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| Safe roads - Staying safe - NSW Centre for Road Safety  SOFTWARE DESIGN DOCUMENT  NSW Traffic Penalty Tool | AUTHORS  Brianne Byer s5175100  Wonwoo Choi  Marco Querzola  s5264979  2810ICT Software Technologies  Trimester 2, 2022 |

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# System Vision

## Problem Background

Cars are closely related to our lives and many people are driving. Driving a car is very convenient, but at the same time, there are quite a few rules given to the driver for safety. So, our team is going to show which penalties are awarded the most in the project so that people are alert or careful about it. NSW is Australia's most populous state. (Australian Bureau of Statistics,2022) That's why our team is going to do it on a trial basis with data from NSW. In this program, you can specify a specific time period and view the penalty history that occurred during that time period. In order to make it easier for users to recognize visual information, we will convert the information into a graph and easily deliver it to users. There are four main pages in this program. “Main page", "Distribution of Cases in each offence code”, "All cases captured by radar or camera", "Cases caused by mobile phone usage" and "Penalty caused in School Zone". The main page is a page that users can see when they first access, and there are buttons that allow users to set a period or display only events near the school. On the other two pages except "Penalty reasoned in school Zone" and "Main page", the user sets a period, specifies whether to display only events near the school, and presses the search button to automatically generate a graph of the result value, and the user can also initialize the conditions using the clear button. Finally, on the Penalty Caused in School Zone page, when the user clicks the Search button after specifying a period, penalties that occurred near the school during the selected period are displayed as a graph. Every page has a navigation bar, which allows you to move to another page fluidly.

## System Overview

In our system users can input a maximum of 3 conditions for searching. Start date, End date and School Zone check box. Start date and End date condition to set the period of searching. If the user clicks the Start date or End date text box, then the calendar will pop up and the user can select the date there. Users can tick the box to see the only penalty given in the school zone area. Once the user selects all the conditions, the user can click the “Search” button to generate a graph. However, the main page will only generate raw data without a graph, but the rest of the page will generate graphs. Once the user clicks the “Reset” button that is located next to the “Search” button, the input conditions will be null. Users can move the page by using a navigation bar that locate the left side of the page. Depending on the page the navigation bar will be changed.

## Potential Benefits

By using this program, users can learn about which traffic rules are most poorly followed and many people are caught. By knowing this information, users will be most alert to traffic rules and will be able to try not to break them in the future. Also, if traffic regulators use this program to find out which laws are best broken, they will be able to study how to prepare for the most common rules.

# Requirements

## User Requirements

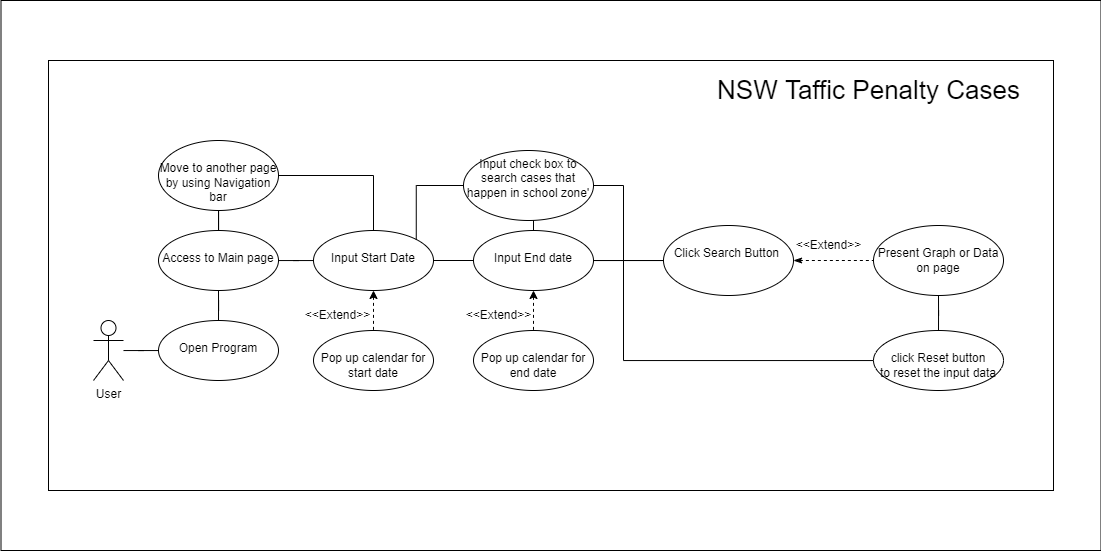
This program is designed for the user to be able to search through a set of data relating to traffic penalties in NSW between 2011 and 2018. The user will first be able to select a period they want to search from ranging from the whole data set to a day or week window. Once the period is selected the user can search for certain keywords such as mobile phone usage or drink driving offences. During a selected time period the user will be able to produce a chart which shows a distribution of number of cases in each offence code, this will help to get an idea of what is the most common breach of NSW traffic rules. This program will be a very useful analysis tool and would help those working in analytical roles within the NSW government especially those involved in the Transport for NSW department.

