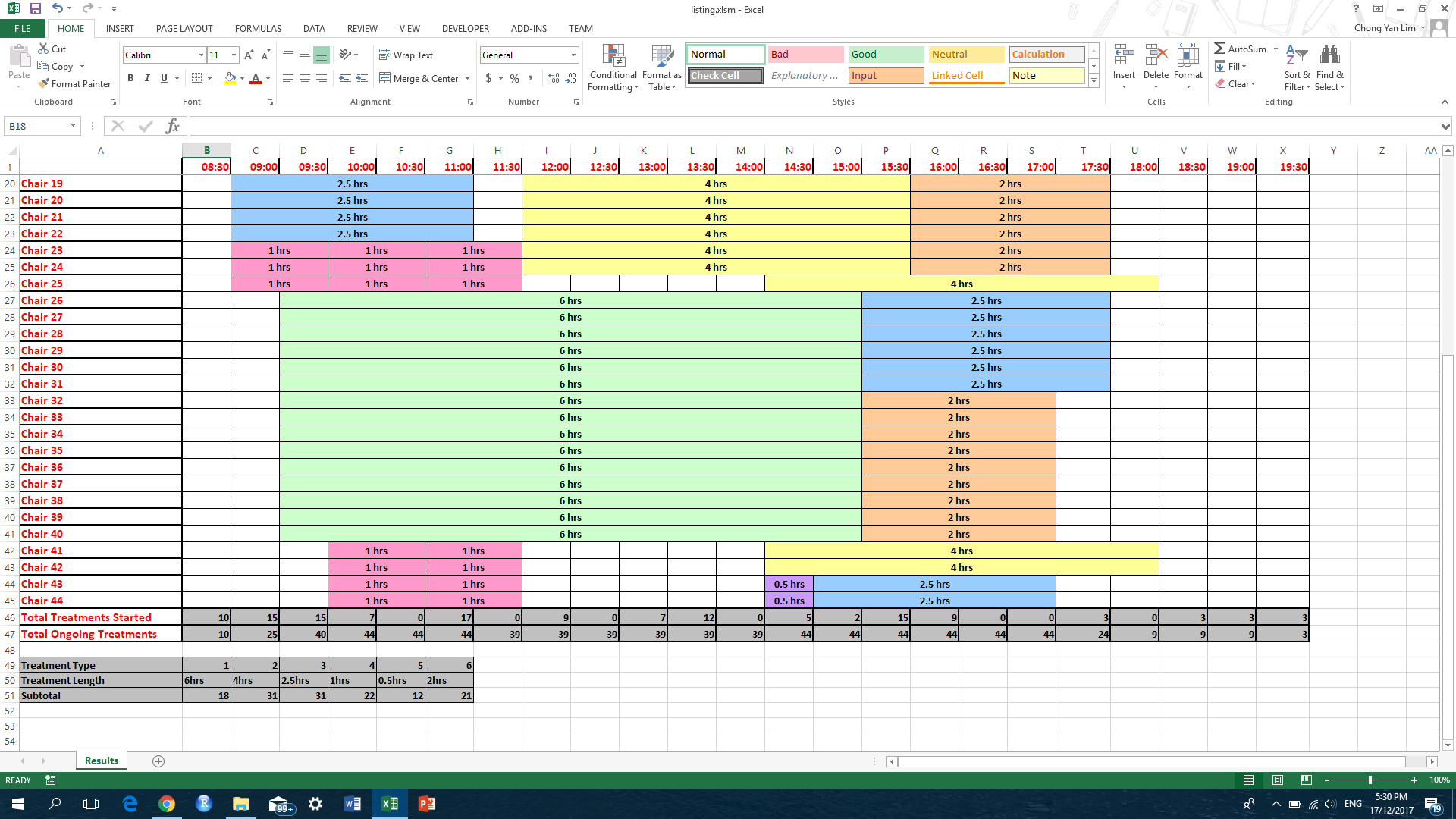
**Chemotherapy Scheduler & Optimiser**

1. Structure and Basic Information of Program

*Simple diagram to be inserted*

This program is coded in Java, and should be compatible with all devices in general which has Java Development Kit (JDK) v1.8.0 and above. It makes use of IBM ILOG CPLEX, an industrial standard optimisation engine to generate the optimal number of treatments for each treatment type. To be exact, CPLEX Community Version 12.7 was used. It also makes use of JACOB, an open source package which allows interaction between the Java based program and Microsoft Excel.

The program operates by first reading input from a Comma Separated Variable (.csv) file. The variables which this input file requires will be explained in Section 2. The bulk of processing will be handled in the program, which makes use of CPLEX’s solver engine to generate a matrix which contains the optimal treatment allocation for the input variables given. The program then automatically calls a Microsoft Excel file to generate the output in a tabular format as shown below. This result is automatically saved in a file called *listing.xlsm*, which can be found in the same folder as the program.



1. Input Variables

The following table contains the list of input variables which the user is expected to provide. These variables will be stored in a file *input.csv*.

|  |  |
| --- | --- |
| **Variable Name** | **Details** |
| Number of Types of Treatment | An integer input, indicating how many types of treatment lengths are there. Treatments with the same length are considered as one treatment. |
| Length of Each Treatment | An array of integer inputs. Size of array should be consistent with number of types of treatments. Each integer input should represent the number of time slots which will be occupied.  By default, each time slot represents half an hour. Hence a 6 hours treatment takes up 12 slots. |
| Ratios of Treatments | An array of floating (decimal) point inputs. Size of array should be consistent with number of types of treatments.  **Important:** The sum of all these ratios must sum to 1.0, otherwise the program will reject this input. |
| Allowable Error in Ratios | A floating (decimal) point input. For the program to function normally, this value should be kept between 0.01 and 0.05. This allows for some flexibility in the program towards scheduling treatments. |
| Maximum Number of Chairs | An integer input. This represents the maximum number of chairs available at the chemotherapy clinic. |
| Maximum Number of Cases per Nurse | A floating (decimal) point input. This represents the maximum number of cases (on average) that a nurse should oversee at any point in time. For example, inputting 3 means that each nurse should not be handling more than 3 patients at any point in time. |
| Number of Time Slots | An integer input. This represents the maximum operating hours of the clinic. Each time slot is by default half an hour long. For example, if the clinic is open from 10am to 10pm, then there should be 24 slots. |
| Manpower at each Time Slot | An array of floating (decimal) point inputs. Size of array should correspond to the number of time slots indicated.  This represents the number of nurses available at each time slot. |
| Number of Chairs Operating at each Time Slot | An array of integer inputs. Size of arrays should correspond to the number of time slots indicated.  This represents the number of chairs which are in operation at each particular time. |
| Number of Booked Treatments Last Month | An array of integer inputs. Size of array should correspond to the number of treatment types indicated.  This represents the total number of bookings which were made in the previous time period (does not have to be a one month period). |
| Number of No-Shows Last Month | An array of integer inputs. Size of array should correspond to the number of treatment types indicated.  This represents the total number of bookings which were cancelled AND bookings for which the patient did not come. The time period does not have to be a month, but should correspond to the time period for which the total number of bookings were collected. |
| No-Show Factor | A floating point (decimal) input. This number is a tuning factor. A value of 0 means that the number of treatments allocated will NOT be affected by the percentage of no-shows. Meanwhile, a greater value will encourage the treatment allocations to be more dependent on the percentages of no-shows. |