Graphical User Interface for Data Visualization and Analysis of Material Mechanics
User Manual
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General Launching & Setup Guidelines

For **Mac OS X+**:
1. Download from dropbox
2. Open DVaCGUI.zip
3. Open DVaCGUI.app to launch the software
    a. May need to allow authorization for opening software off open web

For **Windows 10 OS+**:
1. Download from dropbox
2. Download** PyCharm professional:
    https://www.jetbrains.com/pycharm/download/#section=windows
    a. Activate free educational license through academic institution for unlimited usage
3. Click *File*, then *New Project*
4. Select *Pure Python*
5. Name the file DataVisualizationAndCalculationGUI and specify a directory
6. Select the following information for *Project Interpreter*:
    a. New environment using: Virtualenv
    b. Base interpreter: Python 3.8.3
7. Click *Create*
8. Right click the folder that has the name of the file
9. Hover *New*
10. Click *Python File*
11. Name it *main*, hit enter/return on keyboard (creates main.py file)
12. Open DVaCGUI.py to open script that contains code
13. Copy code from DVACGUI.py and paste to main.py
14. Open *PyCharm Preferences*
15. Select *Project: DataVisualizationAndCalculationGUI*
16. Select *Project Interpreter*
17. Click the + (install) button
18. For each of the following below: search*, select, click *Install Package*
    a. matplotlib
        i. Version: 3.3.1
    b. pandas
        i. Version: 1.1.0
    c. numpy

i.　Version: 1.19.1
　　　d.　scipy
　　　　　i.　Version: 1.5.2
19. Once all packages added to *Project Interpreter,* click *OK.*
20. Right click the file main.py and select *Run* to launch the software.

Note: if the package does not show up when searching, the user does not have the package installed. To install the package, go to the Windows terminal and pip3 install the missing package.

**Note:* no access to Windows 10 OS computer, so could not create a simple .exe file similar to how for the Mac OS X version just requires opening an application, hence the long process on Windows 10 OS.*

General Usage Guidelines

1. After launching software, the DVaC GUI window appears
2. Upload .csv files to GUI through *Choose Select File*
　　a. Maximum of 26 .csv files (including files parsed into multiple .csv files)
3. If the .csv file is cycle data, parse one of four ways:
　　a. *Displacement controlled*
　　b. *Arbitrary displacement peaks*
　　c. *Load controlled*
　　d. *Arbitrary load peaks*
4. For each .csv file, can click *CSV File + .csv file #* to open Data Calculations window
5. The windows are:
　　a. Main window: CSV Interface (where steps 1-4 occur)
　　b. Secondary window: Data Calculation
　　c. Tertiary window: Statistics Interface
　　d. Quaternary window: Weibull Distributions Interface

In **Data Calculation** window:
1. Choose raw data to plot with *Select Abscissa* and *Select Ordinate* drop-downs
2. For all calculations, in numeric input areas, hit enter/return on keyboard after you input a value for the program to register the value
3. After a calculation is completed, click *Refresh Options* to update drop-down menus for graphing as well as display output values and information
4. If a calculation cannot be done, a pop-up window appears that outlines what may be missing such that the calculation cannot be done.
5. Available calculations:
　　a. Engineering stress-strain
　　b. True stress-strain

c. Young's modulus (slope method)
   d. Young's modulus (CSM method)
   e. Sneddon's correction to Young's modulus (CSM method)
   f. Ultimate failure stress-strain
   g. Energy dissipated
   h. Burst events
     i. # of bursts
     ii. Lower & upper bound stress-strain of bursts
     iii. Size of bursts (strain range)

6. Change domain and range of plot, then click *Refresh Options* to update graph
7. Export graph as .svg file
  a. Name of .svg file is y-axis + units vs. x-axis + units
8. Do not dismiss Data Calculation window for update main DVaC GUI window functionality

In **CSV Interface** window:
1. Choose same data for each *Select Abscissa* and *Select Ordinate* of each .csv file
2. Click *Plot All* to display all plots onto the same graph
3. If Data Calculation windows are open and calculations have been done using them for the .csv files, click *Refresh Plot-able Options* to update *Select Abscissa* and *Select Ordinate* drop-downs with calculated data
4. Change domain and range of plot, then click *Refresh Plot-able Options* to update graph
5. Export graph as a .svg file
  a. Name of .svg file is y-axis + units vs. x-axis + units

Output of **Statistics Interface** window:
1. For all 8 data calculation algorithms, statistics interface stores each calculation for every uploaded data file.
2. The statistics interface calculates and displays the mean, median, standard deviation, variance, interquartile range, and outliers for the distribution of calculated data.
3. The statistics interface also displays boxplots for visualization of each mode of statistics calculated.

Output of **Weibull Distribution** window:
1. Graphical plot with 4 axes
  a. 1st X-axis: ln Stress
  b. 1st Y-axis: ln ln (1 / (1 - Probability of Fracture))
  c. 2nd X-axis: Fracture Stress (typically MPa)
  d. 2nd Y-axis: Probability of Fracture (%)
2. Displays both the weibull modulus and characteristic strength calculated from a linear regression analysis of the graphical plot.

3. Note that the weibull distribution does not account for minimum stressed below which the test specimen will not break. This can be included in the algorithm in the future but would require statistical confidence analysis.