## Software Requirements

**Table 1 - Functional Requirements**

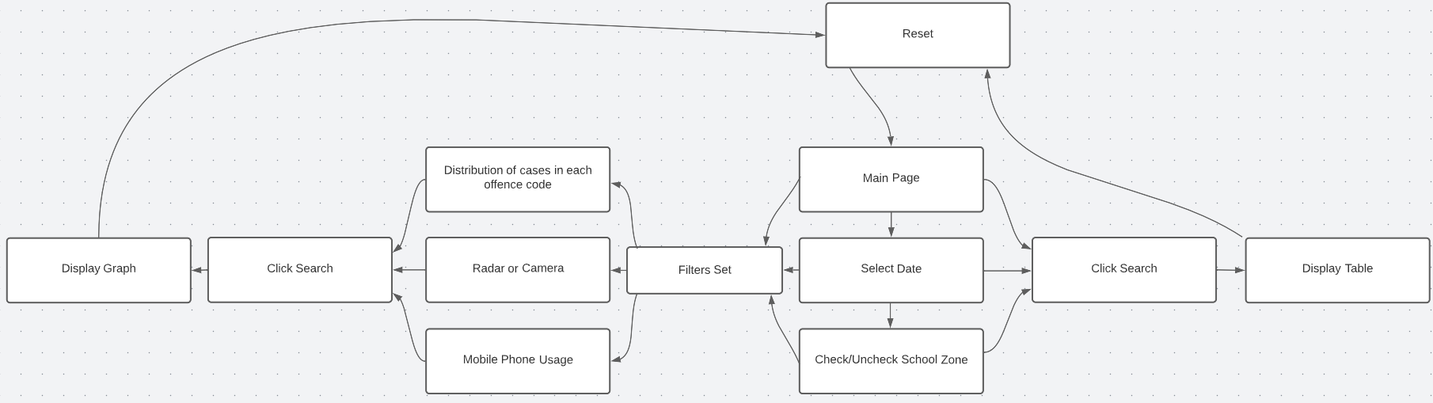
|  |  |
| --- | --- |
| **Identifier** | **Requirements** |
| **R1.1** | The program shall ask for input for a date range between 2011-2018, this can be anywhere from years to days |
| **R1.2** | The program will then provide a search box where user can filter offences by type of offence or various keywords. |
| **R1.3** | The program shall provide a list of offences relevant to type/keyword. User can click on each offence to get more information. |
| **R1.4** | The program shall provide a chart showing the distribution of number offences in each code. |
| **R2.1** | Main page present calendar to select start date and end date. |
| **R2.2** | In main page “School Zone” check box should be able to check or uncheck the checkbox. |
| **R2.3** | In main page “Search” button can be clicked by user |
| **R2.4** | In main page, after user click “Search” button the graph or appropriate result is generated on result panel. |
| **R2.5** | In main page, “Reset” button can be clicked by user |
| **R2.6** | In main page, by clicking “Reset” button clear or reset the input data such as ‘Start date’, ‘End date’ and check box. |
| **R2.7** | In main page, Navigation bar present on the left side of Main page. |
| **R2.8** | In the main page the colour of ‘Main’ button in navigation bar changed. |
| **R3.1** | By pressing ‘Distribution of cases in each offence code’ button user can move to that page. |
| **R3.2** | By pressing ‘Radar or Camera’ on navigation bar user can move to that page. |
| **R3.3** | By pressing ‘Mobile Phone Usage’ on navigation bar user can move to that page. |
| **R3.4** | By pressing ‘School Zone’ from navigation bar user can move to that page. |
| **R3.5** | If user access to ‘Distribution of cases in each offence code’ page the colour of ‘Distribution of cases in each offence code’ button in navigation bar will be changed. |
| **R3.6** | If user access to ‘Radar or Camera’ page the colour of ‘Radar or Camera’ button in navigation bar will be changed. |
| **R3.7** | If user access to ‘Mobile Phone Usage’ page the colour of ‘Mobile Phone Usage’ button in navigation bar will be changed. |
| **R3.8** | If user access to ‘School Zone’ page the colour of ‘School Zone’ button in navigation bar will be changed. |
| **R4.1** | ‘Distribution of cases in each offence code’ page present calendar to select start date and end date. |
| **R4.2** | In ‘Distribution of cases in each offence code’ page, “School Zone” check box should be able to check or uncheck the checkbox. |
| **R4.3** | In ‘Distribution of cases in each offence code’ page, “Search” button can be clicked by user |
