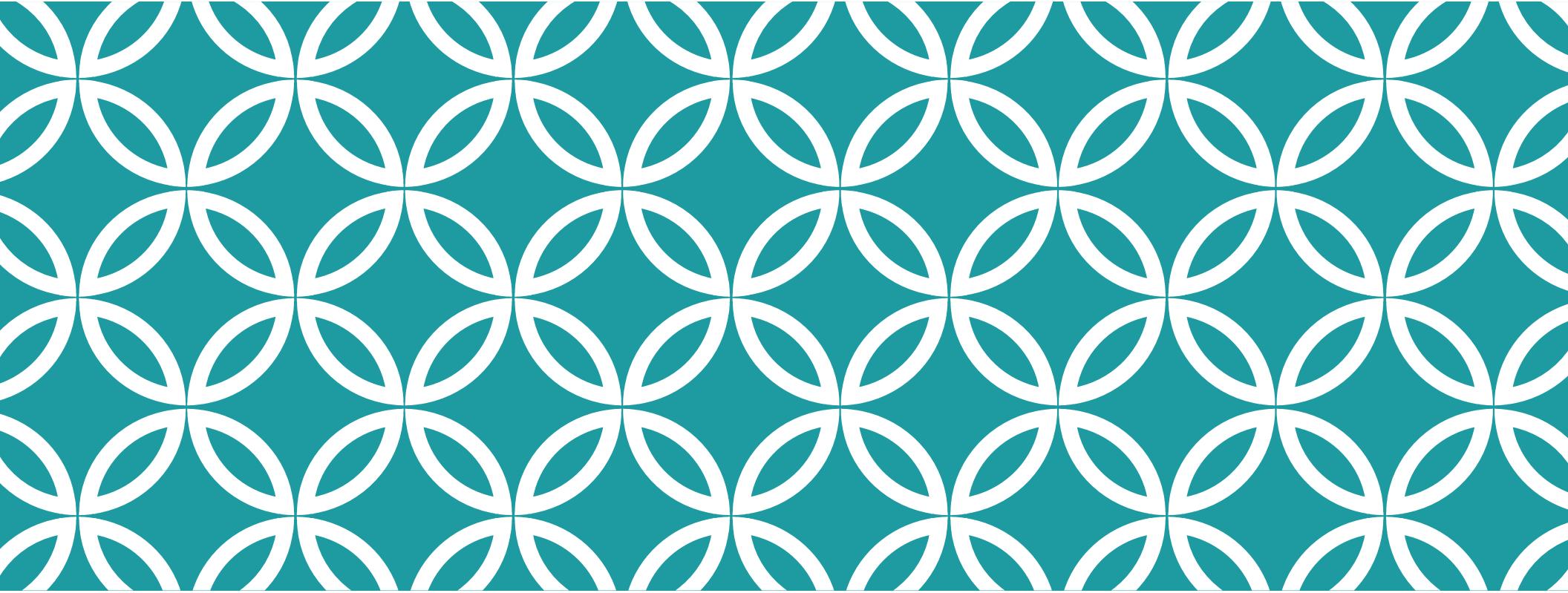


COMP 3111 PROJECT

Group 6:
DAFTARY, Malav
SINGH, Ipsita Sanjay
SHEKHAR, Shriyan



COVERAGE AND TEST REPORT

All

TEST REPORT

The screenshot shows the Coverage tool interface with the following details:

- Project:** comp3111.qsproject
- Test Summary:** Tests passed: 57 of 57 tests – 4 sec 664 ms
- Test Details:** The tree view lists various test methods with their execution times:
 - ControllerTest
 - HandleCombo21() 691 ms
 - HandleCombo22() 179 ms
 - HandleCombo23() 135 ms
 - HandleCombo24() 134 ms
 - HandleCombo25() 130 ms
 - HandleCombo2() 172 ms
 - HandleCombo3() 135 ms
 - HandleCombo4() 131 ms
 - HandleCombo5() 129 ms
 - testReset() 117 ms
 - HandleCombo() 131 ms
 - testT1() 216 ms
 - Task3() 140 ms
 - testInitialize() 109 ms
 - testReset2() 137 ms
 - T3AnalysisTest
 - getRecommendData 43 ms
 - getRecommendData 39 ms
- Output:** C:\Users\shekh\.jdks\openjdk-21.0.2\bin\java.exe ...
Process finished with exit code 0

100% pass

COVERAGE REPORT

The screenshot shows a coverage report for a Java project named "comp3111.qsproject". The report is displayed in a dark-themed interface with a sidebar on the left showing the project structure.

Project Structure:

- Work [QSProject] (C:\Users\shekh\IdeaProjects\comp3111)
- .idea
- .mvn
- src
 - main
 - test
 - java
 - comp3111.qsproject
 - ControllerTest
 - RecommendItemTest
 - T1Analysis
 - T3Analysis
 - T3AnalysisTest
 - T21Analysis
 - T22Analysis
 - T22AnalysisTest
 - target
 - classes

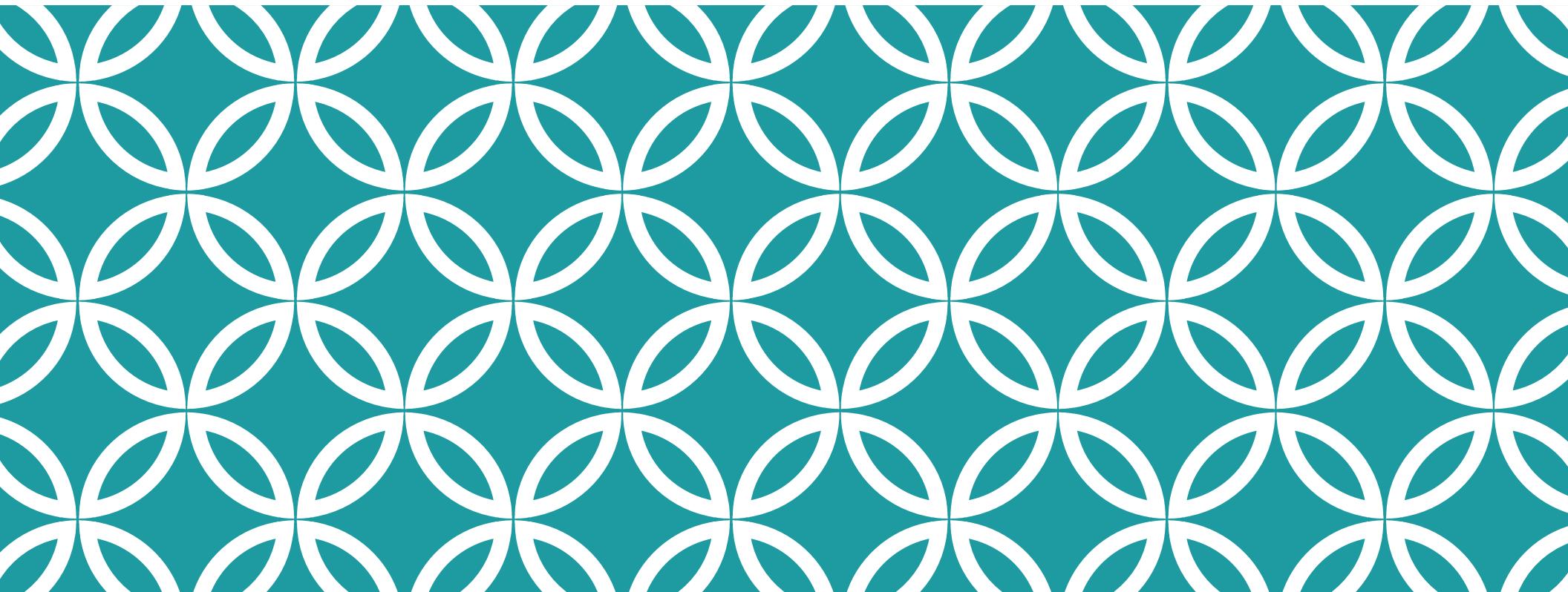
Coverage Report:

Element	Class, %	Method, %	Line, %	Branch, %
comp3111.qsproject	88% (8/9)	83% (51/61)	72% (707/980)	68% (269/392)
Application	0% (0/1)	0% (0/2)	0% (0/6)	100% (0/0)
Controller	100% (1/1)	85% (12/14)	56% (326/572)	47% (100/210)
QSLitem	100% (1/1)	62% (10/16)	86% (37/43)	75% (6/8)
QSLlist	100% (1/1)	100% (4/4)	95% (46/48)	100% (8/8)
RecommendItem	100% (1/1)	100% (11/11)	100% (22/22)	100% (6/6)
T1Analysis	100% (1/1)	100% (4/4)	100% (47/47)	100% (20/20)
T3Analysis	100% (1/1)	100% (2/2)	100% (62/62)	93% (58/62)
T21Analysis	100% (1/1)	100% (4/4)	87% (77/88)	86% (33/38)
T22Analysis	100% (1/1)	100% (4/4)	97% (90/92)	95% (38/40)

OVERALL REPORT

The screenshot shows an IDE interface with several windows open:

- Project View:** Shows the project structure under "COMP3111-Project [QSProject]". The "src/main/java" folder contains a package named "comp3111.qsproject" which includes classes like Application, Controller, QSLitem, QSLList, RecommendItem, T1Analysis, T3Analysis, T21Analysis, and T22Analysis. A module-info.java file is also present.
- Code Editor:** Displays two files: T3Analysis.java and T1Analysis.java. T3Analysis.java has a coverage report on the right showing 88% coverage with 3 usages. T1Analysis.java has a coverage report showing 83% coverage with 3 usages.
- Coverage Report:** A table titled "Coverage" for "comp3111.qsproject in QSProject" showing coverage details for various classes and methods.
- Test Results:** A "Cover" tab showing test results for "qsproject" with 57 tests passed in 5 seconds.
- Bottom Status Bar:** Shows the current file path as "COMP3111-Project > src > main > java > comp3111 > qsproject > T1Analysis > getTableList", and status indicators for line endings (LF), character encoding (UTF-8), and code style (4 spaces).



SCREENSHOTS

Sample inputs and outputs for each task

TASK 1: INPUT 1 – YEAR – 2017

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year 

Data Table Pie Chart Bar Chart

All Information

Rank	University	Score	Country	City	Type
No content in table					

TASK 1: INPUT 2 – PIE CHART PROPERTY – COUNTRY

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

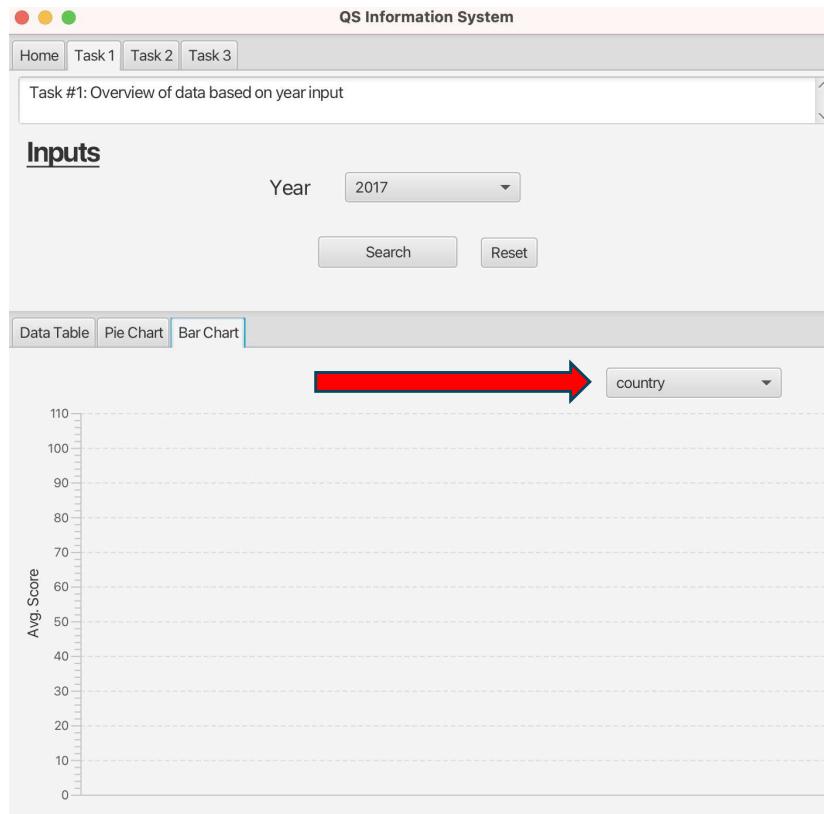
Inputs

Year

Data Table Pie Chart Bar Chart

country

TASK 1: INPUT 3 – BAR CHART PROPERTY – COUNTRY



TASK 1: OUTPUT 1 – DATA TABLE (YEAR – 2017)

