Component specification

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Software components. High level description of the software components such as: *data manager*, which provides a simplified interface to your data and provides application specific features (e.g., querying data subsets); and *visualization manager*, which displays data frames as a plot. Describe at least 3 components specifying: what it does, inputs it requires, and outputs it provides.

1. **theoretical_photokinetics()**
    a. **Purpose:** Calculates theoretical photouncaging values using the following first order kinetic equation for photouncaging:
    $$\boldsymbol{Y = Y_o + (plateau - Y_o)(1 - \exp(-k * x))}$$
    b. **Input:**
        i. Array of x values separated by commas.
        ii. Photokinetic constant, k
    c. **Output:**
        i. Table of x and corresponding y values (normalized to 1)
        ii. Scatter plot of theoretical data

2. **exp_association()**
    a. **Purpose:** Calculates the photouncaging constant k using the first order equation from above using raw data inputted from user as an excel file. It uses scipy.optimize.curve_fit to calculate the k value.
    b. **Input:**
        i. Excel file uploaded into Colaboratory folder, titled example_2 formatted such that the first column is labelled time and has all the time values and the corresponding y values titles labelled value
    c. **Output:**
        i. Table of x and y values
        ii. Kinetic constant
        iii. Data normalized and plotted in a scatter plot
3. **cell_migration()**
    a. **Purpose:** Simulates cell migration using a stochastic agent based model designed by Fadai et al. 2019.
        i. **Input: V,rm,rp,rd,tf,C_start,C_end,rhox**
        ii. **Output:** Matrix consisting of cell location using a heat map, where white equates to occupancy by a cell and black equates to an empty compartment
4. **Interactions to accomplish use cases**. Describe how the above software components interact to accomplish at least one of your use cases.
    a. **Use case: For calculating theoretical photokinetics,** after the user has entered the desired x values and photokinetic constant, the user should select "run" on the cell and the values will be outputted.
    b. **Use case: For calculating a kinetic constant from raw data,** after uploading the **excel file,** the user should run the cell, k value will be calculated. It will call a check_excel() function to verify that the excel file is in the correct format. If it is

not, then it will return an error to the user and description of proper excel file format. Display() will call exp_association() which returns the equation used to calculate the kinetic constant.

c. **Use case: For modeling cell migration,** the user will input the various parameter values from a slider tool using Colab Forms. Cell_migration() will call on check_param() function to verify that all values are within a given range. If they are not, an error will be returned to the user.

5. **Preliminary plan**.
    a. Run check functions for inputs from users to verify inputs are correct format
        i. Fix errors
    b. Update output from cell_migration() to make it more user friendly/understandable