| **R4.4** | In ‘Distribution of cases in each offence code’ page, after user click “Search” button the graph or appropriate result is generated on result panel. |
| **R4.5** | In ‘Distribution of cases in each offence code’ page, “Reset” button can be clicked by user |
| **R4.6** | In ‘Distribution of cases in each offence code’ page, by clicking “Reset” button clear or reset the input data such as ‘Start date’, ‘End date’ and check box. |
| **R4.7** | In ‘Distribution of cases in each offence code’ page, navigation bar present on the left side of Main page. |
| **R5.1** | ‘Radar or Camera’ page present calendar to select start date and end date. |
| **R5.2** | In ‘Radar or Camera’ page, “School Zone” check box should be able to check or uncheck the checkbox. |
| **R5.3** | In ‘Radar or Camera’ page, “Search” button can be clicked by user |
| **R5.4** | In ‘Radar or Camera’ page, after user click “Search” button the graph or appropriate result is generated on result panel. |
| **R5.5** | In ‘Radar or Camera’ page, “Reset” button can be clicked by user |
| **R5.6** | In ‘Radar or Camera’ page, by clicking “Reset” button clear or reset the input data such as ‘Start date’, ‘End date’ and check box. |
| **R5.7** | In ‘Radar or Camera’ page, Navigation bar present on the left side of Main page. |
| **R6.1** | ‘Mobile Phone Usage’ page, present calendar to select start date and end date. |
| **R6.2** | In ‘Mobile Phone Usage’ page, “School Zone” check box should be able to check or uncheck the checkbox. |
| **R6.3** | In ‘Mobile Phone Usage’ page, “Search” button can be clicked by user |
| **R6.4** | In ‘Mobile Phone Usage’ page, after user click “Search” button the graph or appropriate result is generated on result panel. |
| **R6.5** | In ‘Mobile Phone Usage’ page, “Reset” button can be clicked by user |
| **R6.6** | In ‘Mobile Phone Usage’ page, by clicking “Reset” button clear or reset the input data such as ‘Start date’, ‘End date’ and check box. |
| **R6.7** | In ‘Mobile Phone Usage’ page, navigation bar present on the left side of Main page. |
| **R7.1** | ‘School Zone’ page, present calendar to select start date and end date. |
| **R7.2** | In School Zone’ page, “School Zone” check box should be able to check or uncheck the checkbox. |
| **R7.3** | In ‘School Zone’ page, “Search” button can be clicked by user |
| **R7.4** | In School Zone’ page, after user click “Search” button the graph or appropriate result is generated on result panel. |
| **R7.5** | In ‘School Zone’ page, “Reset” button can be clicked by user |
| **R7.6** | In ‘School Zone’ page, by clicking “Reset” button clear or reset the input data such as ‘Start date’, ‘End date’ and check box. |
| **R7.7** | In ‘School Zone’ page, navigation bar present on the left side of Main page. |