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year 

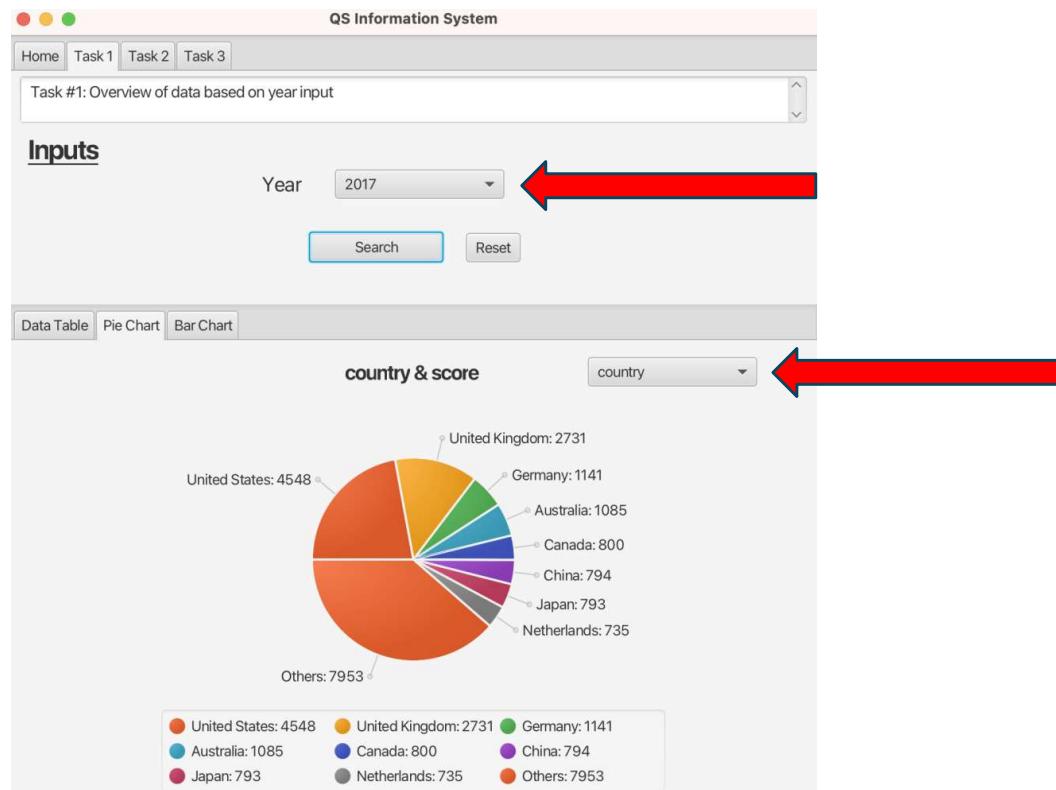
Search Reset

Data Table Pie Chart Bar Chart

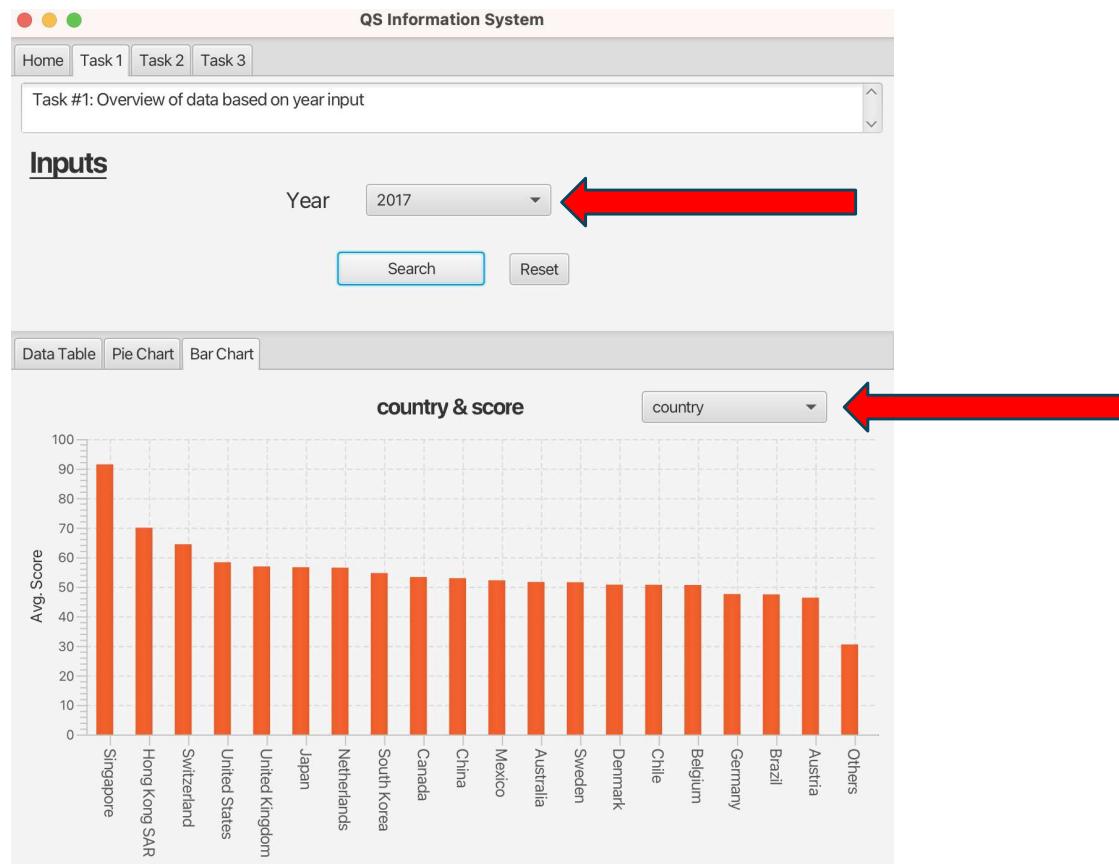
All Information

Rank	University	Score	Country	City	Type
1	Massachusetts Institute of T...	100	United States	Cambridge	Private
2	Stanford University	98.7	United States	Stanford	Private
3	Harvard University	98.3	United States	Cambridge	Private
4	University of Cambridge	97.2	United Kingdom	Cambridge	Public
5	California Institute of Techn...	96.9	United States	Pasadena	Private
6	University of Oxford	96.8	United Kingdom	Oxford	Public
7	UCL	95.6	United Kingdom	London	Public
8	ETH Zurich - Swiss Federal I...	94.2	Switzerland	Zurich	Public
9	Imperial College London	94.1	United Kingdom	London	Public
10	University of Chicago	93	United States	Chicago	Private
11	Princeton University	92.8	United States	Princeton	Private
12	National University of Singa...	91.5	Singapore	Singapore	Public
13	Nanyang Technological Uni...	91.4	Singapore	Singapore	Public
14	EPFL	91.1	Switzerland	Lausanne	Public
15	Yale University	90.0	United States	New Haven	Private

TASK 1: OUTPUT 2 – PIE CHART (YEAR – 2017, PROPERTY – COUNTRY)



TASK 1: OUTPUT 3 – BAR CHART (YEAR – 2017, PROPERTY – COUNTRY)



TASK 2.1 – INPUT 1

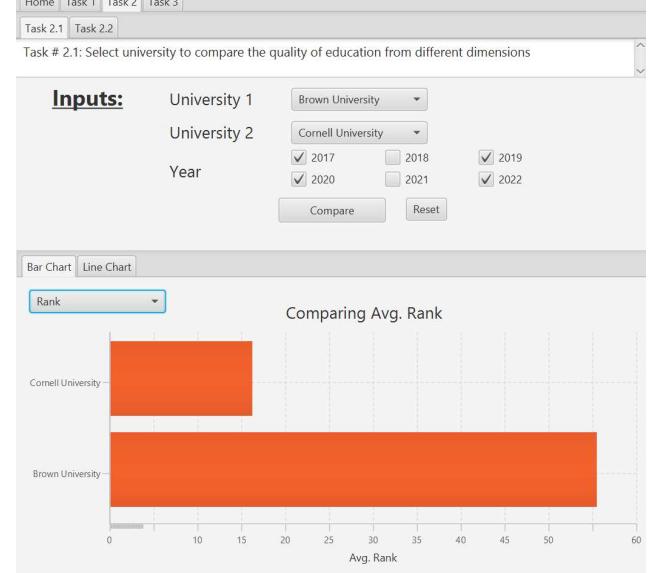
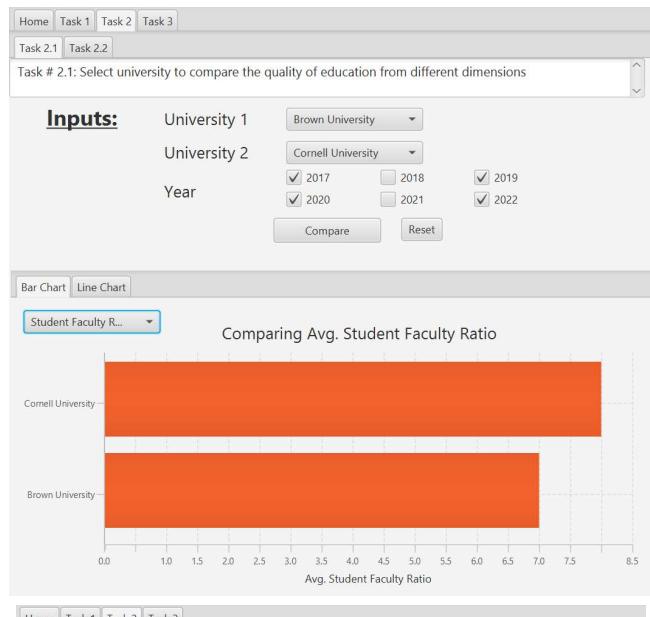
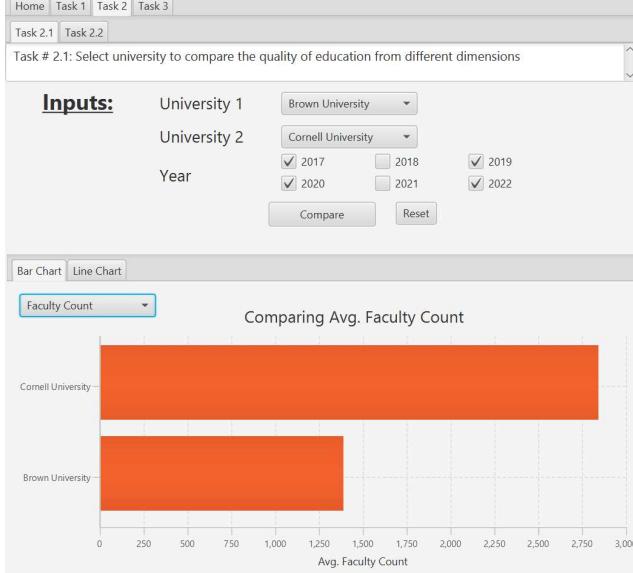
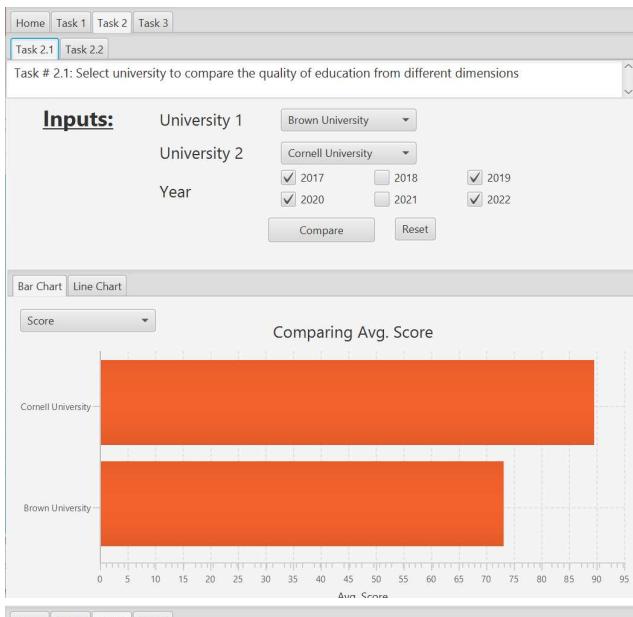
Bar Chart:

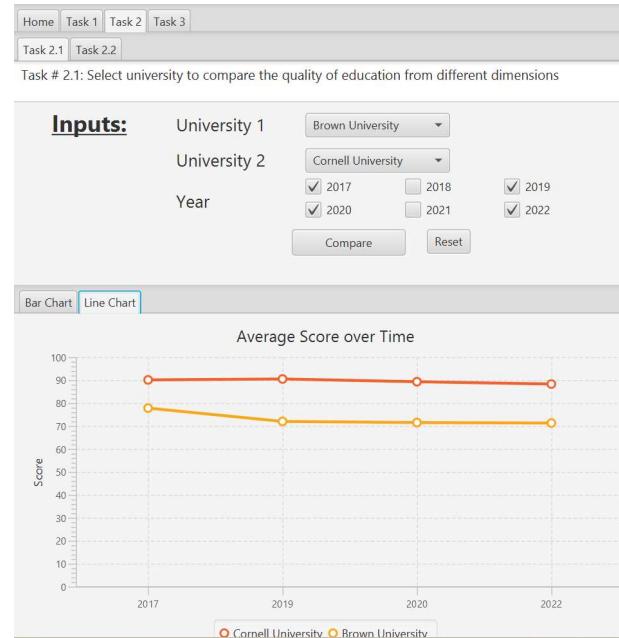
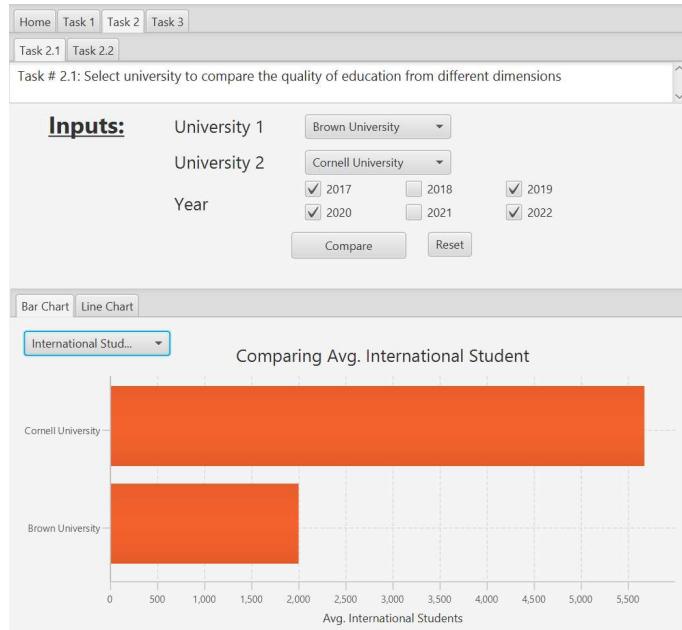
Top left – Score

Top right – Student Faculty Ratio

Bottom left – Faculty Count

Bottom right – Rank





TASK 2.1 – INPUT 1

Left: Bar Chart of International Students.
 Right: Line Chart of Average Score

TASK 2.1 – INPUT 2

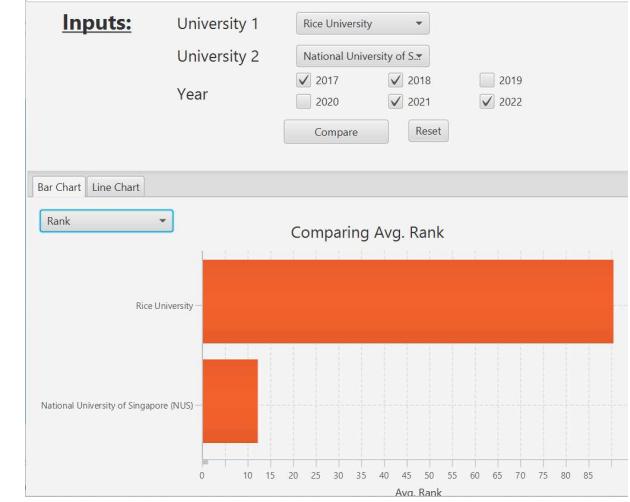
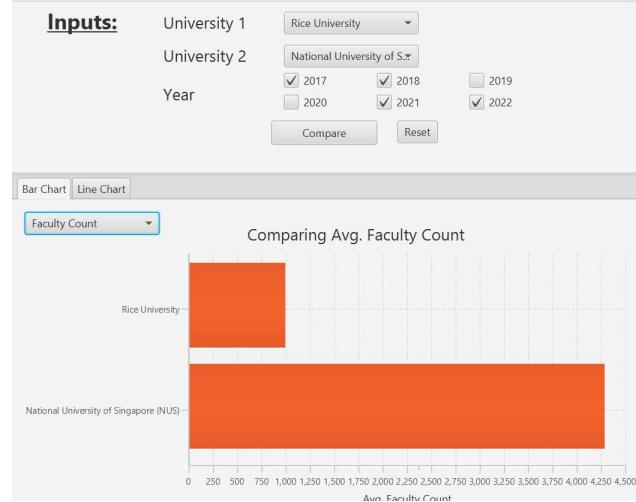
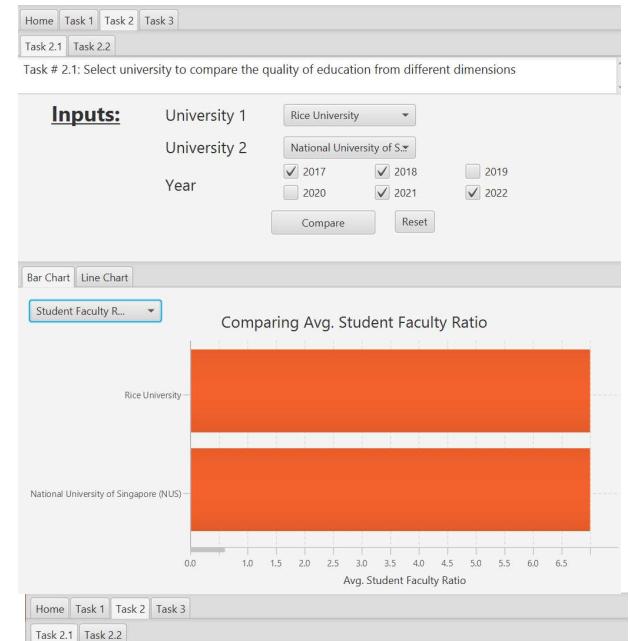
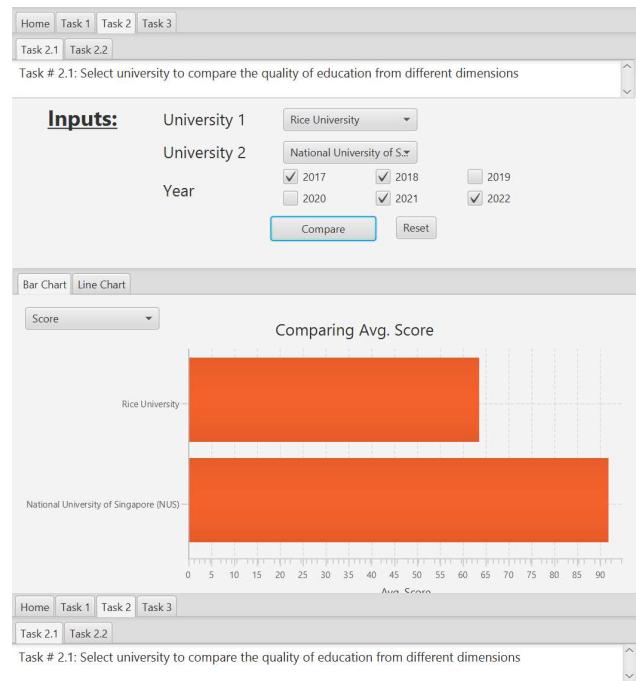
Bar Chart:

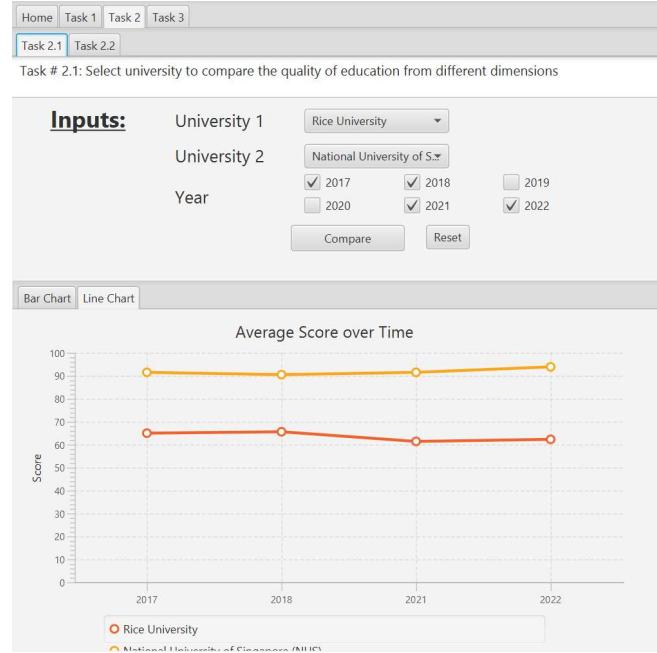
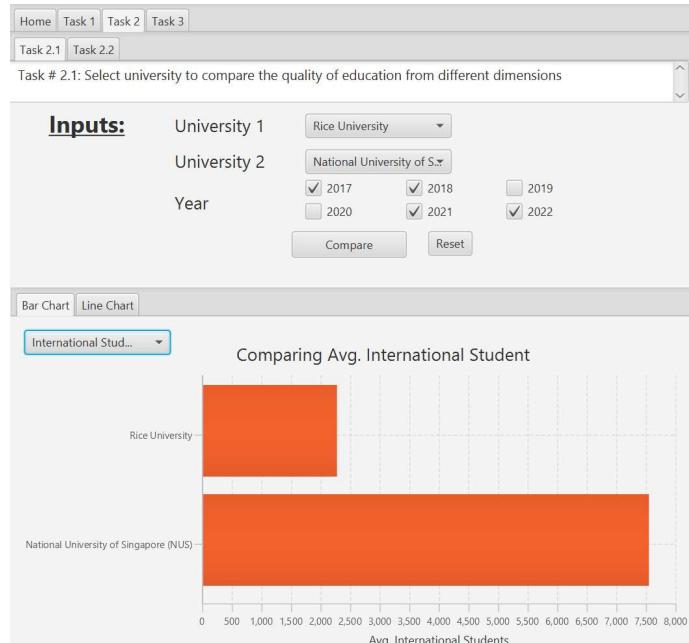
Top left – Score

Top right – Student Faculty Ratio

Bottom left – Faculty Count

Bottom right – Rank





TASK 2.1 – INPUT 2

Left: Bar Chart of International Students.
 Right: Line Chart of Average Score

TASK 2.2 – INPUT 1

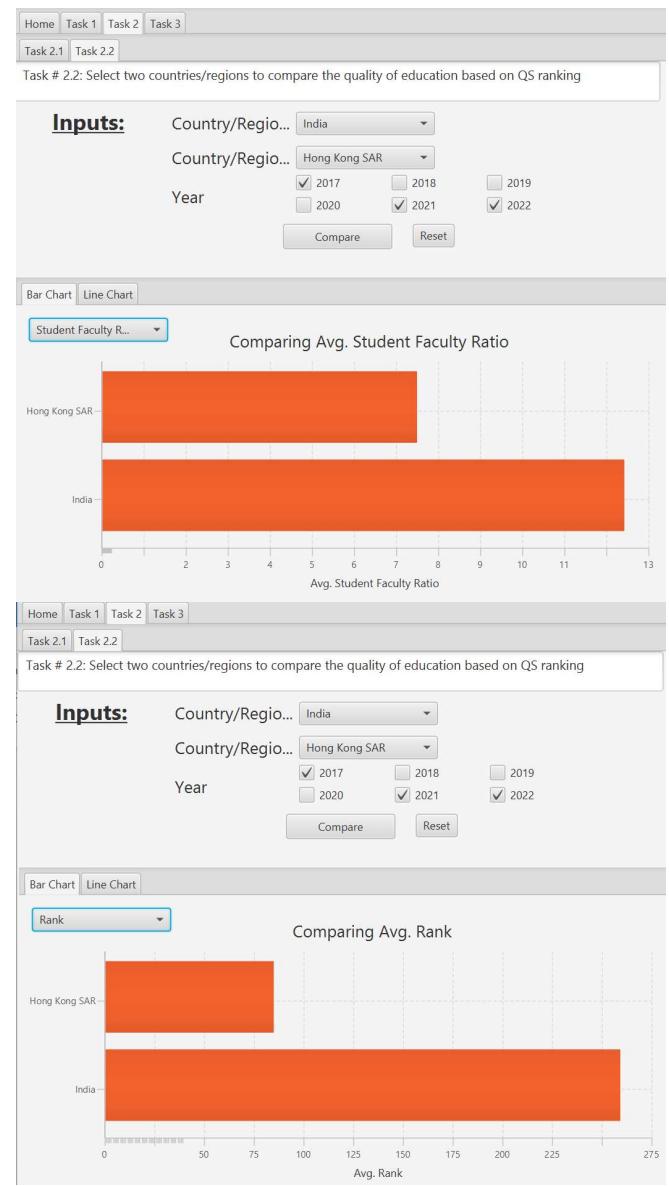
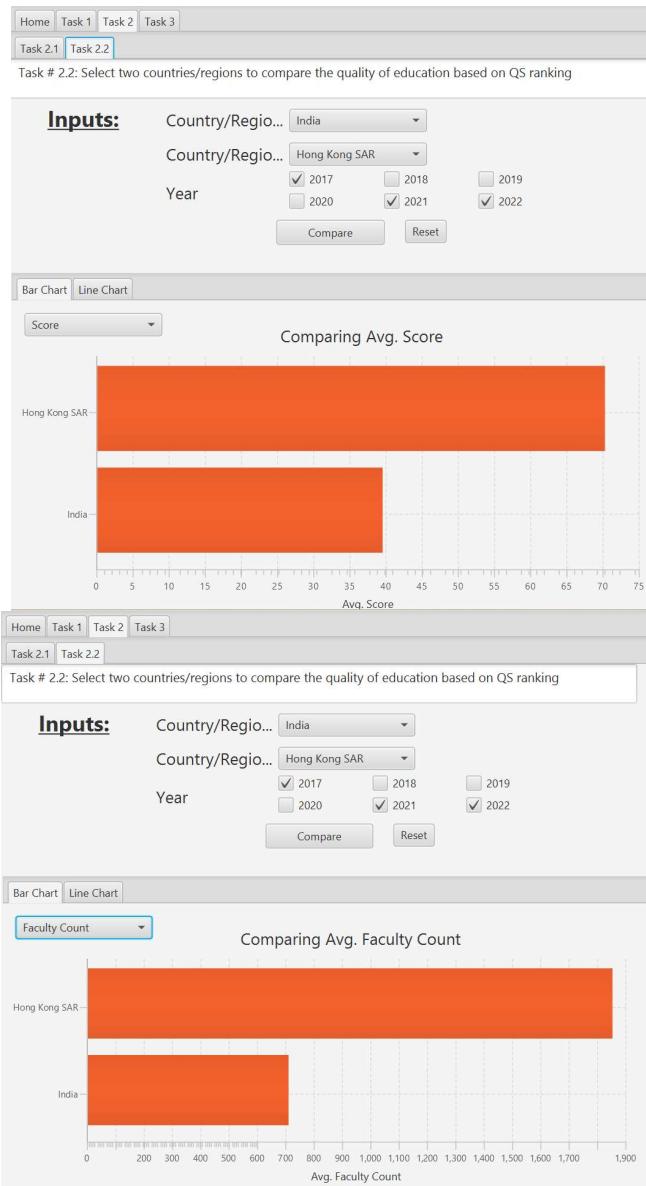
Bar Chart:

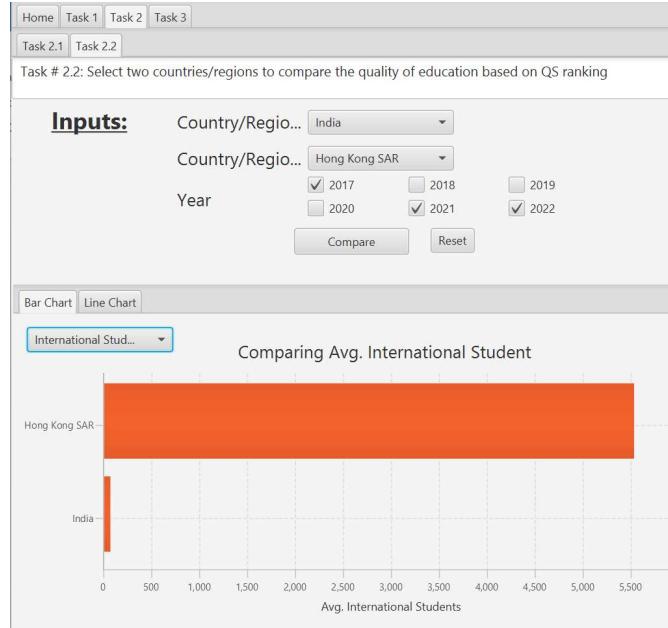
Top left – Score

Top right – Student Faculty Ratio

Bottom left – Faculty Count

Bottom right – Rank





TASK 2.2 – INPUT 1

Left: Bar Chart of International Students.
 Right: Line Chart of Average Score

TASK 2.2 – INPUT 2

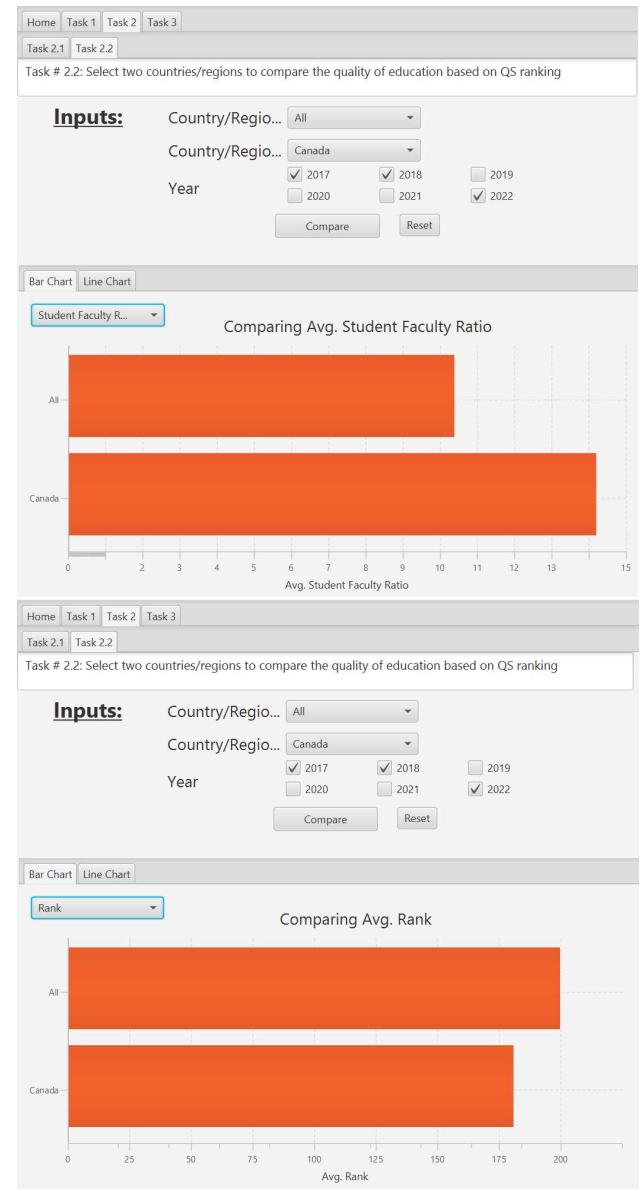
Bar Chart:

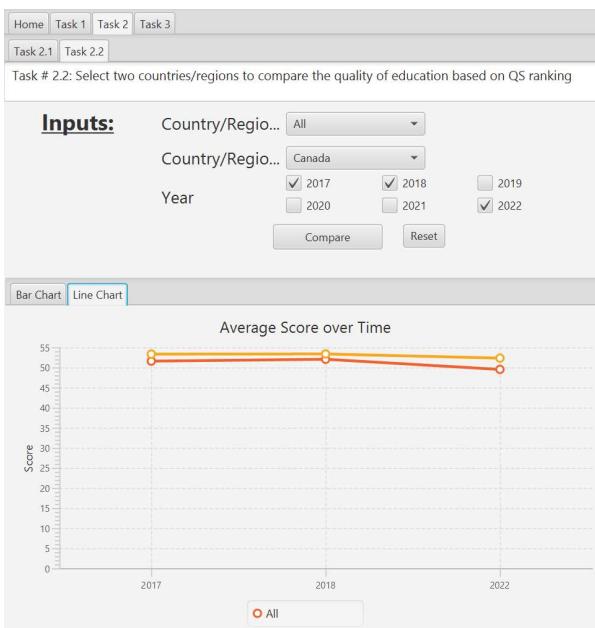
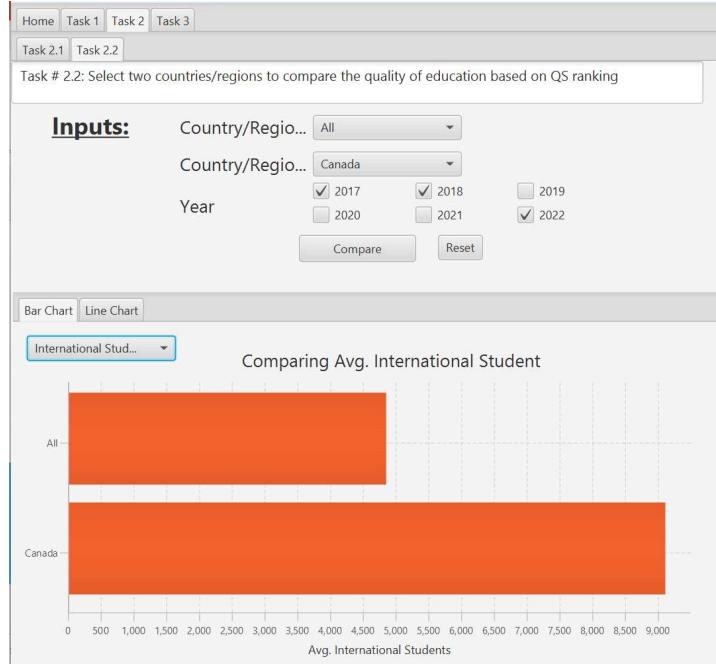
Top left – Score

Top right – Student Faculty Ratio

Bottom left – Faculty Count

Bottom right – Rank





TASK 2.2 – INPUT 2

Left: Bar Chart of International Students.
Right: Line Chart of Average Score

TASK 3 - SAMPLE INPUTS AND OUTPUTS

QS Information System

Home | Task 1 | Task 2 | Task 3

Task # 3: University suggestion based on user input

Inputs

Ranking Range Top Bottom

Type

Region

Recommendation

Based on your input these universities you can prefer for higher education

University	The Best Year of Rank	The Best Rank	The Most Recent Year	Rank of the most recent y...
No content in table				

Input

After pressing
the “Recommend”
button

QS Information System

Home | Task 1 | Task 2 | Task 3

Task # 3: University suggestion based on user input

Inputs

Ranking Range Top Bottom

Type

Region

Recommendation

Based on your input these universities you can prefer for higher education

University	The Best Year of Rank	The Best Rank	The Most Recent Year	Rank of the most recent y...
Massachusetts Institute of Tec...	2017	1	2022	1
Stanford University	2017	2	2022	3
Harvard University	2017	3	2022	5
California Institute of Technolo...	2018	4	2022	6
University of Chicago	2018	9	2022	10

Output

TASK 3 - SAMPLE INPUTS AND OUTPUTS (CONTINUED)

The screenshot shows the 'QS Information System' window with 'Task 3' selected. The 'Inputs' section contains fields for 'Ranking Range' (Top: 1, Bottom: 25), 'Type' (Public), and 'Region' (Asia). Below the inputs is a 'Recommendation' section with a message: 'Based on your input these universities you can prefer for higher education'. A table below is empty, showing 'No content in table'.