## Use Cases & Use Case Diagrams



# Software Design and System Components

## Software Design



## System Components

### Functions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | **Applied page** | **Input Value(type)** | **Output(return)**  **Value(type)** | **Concept of function** |
| **Get\_Start\_Date** | Main Page, Offence Code,  Radar or Camera,  Mobile Phone,  School Zone | Choose the date from calendar that creates by ‘tkcalendar’ | Start\_date (date) | User can choose the date from pop up calendar. |
| **Get\_End\_Date** | Main Page, Offence Code,  Radar or Camera,  Mobile Phone,  School Zone | Choose the date from calendar that creates by ‘tkcalendar’ | End\_date (date) | User can click end date button then calendar will pop up and user can choose end date from calendar. |
| **Submit\_button** | Main Page, Offence Code,  Radar or Camera,  Mobile Phone,  School Zone | Start\_date (date)  End\_date(date)  School\_zone(Boolean)<- not apply for School Zone page | Result(dictionary) | If user click submit button the function will get all the input value (start, end,schoolzone)  And return the list. The list will be used for generate graph. |
| **Generate\_bar\_graph** | Mobile Phone, School Zone | Result(dictionary) | Present bar Graph (graph.show()) | By using matplotlib.pyplot we input Result from Submit\_button function which is dictionary  dictionary as input and get graph as output. |
| **Generate\_line\_graph** | Radar or Camera | Result(dictionary) | Present line Graph | Input the Result from Submit\_button function and generate line graph as output. |
| **Generate\_pie\_chart** | Offence code | Result(dictionary) | Present pie chart | Input the Result from Submit\_button function and generate pie graph as output. |
| **Show\_all\_data** | Main Page | Result(dictionary) | Present all data in table. | Input Result dictionary from Submit\_button function and generate table that contain all of the raw data. |
| **Reset** | Main Page, Offence Code,  Radar or Camera,  Mobile Phone,  School Zone |  | Set the value of Start\_date,End\_date, School\_zone value as null. | Once the user click the button Reset function activate and reset the input value. |

### Data Structures / Data Sources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of Data | Type of Structure | Description of where and how it used | List of data members and what each one is for do | List of functions that use it |
| Result | Dictionary | The search result retrieved as list and will be used for generate graph | Offence\_Month->(date)when the offence happened, Offence\_Code(string)->what is the offence type,,  Offence\_Name(string)->what is the name of the offence | Submit\_button  Generate\_bar\_graph()  Generate\_pie\_chart()  Generate\_line\_graph()  Show\_all\_data() |
| Input | list | The condition that user entered will be combine as list and be putted in search function | Start\_date(date)-> input for set start date.  End\_date(date)-> input for set end date.  School\_Zone(Boolean)-> input for set whether the user searches only school zone information or not. | Submit\_button()  Reset() |
| Start\_date | date | Get the start date from the start date calendar. | Start\_date(date)-> use it to set the start date. | Get\_Start\_Date() |
| End\_date | date | Get the end date from the end date calendar. | End\_date(date)-> use it to set the end date. | Get\_End\_Date() |

### Detailed Design

Pseudocode for all non-standard / non-trivial algorithms that operate on data structures

Firstly create a table for the data provided from the database.

* create table NSW\_Traffic\_Penalty
* column-date datatype [date]
* column-description datatype [string]
* column-amount datatype [float]
* column-location datatype [string]

Insert data from database into table.

* INSERT INTO NSW\_Traffic\_Penalty [Offence(date, description, amount, location)]

e.g.

|  |  |  |  |
| --- | --- | --- | --- |
| date | description | amount | location |
| 01/09/2012 | Exceed speed limit over 20km/h - Camera Detected | 417 | Mate Street North Albury Northbound |
| 01/03/2012 | Larceny (Under 300 dollar) | 117 |  |
| 01/05/2012 | P1 driver exceed 90km/h - over 20 km/h - Radar | 371 |  |
| 01/02/2013 | Fail to surrender number-plate to Authority | 99 |  |

To query the table for all offences before a specific date.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE date < ‘06-jul-2013’;”

This will show all the offences before the 6th of July 2013.

To query the table for offences that were fined within a specific dollar amount range.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE amount > 99 AND < 401;”

This will show all the offences that were fined from $100-$400.

To query the table for all offences in a specific location.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE location = ‘Mate Street’;”

This will show all offences that occurred on Mate Street.

To query the table for penalties that occur between a start and end date.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE date BETWEEN CONVERT(DATE,’Start\_Date’) AND CONVERT(DATE,’End\_Date’)’;”

This will generate all of the Penalty that caused between start date and end date.

To query the table for offences showing mobile phone usage.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE OFFENCE\_CODE =’65013’;”

This will generate Mobile phone usage penalty only.

To query the table for offences that occurred in school zones.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE SCHOOL\_ZONE\_IND=’Y’;”

This will generate the penalty that happens in the school zone.

To query the table for offences that were caught by camera.

* “SELECT \* FROM NSW\_Traffic\_Penalty WHERE CAMERA\_IND =Y;”

This will generate a penalty that is caught by camera.

To show the whole table.

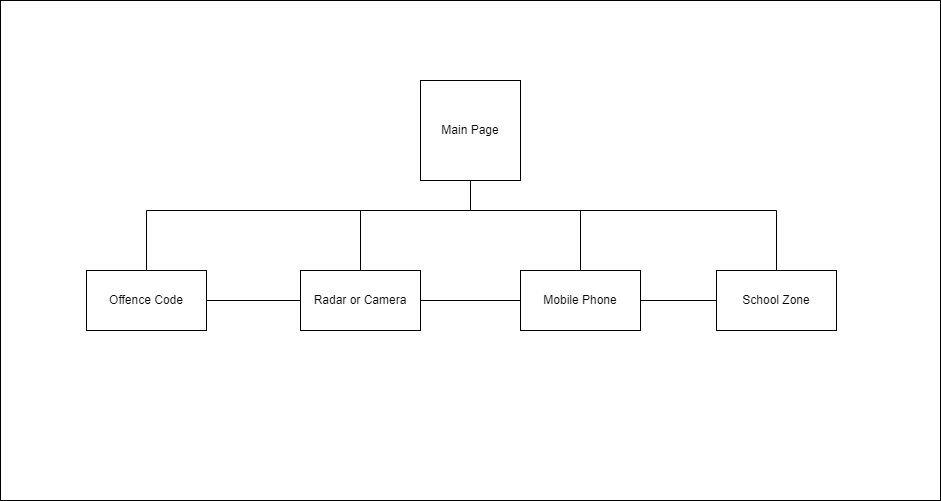
* “SELECT \* FROM NSW\_Traffic\_Penalty;”

This will generate all of the penalties.

# User Interface Design

# Structural Design

## Structure of Product (Hierarchy Chart)



**Figure 2 - Hierarchy of NTPT**

First of all, when the user executes the program, they will be able to see the main page. In the main page user can select the period on the top of the page. Once the user completes the input period, the user can search the data during that period by clicking the ‘Search’ button. User can reset the data by clicking the ‘Reset’ button that is located next to the search button. By default, the main page will display all of the data as a table. Users can move to another page by using a vertical navigation bar located on the right side of the page. According to the current page the colour of that page on the nav bar will be changed, so the user can easily recognize what page they are looking at.

All cases captured by radar or camera page, Cases caused by mobile phone usage page, Penalty caused in School Zone page and Distribution of Cases in each offence code page will show distribution of offence code as graph. The same as the main page user can select a period and by clicking the ‘Search’ button user can search the distribution of cases in the selected period. Users can press the ‘Reset’ button to reset the value of period. If there is no period selected the page will present a distribution of cases from oldest to latest data with graphs. By ticking ‘School Zone’ check box users can only find the case from the school zone during the selected period. As same as other pages this page also has a nav bar that can help users to move to other pages.

Each page will have the appropriate type of graph.