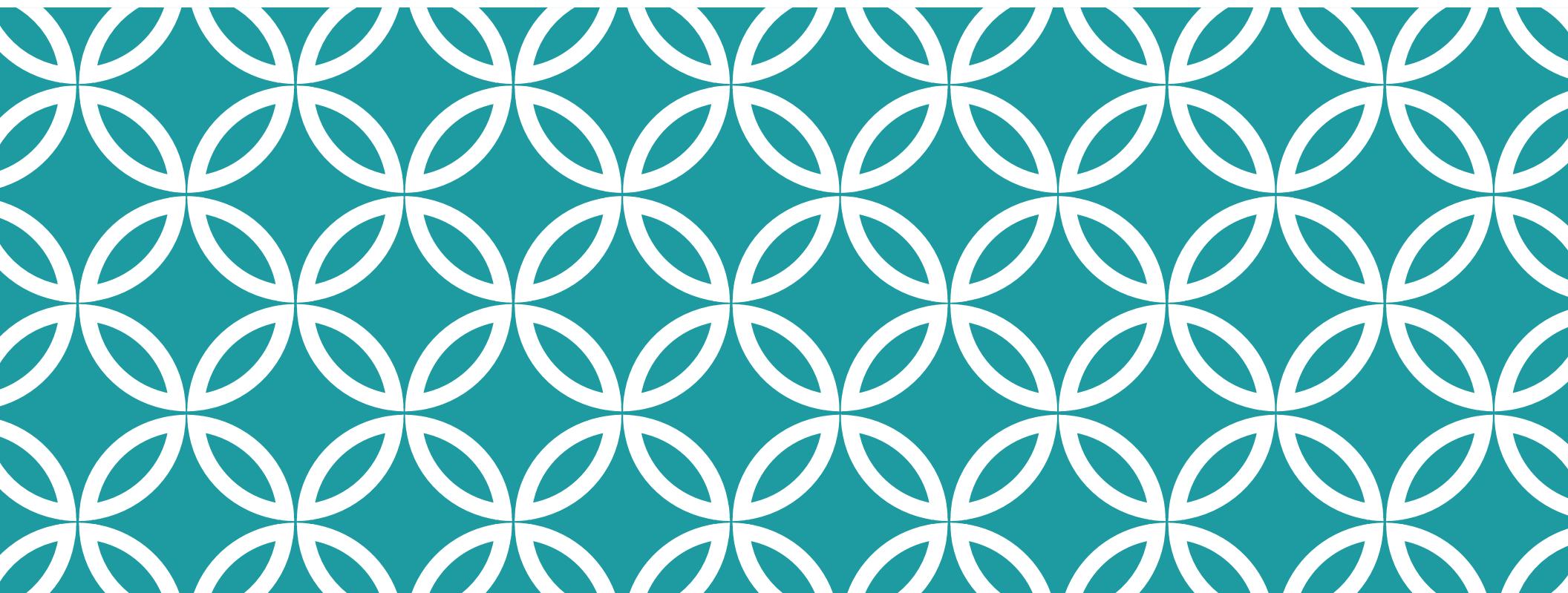
Input

The screenshot shows the 'QS Information System' window with 'Task 3' selected. The 'Inputs' section is identical to the first screenshot. Below it is a 'Recommendation' section with the same message. A table titled 'University' lists the following data:

University	The Best Year of Rank	The Best Rank	The Most Recent Year	Rank of the most recent y...
National University of Singapo...	2019	11	2022	11
Nanyang Technological Univer...	2018	11	2022	12
Tsinghua University	2021	15	2022	17
Peking University	2022	18	2022	18
The University of Tokyo	2020	22	2022	23
The University of Hong Kong	2021	22	2022	22

After pressing the
“Recommend”
button

Output



TASK 1 SUPPLEMENTARY NOTES

Malav Daftary

TASK 1 SHOWCASE

This segment will take you through Task 1 Basic Flow and Alternative Flow along with showing additional included features that make it easier to follow.

Main goal:

- Display Table view, Pie chart, and Bar chart for the user to view the data

Additional Features

- Modified the structure of the Pie and Bar Chart for a better user interface

BASIC FLOW

1. The Year is selected by the user from the dropdown box (The default is 2017)
2. The Property for the Pie chart is selected from the dropdown box in the pie chart tab (The default is country)
3. The Property for the Bar chart is selected from the dropdown box in the pie chart tab (The default is country)
4. Click the Search button
5. The data table, pie chart, and bar chart are displayed

TUTORIAL ON USAGE

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year

Search Reset

Data Table Pie Chart Bar Chart

All Information

Rank	University	Score	Country	City	Type
No content in table					

The year can be selected from the dropdown box

A screenshot of a Mac OS X application window titled "QS Information System". The window has a title bar with "Home", "Task 1", "Task 2", and "Task 3". Below the title bar is a text input field containing "Task #1: Overview of data based on year input". Under the heading "Inputs", there is a dropdown menu labeled "Year" with the value "2017" selected. Below the dropdown are two buttons: "Search" and "Reset". At the bottom of the window are three chart selection buttons: "Data Table", "Pie Chart", and "Bar Chart". A table below is empty, with the message "No content in table". A blue arrow points from the text "The year can be selected from the dropdown box" to the "Year" dropdown menu.

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year

Search Reset

Data Table Pie Chart Bar Chart

All Information

Rank	University	Score	Country	City	Type
No content in table					

No content in table

A screenshot of the same "QS Information System" window. The "Year" dropdown menu is open, showing the years 2017, 2018, 2019, 2020, 2021, and 2022. The year 2020 is highlighted with a blue background. A blue arrow points from the text "The year can be selected from the dropdown box" to the "Year" dropdown menu.

TUTORIAL ON USAGE

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year 2017

Search Reset

Data Table Pie Chart Bar Chart

country

The pie chart property can be selected from the dropdown box

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

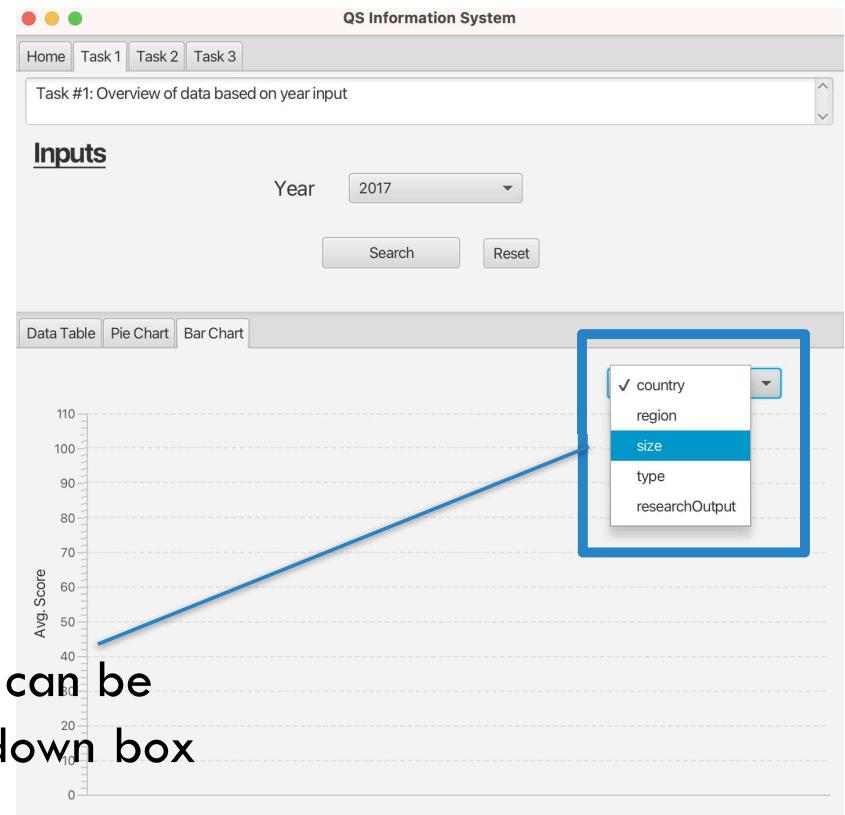
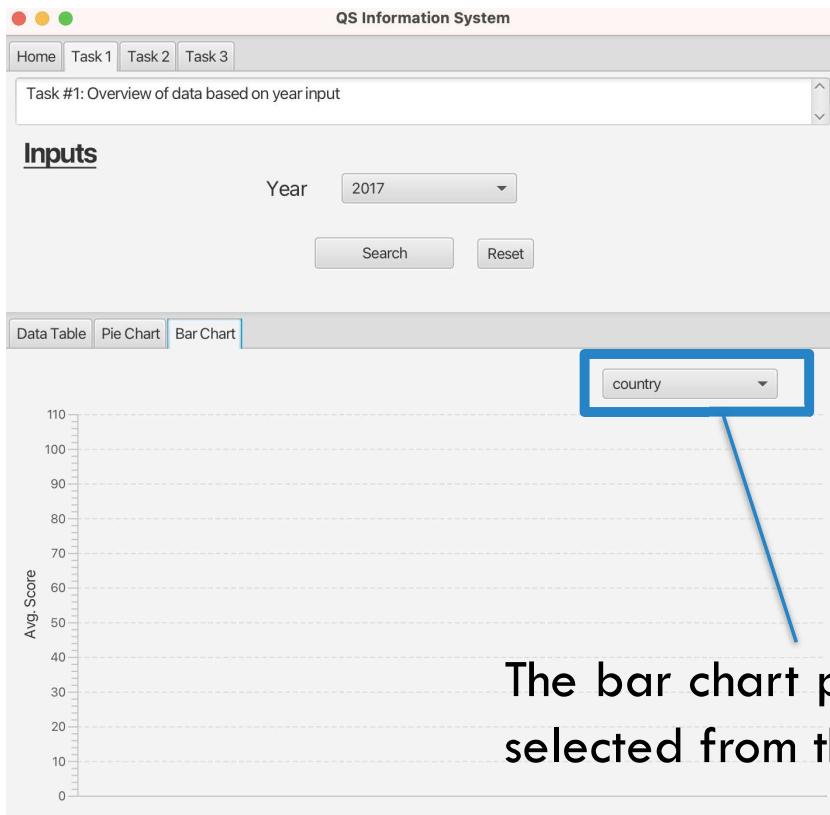
Year 2017

Search Reset

Data Table Pie Chart Bar Chart

✓ country
region
size
type
researchOutput

TUTORIAL ON USAGE



The bar chart property can be selected from the dropdown box

TUTORIAL ON USAGE

Click Search

QS Information System

Home Task 1 Task 2 Task 3

Task #1: Overview of data based on year input

Inputs

Year: 2017

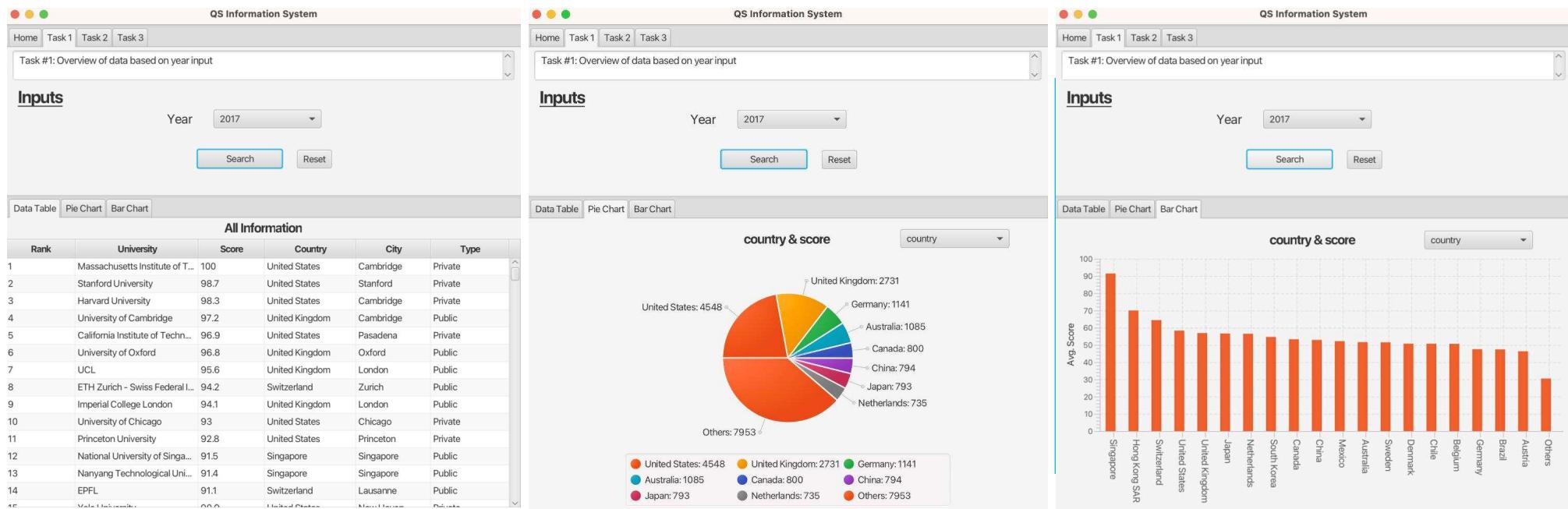
Search (button highlighted with a blue box)