## Visual Design

## Main Page

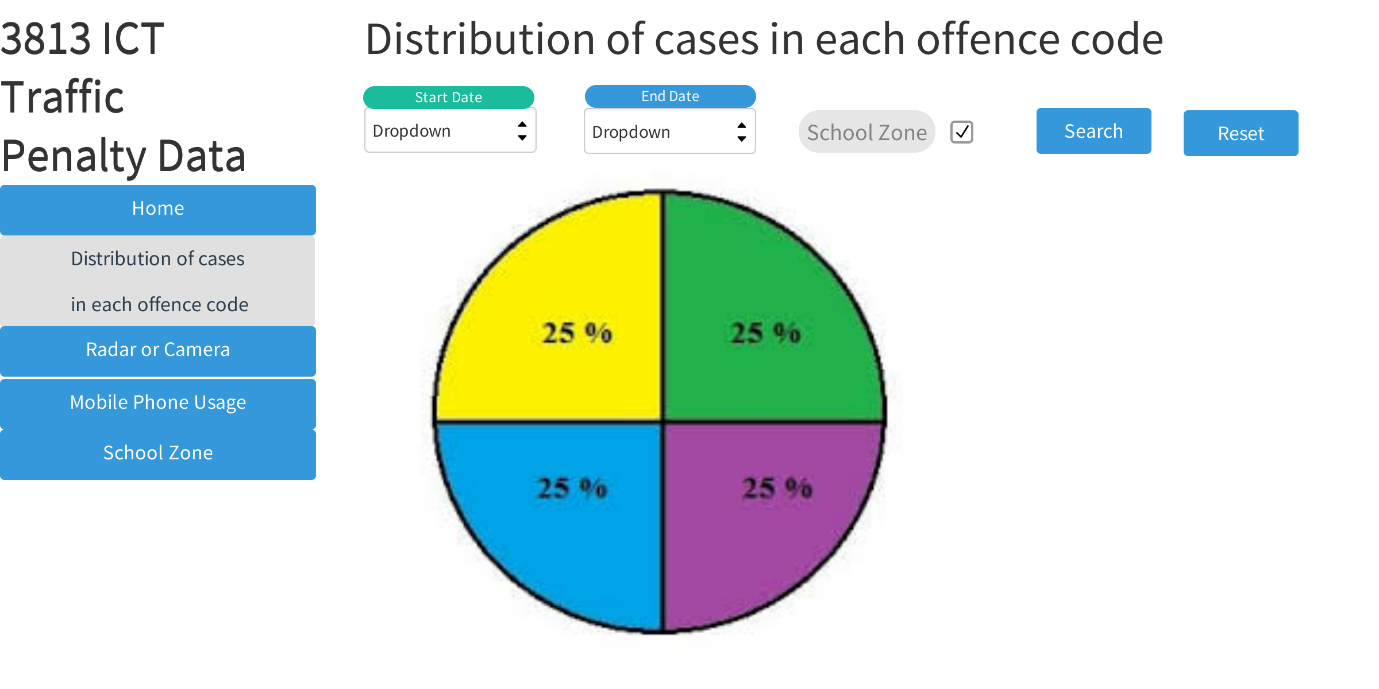
테이블이(가) 표시된 사진

자동 생성된 설명

**Figure 3 - Main Page of NTPT**

This is main page that user will face firstly. User can select start date and end date to choose period and checkbox “School Zone” will decide whether the user going to contain penalty data happened in school zone. When the user entered and if there is no condition then all of the data will be displayed by default. Once the user input conditions such as date and school zone and click search button then appropriate data will be displayed.