Reset

Data Table Pie Chart Bar Chart

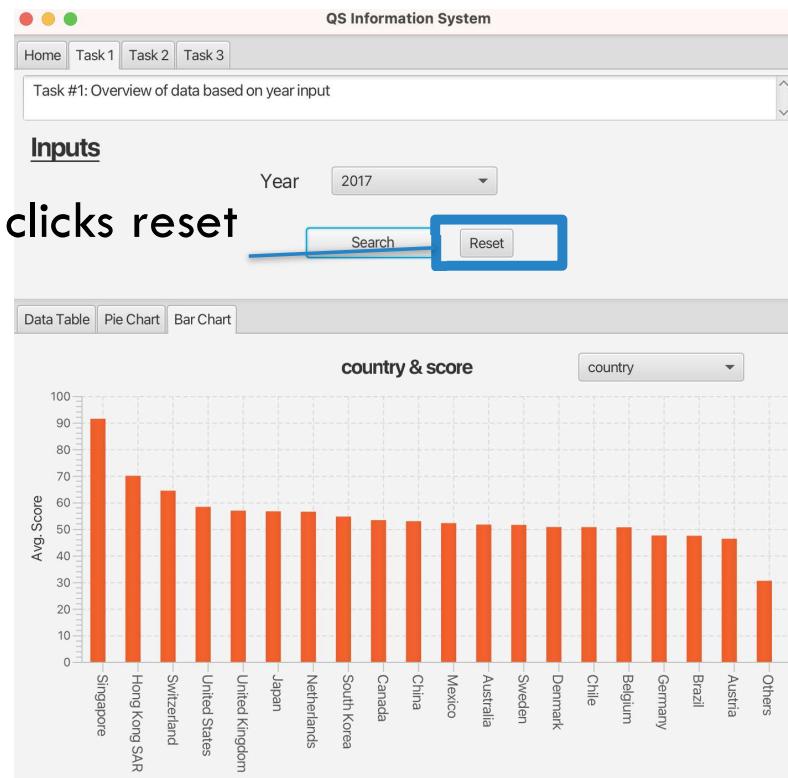
All Information

Rank	University	Score	Country	City	Type
No content in table					

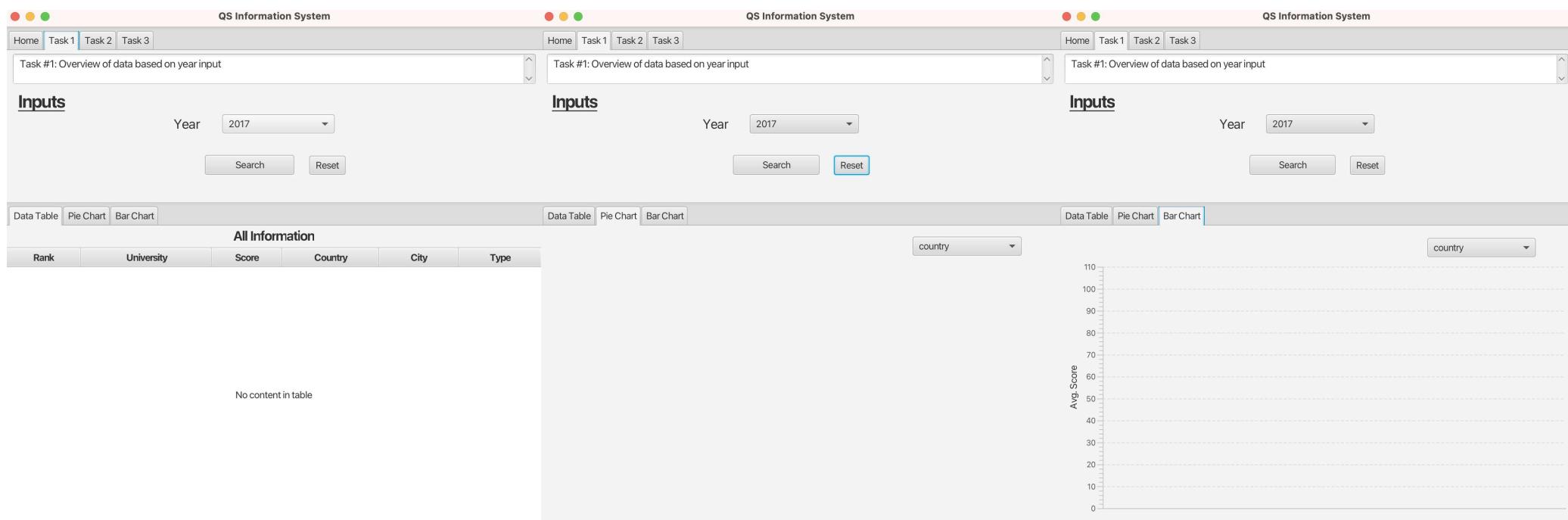


TUTORIAL ON USAGE DATA TABLE, PIE CHART AND BAR CHART ARE DISPLAYED

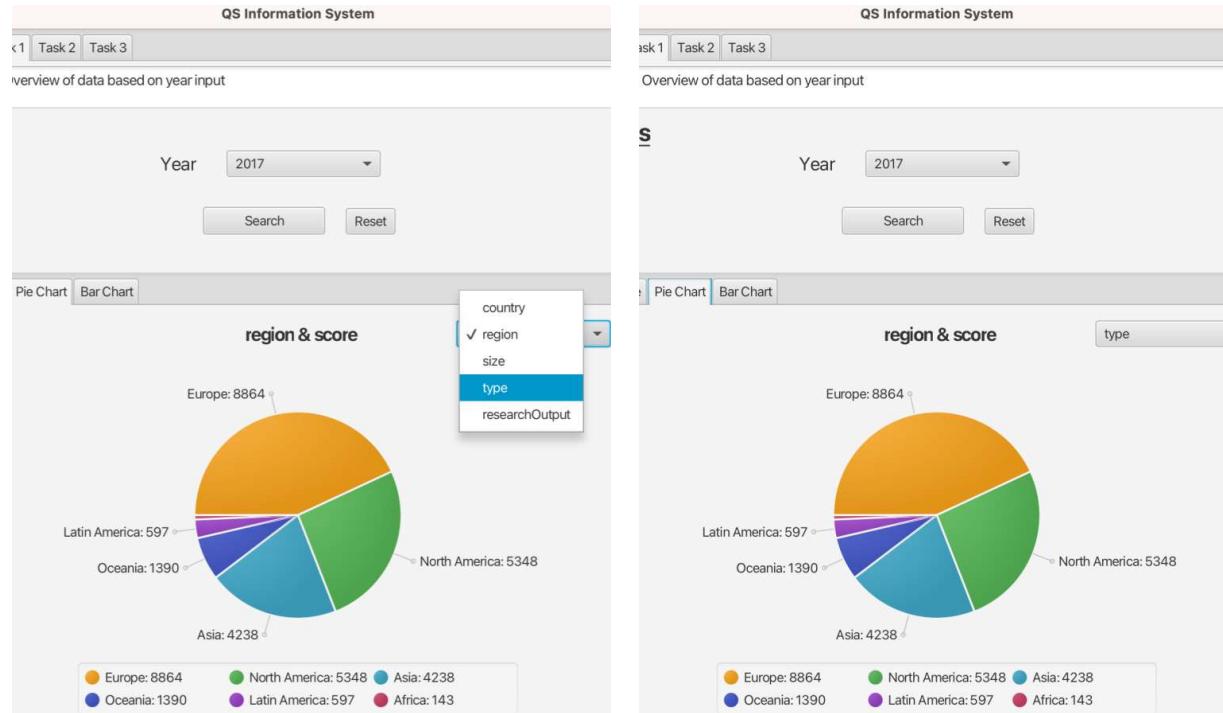
ALTERNATIVE FLOWS – WHEN THE USER CLICKS RESET



ALTERNATIVE FLOWS – WHEN THE USER CLICKS RESET

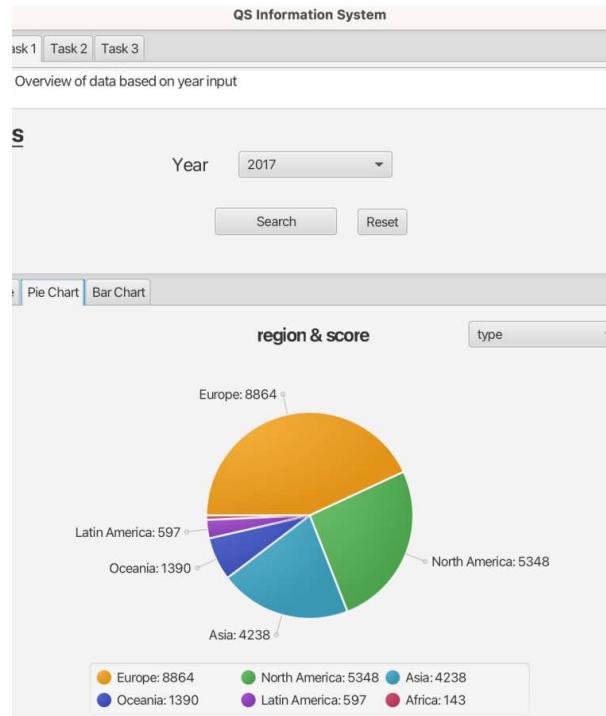


All the displayed data is cleared and the choice boxes are reset to their default values.



ALTERNATIVE FLOWS – WHEN THE USER CHANGES YEAR OR ANY PROPERTIES AFTER DISPLAYING DATA

- If the user changes the year or any of the pie chart/bar chart property, he must press the search button afterwards to display the data for the changed value, else the displayed data remains the same.
- It is done this way rather than automatically to ensure that the user really wishes to change his data rather than an accidental change.
- E.g. The images on the left show that the displayed data remains the same when user changes their pie chart property from region to type
- The user must press the Search button again to update the data



- After pressing the Search button

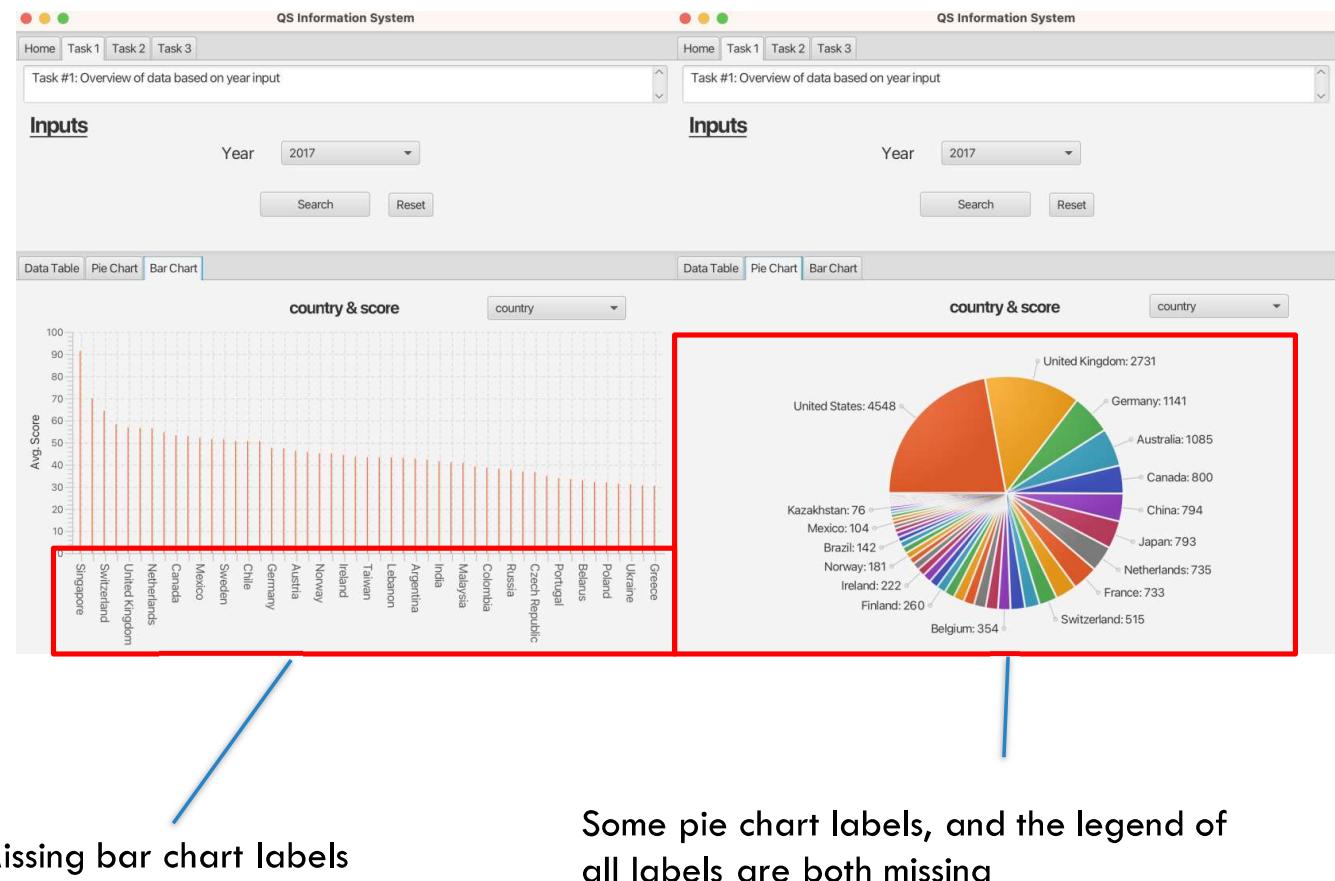
ALTERNATIVE FLOWS – WHEN THE USER CHANGES YEAR OR ANY PROPERTIES AFTER DISPLAYING DATA

ASSUMPTIONS AND LIMITATIONS

- One of the major issues was dealing with incomplete data. Some universities did not have values such as their score or city.
- All the universities were displayed in the data table even if they had some missing values. The user might still benefit from the available information and there were very few of such universities, so this was deemed the best way to deal with it.
- When calculating the scores in the pie and bar charts, if a university did not have a score, then the university was ignored and not included in the calculation.

PIE CHART AND BAR CHART INTERFACE

The Pie and Bar chart were modified to provide a better interface for the user. Initially, all the data points were used but when the property selected is "country" then there are too many data points, and the pie/bar chart looks crammed and some of the data labels do not appear



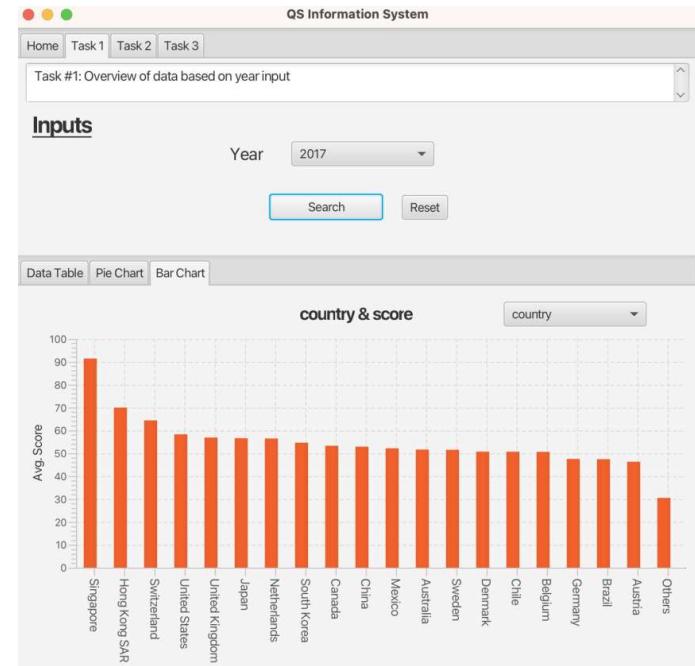
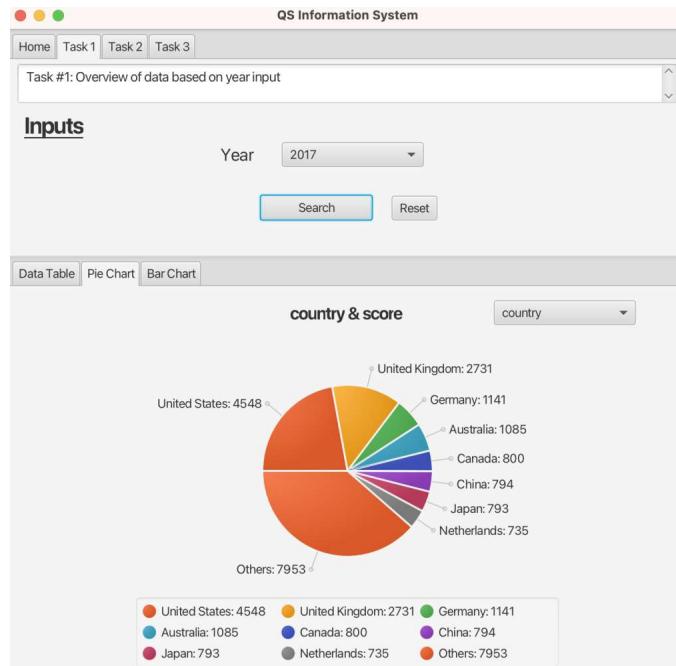
PIE CHART AND BAR CHART INTERFACE

Now, it is modified to display:

- 9 values in the pie chart
- 20 values in the bar chart

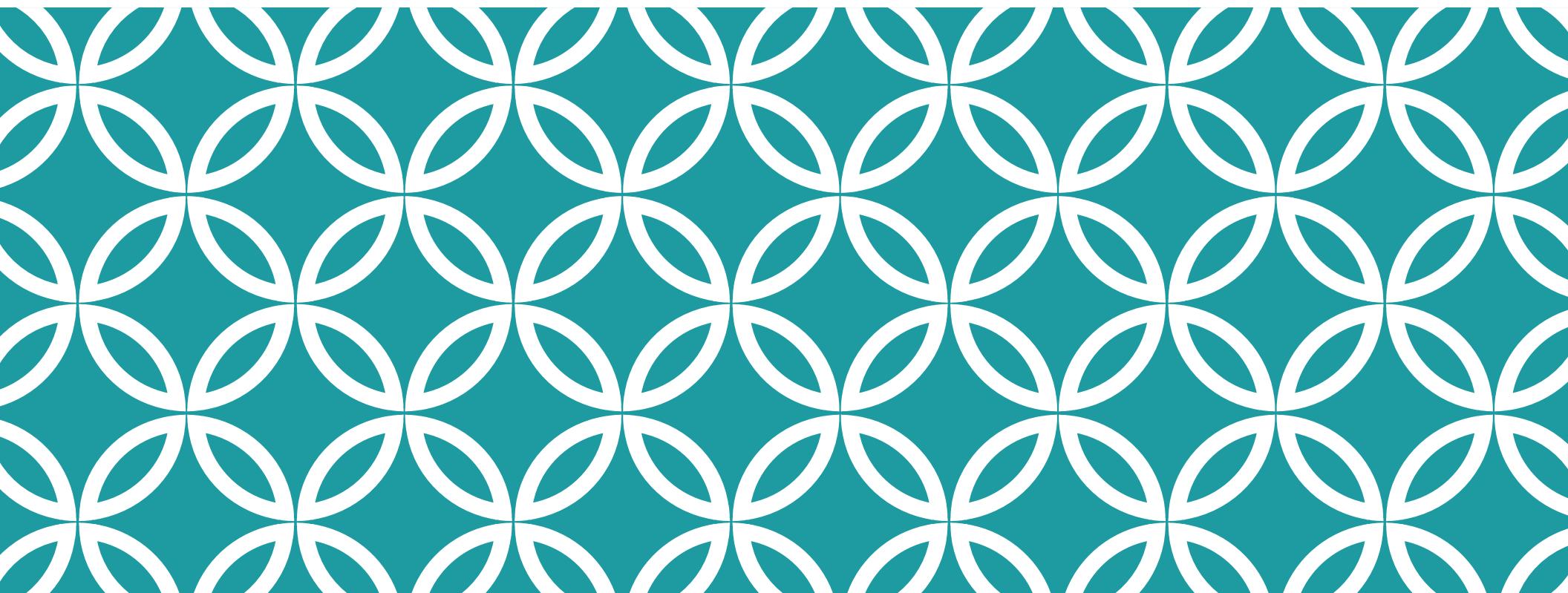
These numbers were carefully chosen after experimenting with several numbers on which provides a combination of the best viewing experience, the most information, and doesn't have any missing labels.

All other countries apart from the top 8 (in pie chart) and top 19 (in bar chart) are combined as "others"



ADDITIONAL NOTES

- An error such as the choice boxes being empty/null can never occur because if the user does not change these values, then they will remain in their default state.
- Even when the reset button is pressed, all the displayed data is cleared but the choice boxes are not set to null, they are reset back to their default value.
- Hence no error handling regarding choice boxes being null is required.



TASK 2 SUPPLEMENTARY NOTES

Shriyan Shekhar

TASK 2 SHOWCASE

This segment will take you through Task 2 Basic Flow and Alternative Flow along with showing additional included features that make it easier to follow.

Main goal:

- Display Bar Chart and Line Chart for the selected universities and years.

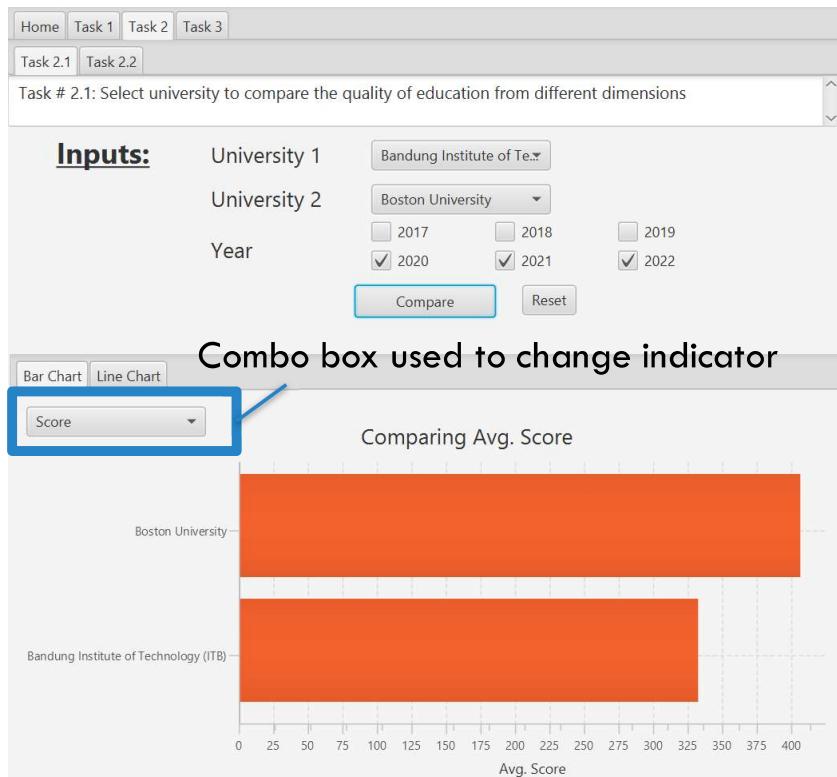
Additional Features

- Added a combo box to show different bar charts in respect to the indicator selected.
- Added Alert boxes for each

BASIC FLOW 2.1

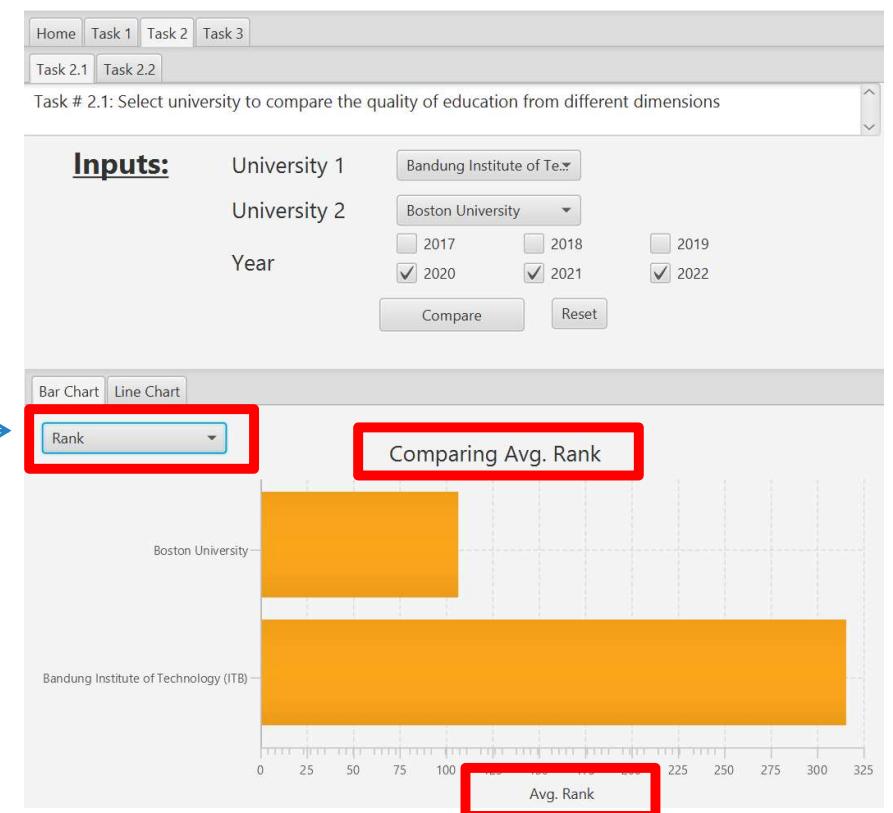
- University 1 is selected
- University 2 is selected
- At least one year is selected
- Click Compare
- Data is Fetched and not Empty
- Display Bar Chart according to user input – Note the default Bar Chart is Score as it is deemed as the most significant indicator for this task.
- User can change input of indicator in the combo box to get other charts

TUTORIAL ON USAGE (THIS ONE SHOWS 2.1 BUT BOTH HAVE SAME WAY OF USE)



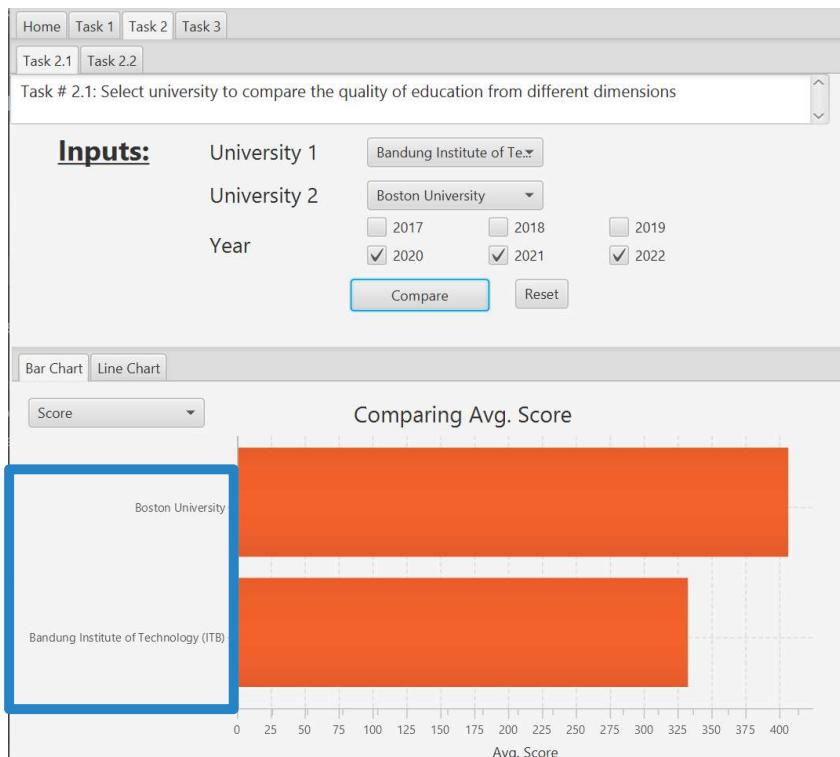
Default Display: Score Bar Chart is default graph

Change
to Rank



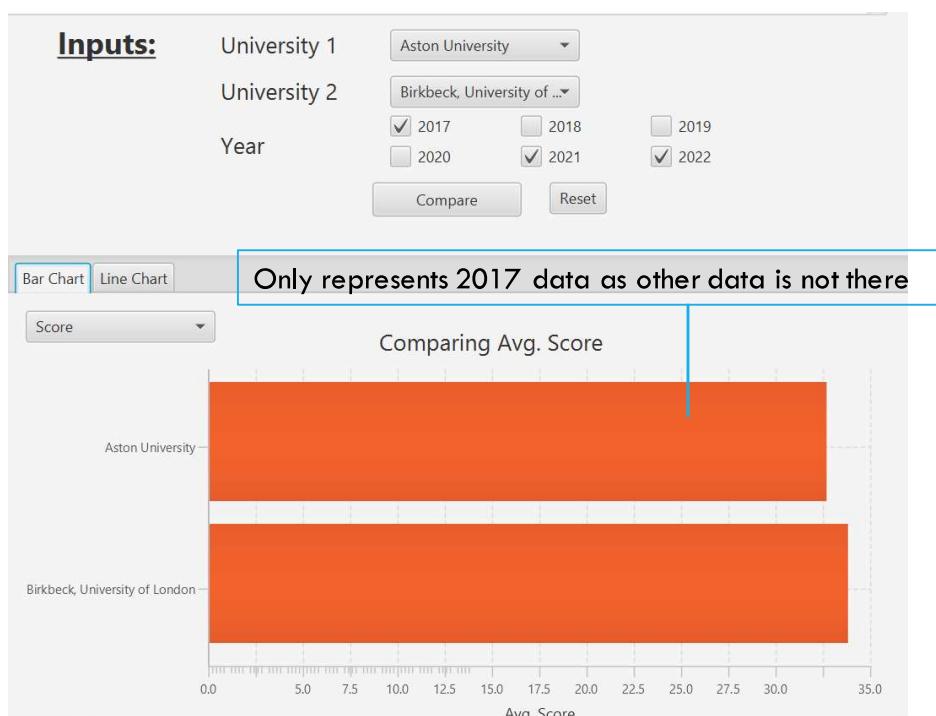
Red Indicates the changed text. Obviously, chart changed.

ASSUMPTION IN BAR CHART



- The Score Bar chart is displayed as the default bar chart when compare is pressed. This is because score is deemed as the most important comparison indicator for this project.
- Instead of “University 1” and “University 2” displayed in the blue area, the actual name of the university is displayed. This is done as the user might choose another input and forget to press compare. There is no way of the user knowing what university (or universities) he/she is comparing. Therefore, it is displayed with the university names.

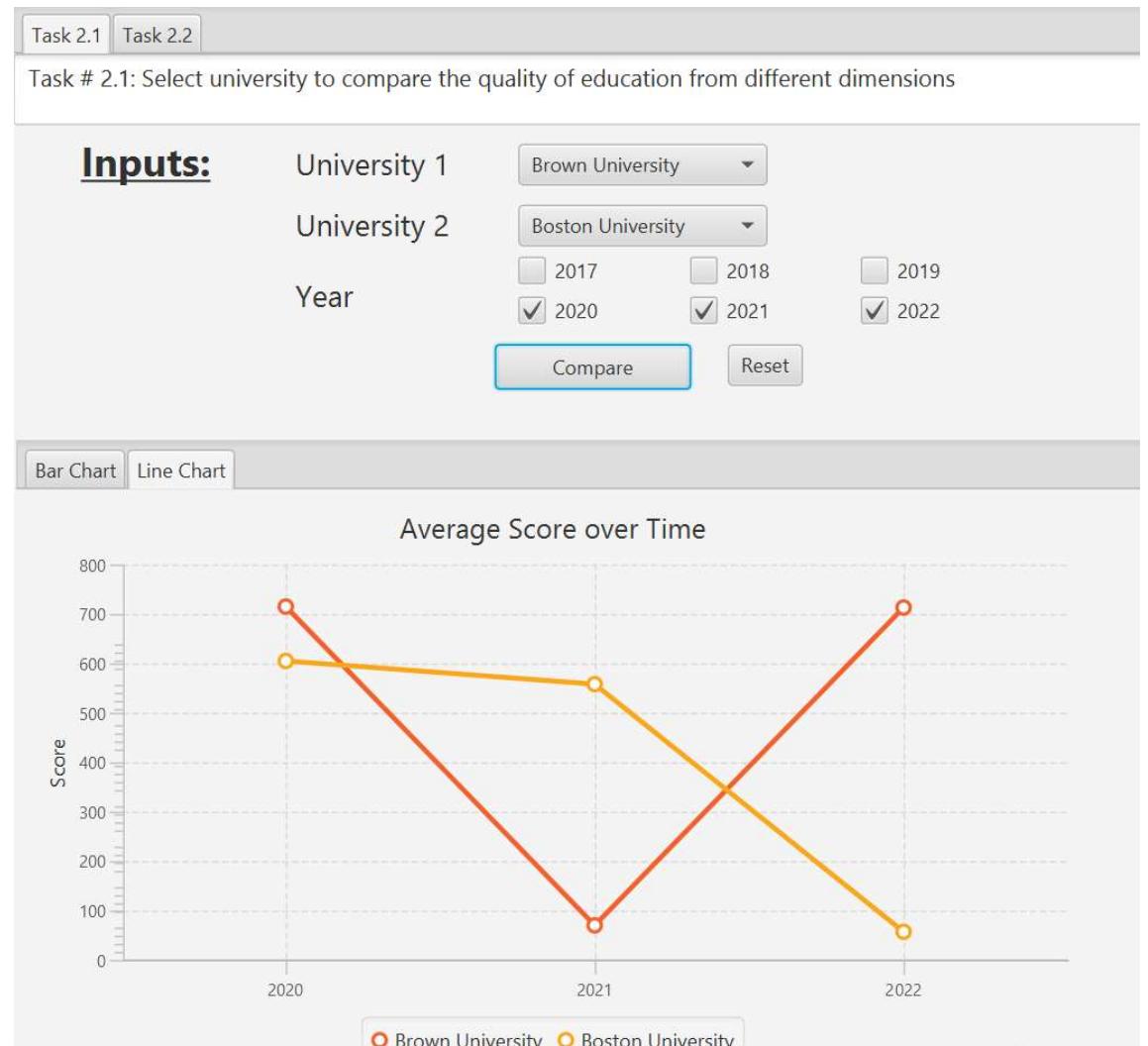
ASSUMPTION IN DATA REPRESENTATION



- Some universities do not have data for all years. If the user selects any of the two universities with no data, an error message will popup and display “Please Select Another Year or University”. (Showed later).
- However, if there is some data (any data) for any year, then it will be displayed if that year is selected. For example, Aston University has data for 2017, 2018, 2019 only. So, if the user selects year 2017, 2021, 2022, the graph for Aston University will only reflect the year 2017. Basically, instead of processing the empty data as 0.0, it is skipped over.
- Justification: For Aston University, if data for 2021 and 2022 is considered as 0.0 (as its not there), then the comparison will be flawed thus empty data points are skipped over.

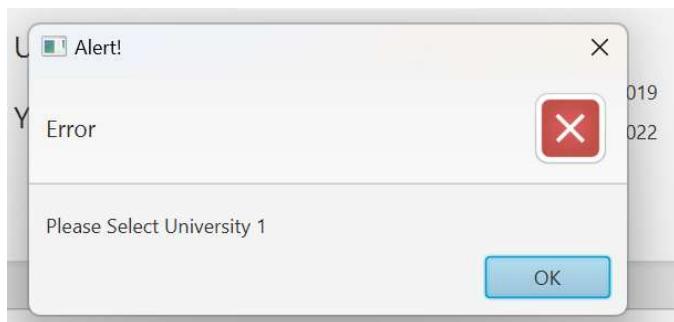
TUTORIAL ON USAGE – LINE CHART

Default Display: Line Chart Display



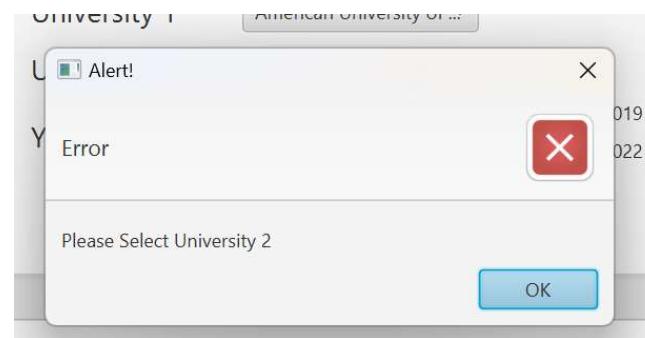
ALTERNATIVE FLOWS (THIS ONE SHOWS 2.1 BUT BOTH HAVE SAME WAY OF USE)

University 1 Not Selected



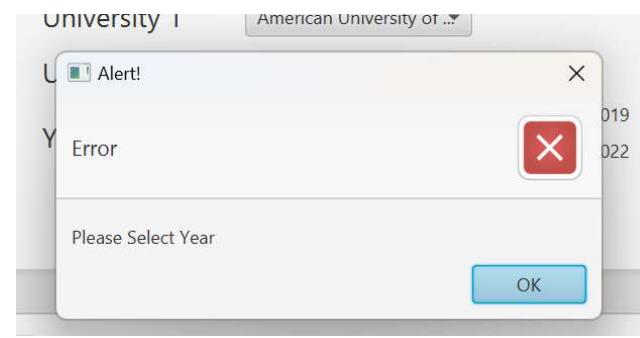
Alert Message Display telling user what to do