## Distribution of Cases in each offence code

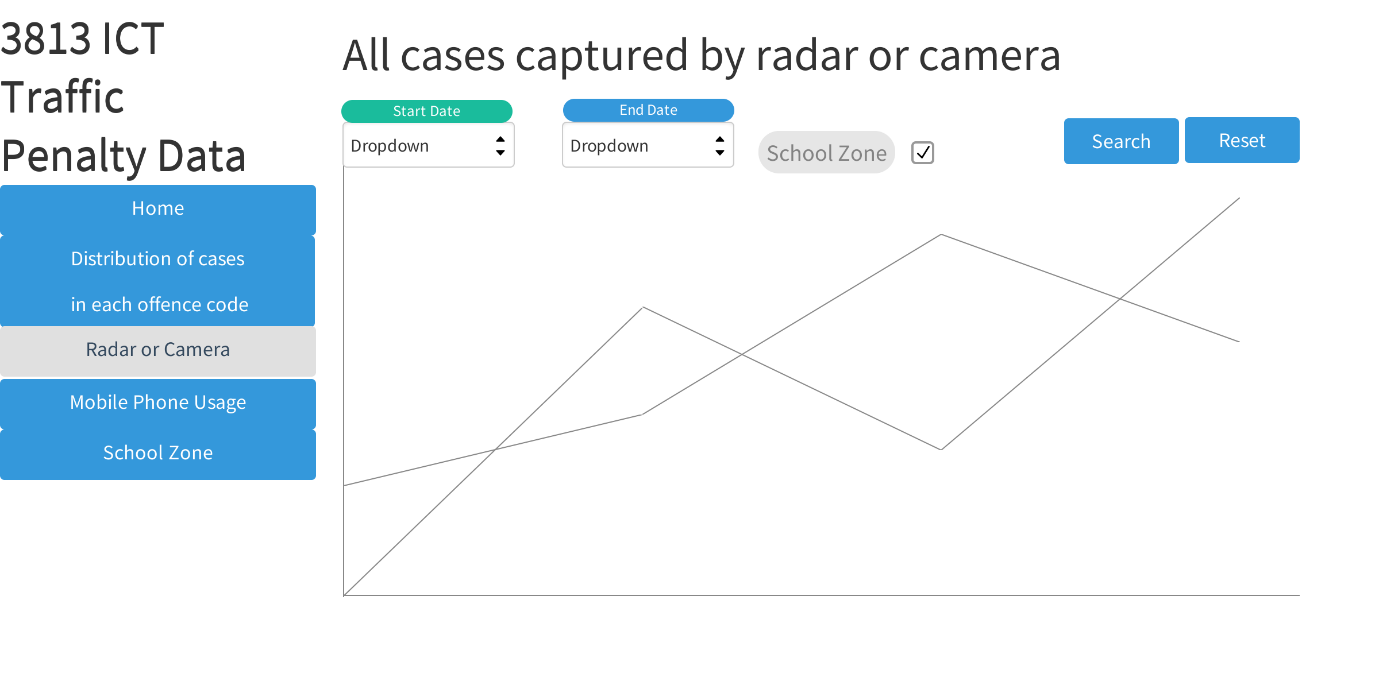


**Figure 4 - Distribution of Cases Page**

In navigation bar located in left side of the page the “Distribution of cases in each offence code” changed into grey background and black font-colour because the user looking at that page. User can select Start date and end date to select period and also can click school zone condition by ticking the checkbox. After all the conditions are decided, the user can click the “Search” button to present the graph or click “reset” to clear the condition.

User can move to another page by using the navigation bar which is located on the left side of the page.

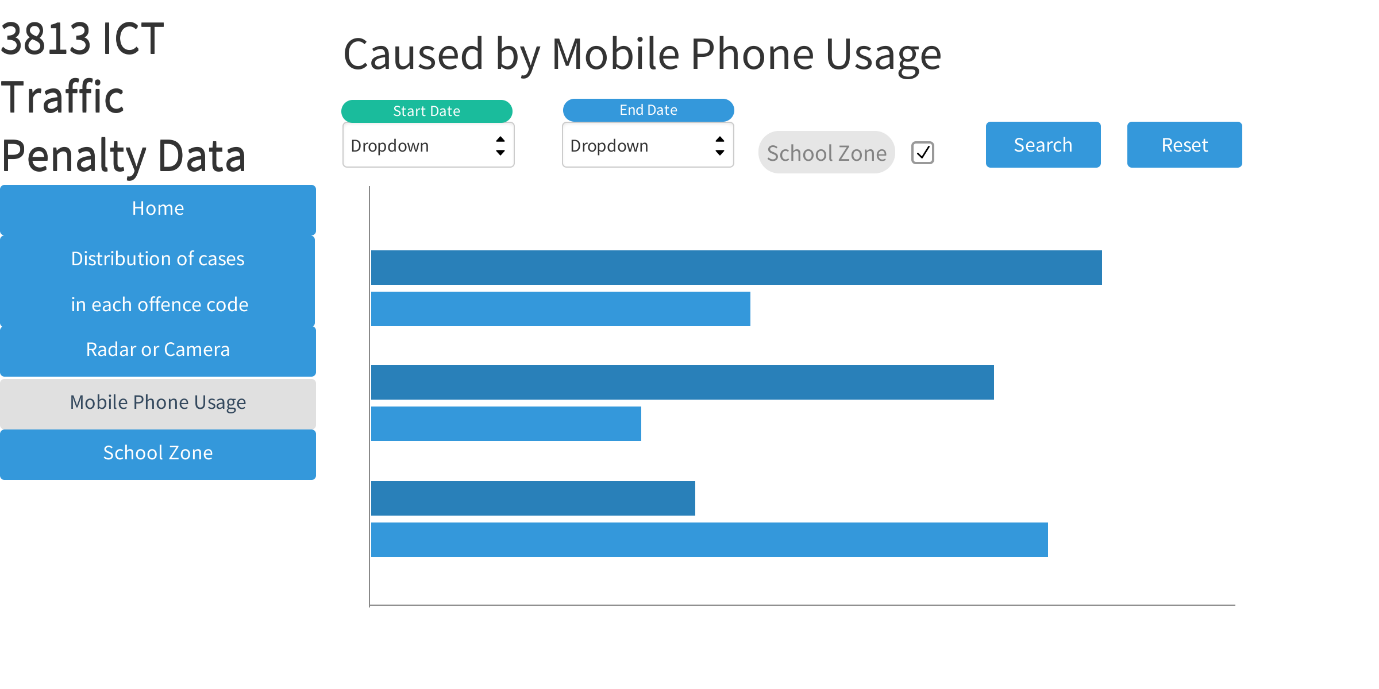
## All cases captured by radar or camera



**Figure 5 - Captured by Radar or Camera Page**

If User clicks the start date the calendar will be displayed and the user can select the date or they can input the date “DD-MM-YY” form, which also applies for the end date. In addition, users can tick the school zone box so they can search only the cases captured by radar or camera in the school zone. After the user chooses both start date, end date and school zone, user can click search to see the graph or click reset to reset the data.