University 2 Not Selected



Alert Message Display telling user what to do

Year Not Selected



Alert Message Display telling user what to do

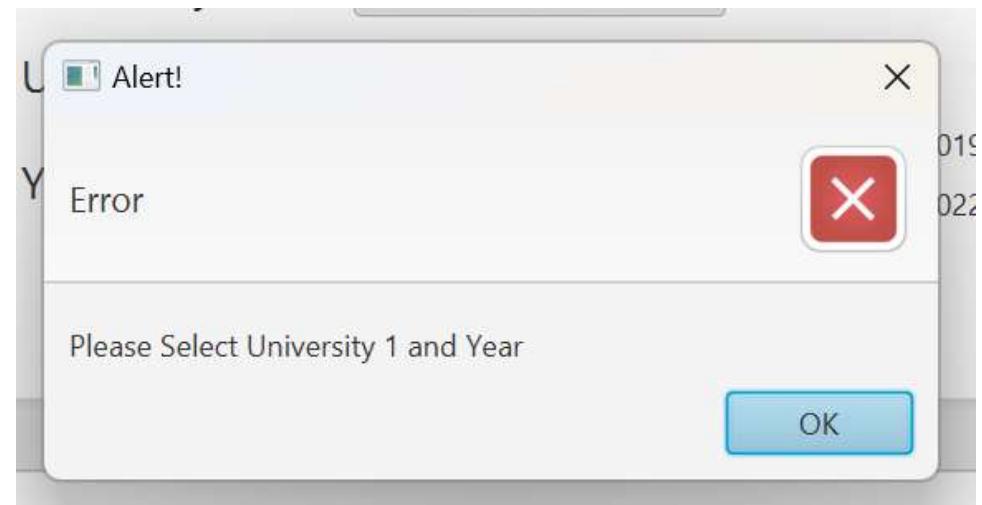
ALTERNATIVE FLOWS CONTINUE – ALERT BOXES

University 1 and University 2 Not Selected



Alert Message Display telling user what to do

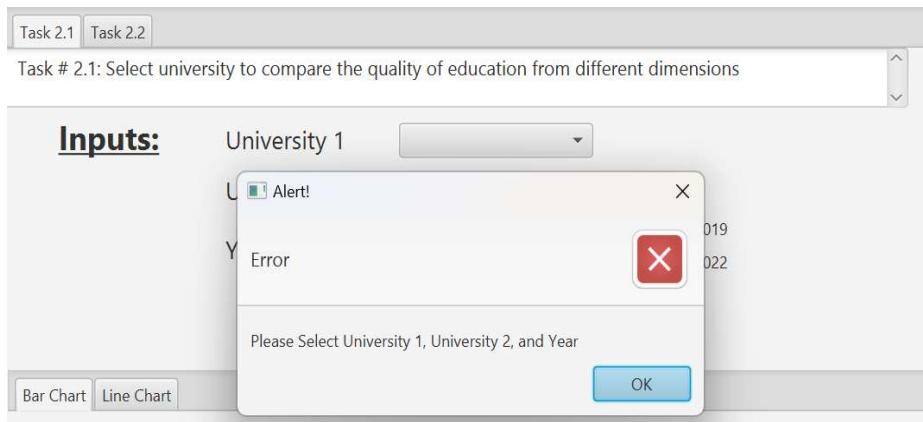
University 1 and Year Not Selected



Alert Message Display telling user what to do

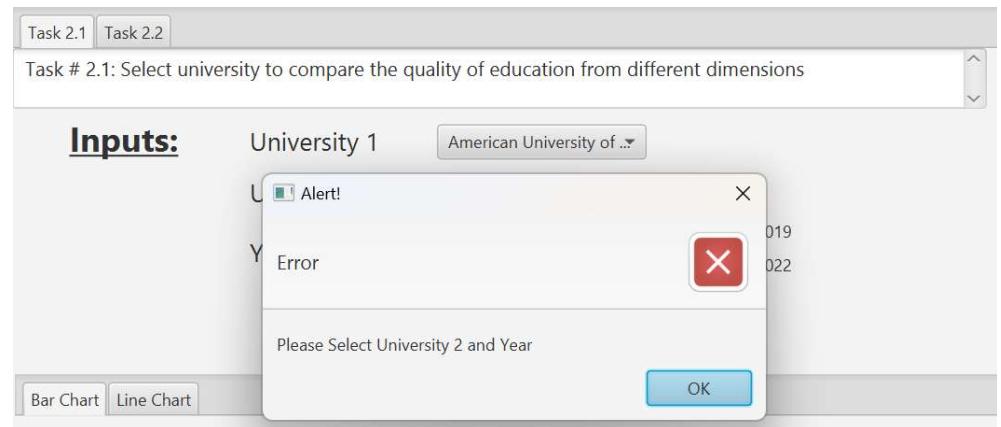
ALTERNATIVE FLOWS CONTINUE – ALERT BOXES

Nothing Selected



Alert Message Display telling user what to do

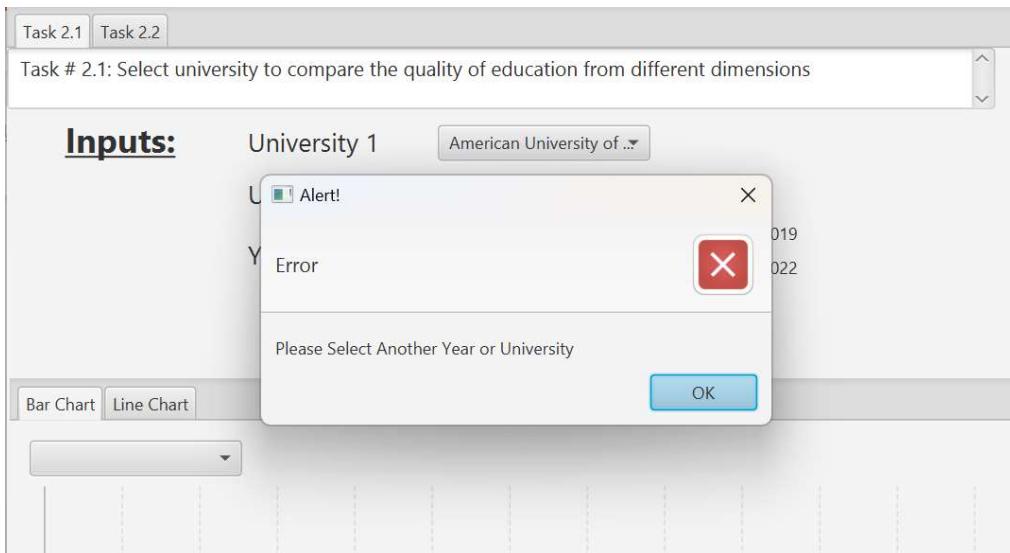
University 2 and Year Not Selected



Alert Message Display telling user what to do

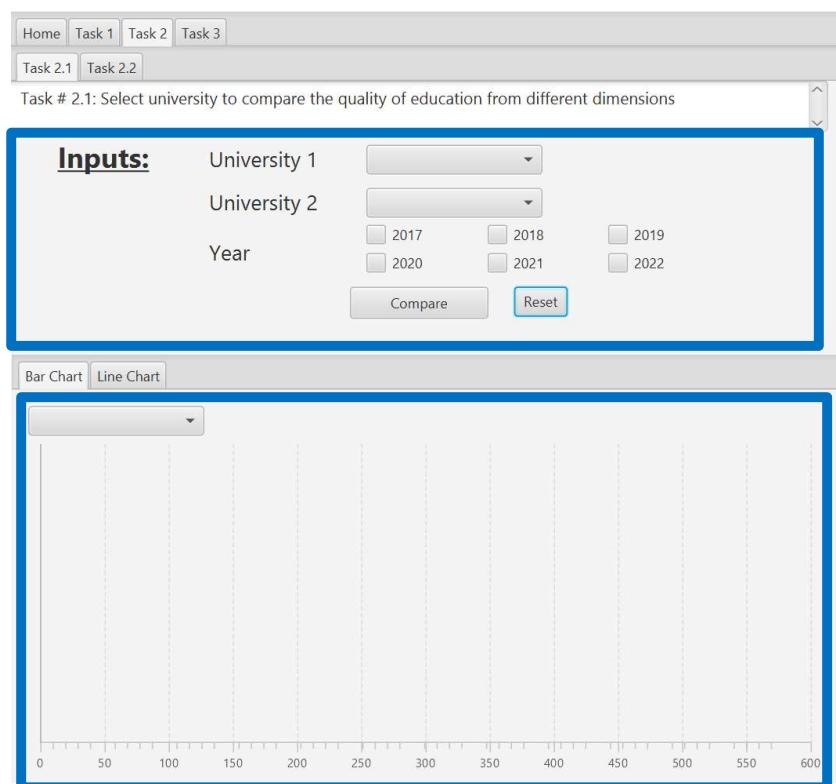
ALTERNATIVE FLOWS CONTINUE

No Data for a university found – invalid year/university



Alert Message: Prompts User to
Select Another Year or University

Reset – Blue indicates area cleared

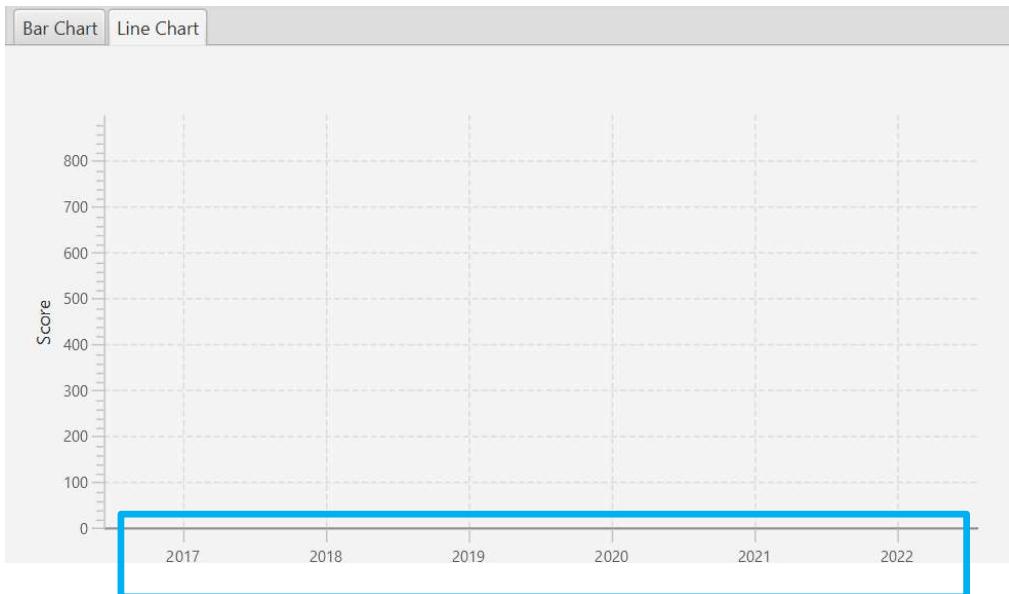


WHEN ALERT OCCURS

Every graph element is cleared but keeps the data for the year selected and university/country names

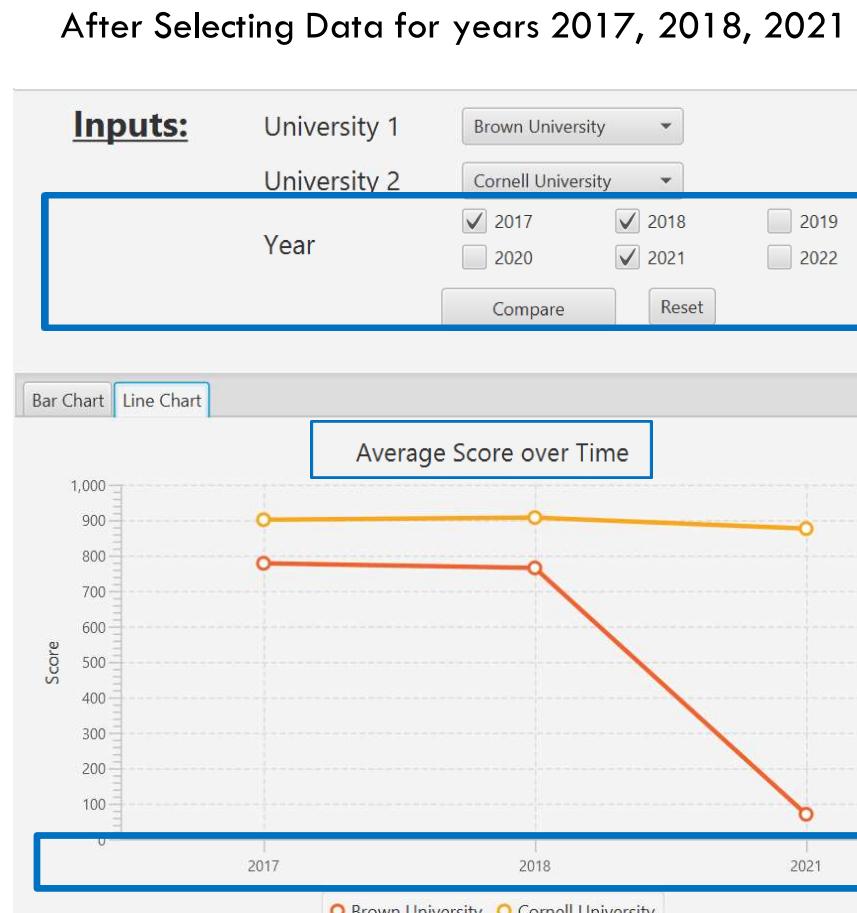
X-AXIS OF LINE CHART

Initial Line Chart when there is no data selected



X-Axis already set to possible values

When compared
→

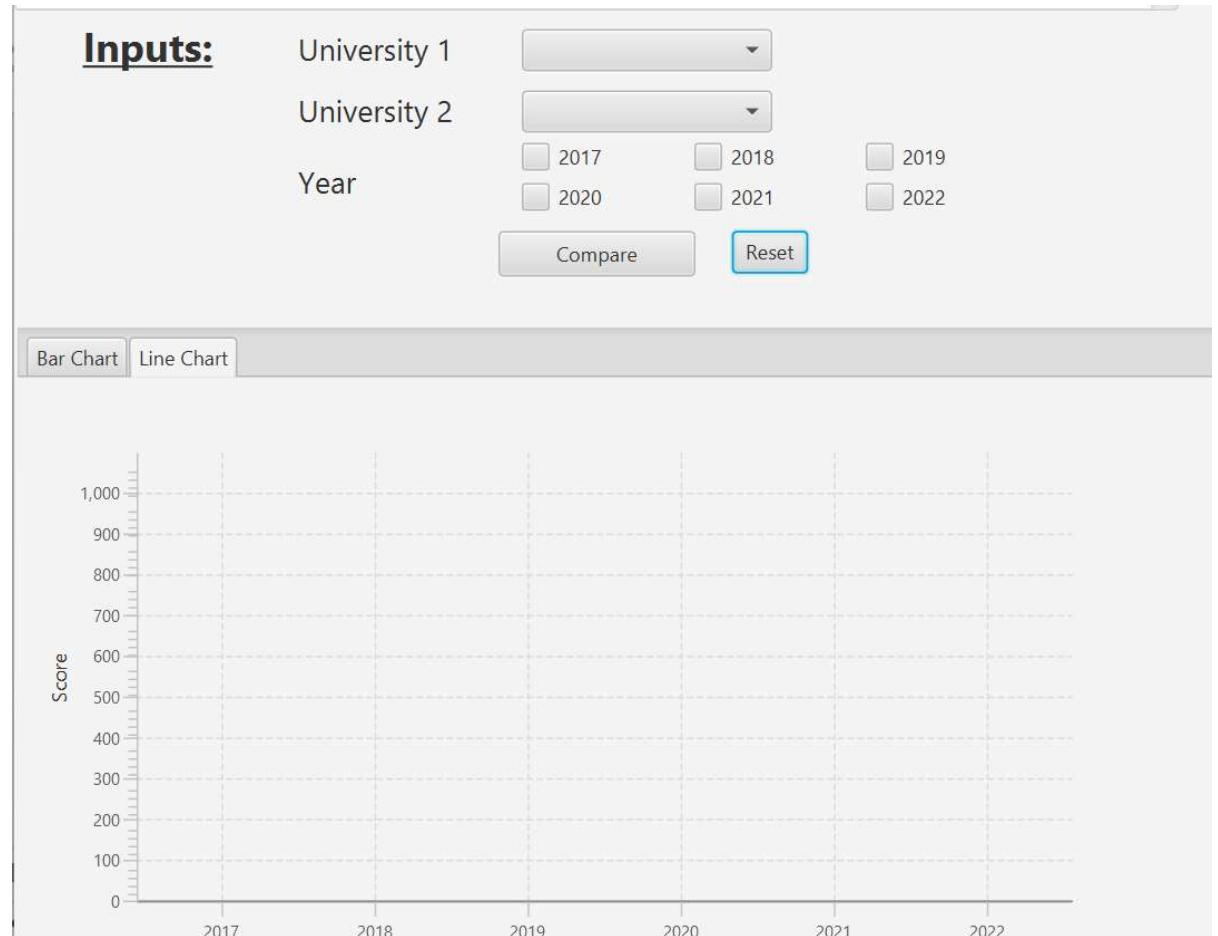


The X-Axis changes to the years selected at the top and the title of the line chart is set.

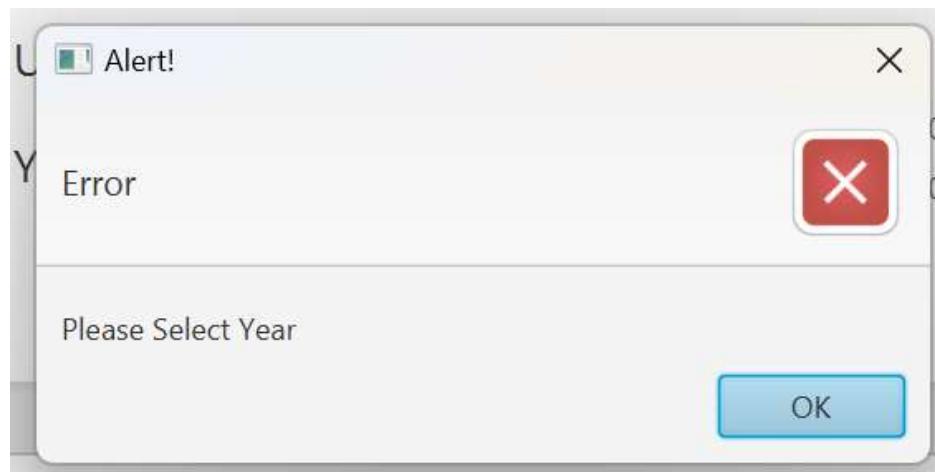
RESET OF LINE CHART

When Reset is clicked

- Everything is cleared
- X-Axis goes back to original of “2017”, “2018”, “2019”, “2020”, “2021”, “2022”
- Title is also Cleared



IF USER SOMEHOW FORGETS WHAT NEEDS TO BE DONE – NO WORRIES



HIT OK or
Close

A screenshot of a user interface for comparing data between two universities. On the left, there are dropdown menus for 'University 1' (American University of ...), 'University 2' (Bandung Institute of Te...), and 'Year' (with options for 2017, 2018, 2019, 2020, 2021, and 2022). Below the year dropdown is a 'Compare' button and a 'Reset' button. A red arrow points from the 'Close' button in the alert dialog to the 'Please Select Year' message in the UI. Another red arrow points from the 'Please Select Year' message in the UI back to the 'Please Select Year' message in the alert dialog.

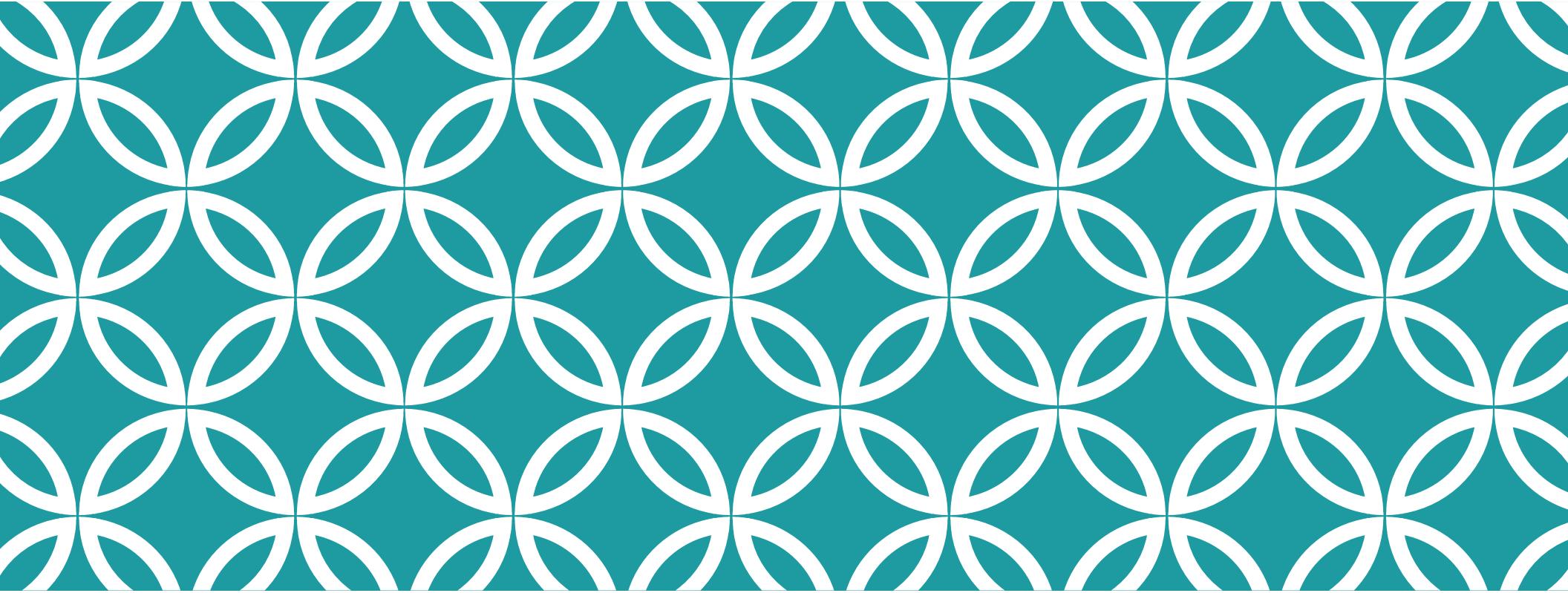
Assume User forgets to input year and closes OK Tab but somehow forgets what he/she needs to do in order to run a comparison – NO PROBLEM.

Reminder message in Red reminding Users what they need to do to run comparisons

TASK2.2

- Country/Region 1 is selected
- Country/Region 2 is selected
- At least one year is selected
- Click Compare
- Data is Fetched and not Empty
- Display Bar Chart according to user input – Note the default Bar Chart is Score as it is deemed as the most significant indicator for this task.
- User can change input of indicator in the combo box to get other charts

NOTE: TUTORIAL ON USAGE FOR TASK2.2 is the Same except alerts and text say country/region rather than university.



TASK 3 SUPPLEMENTARY NOTES

Ipsita Sanjay Singh

TASK 3 SHOWCASE

This segment will take you through Task 3 Basic Flow and Alternative Flow along with showing additional features that make it easier to follow.

Main goal:

- Display a list of recommended universities which satisfy the user inputted criterion.

Additional Features

- Added an "All" option for the Type and Region choice boxes
- Added error boxes which alerts the user whenever an invalid input is given to the program or the inputted criterion is not satisfied by any university

BASIC FLOW

- Top rank is inputted by the user.
- Bottom rank is inputted by the user.
- The type is selected.
- The region in which the university is located is selected.
- Click Search.
- Data is Fetched and not Empty.
- Display the list of recommended universities which satisfy the user inputted criterion.

TUTORIAL ON USAGE

QS Information System

Home Task 1 Task 2 Task 3

Task # 3: University suggestion based on user input

Inputs

Ranking Range Top Bottom Ensure that you have entered valid inputs

Type Region

Press recommend

Based on your input these universities you can prefer for higher education

University	The Best Year of Rank	The Best Rank	The Most Recent Year	Rank of the most recent y...
No content in table				

After pressing Recommend button

QS Information System

Home Task 1 Task 2 Task 3

Task # 3: University suggestion based on user input

Inputs

Ranking Range Top Bottom

Type Region

User can press the reset button to clear the table and enter new inputs

Based on your input these universities you can prefer for higher education

University	The Best Year of Rank	The Best Rank	The Most Recent Year	Rank of the most recent y...
Massachusetts Institute of Tec...	2017	1	2022	1
Stanford University	2017	2	2022	3
Harvard University	2017	3	2022	5
California Institute of Technolo...	2018	4	2022	6
University of Chicago	2018	9	2022	10
Princeton University	2017	11	2022	20
University of Pennsylvania	2022	13	2022	13
Yale University	2022	14	2022	14
Cornell University	2018	14	2022	21
Columbia University	2019	16	2022	19
Johns Hopkins University	2017	17	2022	25

The table is populated with the relevant data

RESETTING OF INPUTS AND TABLE

The screenshot shows the 'QS Information System' window for 'Task # 3: University suggestion based on user input'. In the 'Inputs' section, the 'Ranking Range' is set from 'Top 1' to 'Bottom 2', 'Type' is 'Private', and 'Region' is 'North America'. The 'Recommend' button is highlighted with a blue border, while the 'Reset' button is outlined in green. Below the inputs, a 'Recommendation' section displays a table of universities based on the selected criteria. The table includes columns: University, The Best Year of Rank, The Best Rank, The Most Recent Year, and Rank of the most recent y... . The table shows two rows: Massachusetts Institute of Technology (2017, 1, 2022, 1) and Stanford University (2017, 2, 2021, 2).

After the “Reset” button is clicked, all of the data in the table, the error messages (if any) and the user inputs are cleared

The screenshot shows the same 'QS Information System' window after the 'Reset' button was clicked. The 'Inputs' section now has empty fields for 'Ranking Range', 'Type', and 'Region'. The 'Recommend' button is grayed out. The 'Recommendation' section below the inputs now displays a message: 'No content in table'.

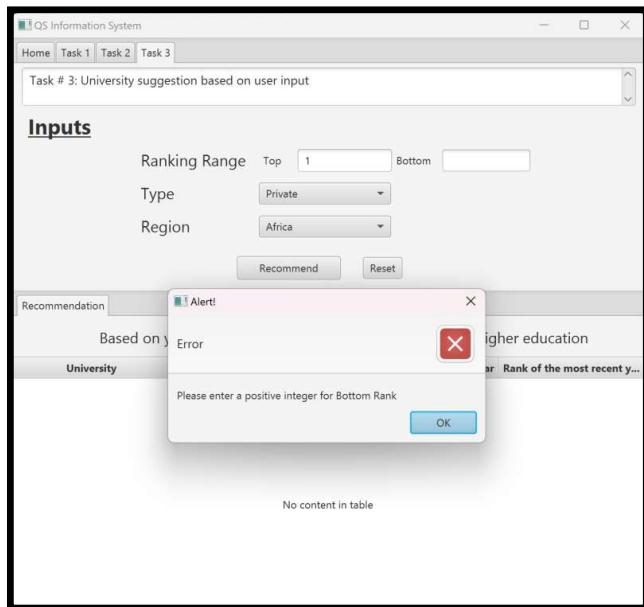
ASSUMPTION IN DATA REPRESENTATION

- Some of the universities have missing data in the Type field. Thus, these universities are not displayed to the user if the user has selected “Private” or “Public” in the Type. However, if the user selects the “All” option for Type, the universities with this missing data and both public and private universities are displayed to the user.
- If the user inputs a criterion which is not satisfied by any universities, an error message is displayed to the user which says: "No recommendation exists for the given inputs, Please input different criterion.“

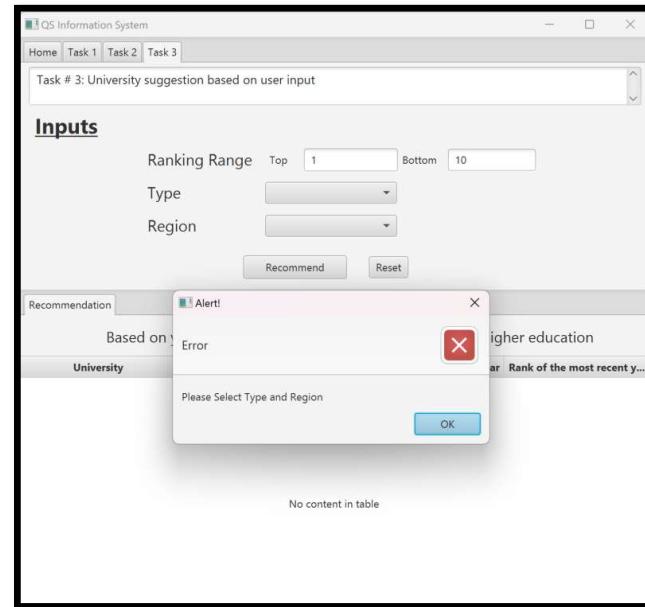
ERROR ALERT MESSAGES

- When an error alert is raised, an alert box pops up and the table data is cleared however the user inputs and the error message (in red) are still displayed so that users can easily change their inputs.

ALTERNATIVE FLOWS

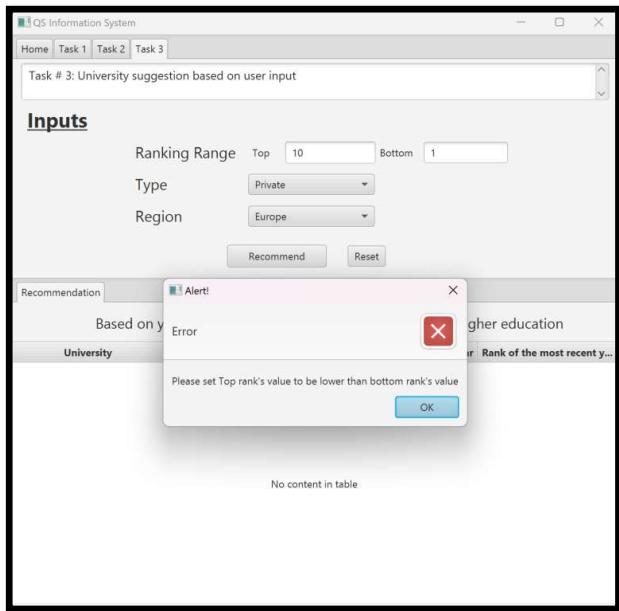


Error message displayed when bottom rank is empty or not an integer. A similar error message is displayed when the top rank is empty or not an integer.

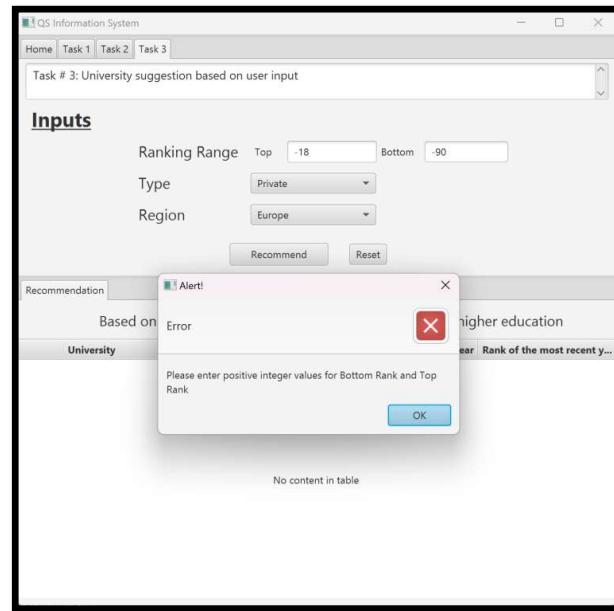


Error message displayed when type and region are not selected by user. A similar error message is raised when either type or region is not selected.

ALTERNATIVE FLOW (CONTINUED)

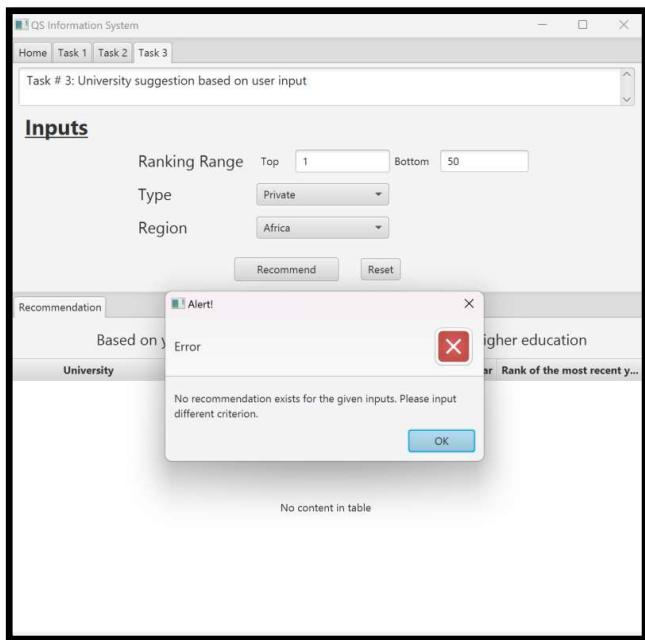


Error message displayed when the user sets the bottom rank to be higher than top rank.



Error message displayed when the user sets the top rank and bottom rank to negative integers. A similar message is displayed when either the top rank or bottom rank is a negative integer.

ALTERNATIVE FLOW(CONTINUED)



Error message displayed when no universities fit the criterion specified by the user.