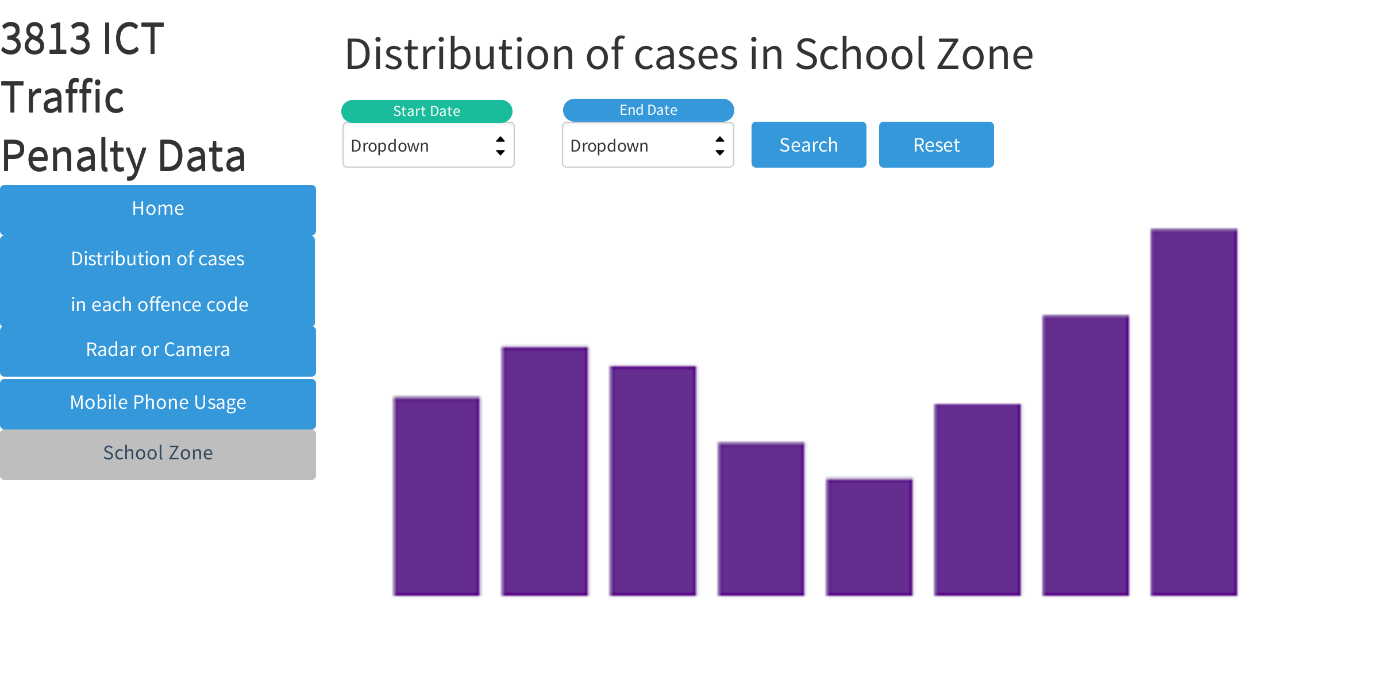
## Cases caused by mobile phone usage



**Figure 6 - Mobile Phone Usage Page**

User can set periods by using start date and end date at the top of the page. User also can only see the data that happens in the school zone by ticking the school zone check box. After all the conditions have been made, the user can click the search button to see the data about selected conditions. If the user wants to clear all the conditions, then the user needs to click the reset button.

## Penalty caused in School Zone



**Figure 7 - School Zone Page**

In this page user can select a period by choosing start date and end date. If the user clicks the search button after the user sets the period, then the cases in the school zone during the selected period will be displayed as a bar graph. After that, user can click the reset button to clear the period and can set another period. As same as other pages, users can go to another page using a navigation bar that locate the left side of the page.

# Reference

1. Australian Bureau of Statistics. (28/06/2022). National, state and territory population

https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release