**Initial Prompt by LHQ:**

I want to have a PD (Partial Discharge) dataset editing application (PDDEA). This PDDEA display the PD dataset and enable the modification of the dataset and save the result into selected folder with original filenames affixed with “\_E”.

A PD Dataset has two .csv files, prpd.csv and waveform.csv, where ‘prpd’ and ‘waveform” are generally representing the filenames of a PD Dataset. The specific PD Dataset filenames may be different, but always one file for prpd, another for waveform.

‘waveform.csv’ contains m lines, with each line representing a PD pulse waveform with n samples. This means that each line has n numbers.

‘prpd.csv’ contains 2 lines. Each line has m numbers. The first line represent the m peaks of m waveforms in in waveform.csv. That is, the 1st number of 1st line in prpd.csv is the peak of 1st waveform in waveform.csv; the 2nd number of the 1st line in prpd.csv is the peak of 2nd waveform in waveform.csv; …, and the last number of 1st line in prpd.csv is the peak of the last waveform in waveform.csv.

The second line in prpd.csv is the phase information of each waveform in waveform.csv. the phase information or phase-angle, fall between 0 and 360. So the m values of the second line of prpd.csv fall in (0, 360).

As for the PDDEA, I plan to do it in the way described below.

1. A GUI to show the prpd pattern, waveforms and other features.

2. On the 1st row, there are 3 text boxes or labels and three butons of ‘Open’, ‘Save’ and ‘Exit’. 3 text boxes/labels will show the cursor position in GUI and the serial number of currently focused waveform and buttons will control the operations of the PDDEA. The first text box/label is called ‘X’ and the second text box/label is called ‘Y’. the third text box/label is called ‘SN’ and will show the serial number of currently focused waveform. These will be further described later.

3. On the 2nd row from top, there are two graph panes (plots). The left one is called ‘prpd’ and the right one is called ‘waveform’. Both panes have width of 720 pixels and height of 480 pixels.

4. When the ‘Open’ button is clicked, a file selection dialog will appear for select two files (prpd.csv and waveform.csv) . when the two files are selected and open button on the dialog is clicked, the program will read the prpd.csv and waveform.csv into numpy arrays prpd[2:m] (2 row and m column) and waveform[m:n] (m row and n column).

5. For ‘prpd’ pane each (peak, phase-angle) pair will be scatter-plotted as a round dot with phase-angle being horizontal coordinates and peak being vertical coordinates. The vertical scale of ‘prpd’ pane ranges (-peak\_max, +peak\_max), where peak\_max=max(abs(waveform[m:n]). When mouse cursor is hovering on ‘prpd’ pane, the vertical coordinate of the cursor position (using the ‘prpd’ pane scale) is shown in the ‘Y’ text box/label, and the horizontal coordinate of the cursor position (using the ‘prpd’ pane scale) is shown in the ‘X’ text box/label. When the left click is done on a prpd dot, a small circle will be drawn surround that prpd dot to indicate that the currently focused prpd dot is this circled one. The index of this prpd dot will be the serial number of the currently focused waveform ‘SN’. Initially the ‘SN’ will be 0, meaning the first waveform and the first pair of (peak, phase-angle). So initially the prpd dot of the first (peak, phase-angle) will be circled.

6. For ‘waveform’ pane, the vertical coordinate is scaled to (-peak\_max, +peak\_max) as well. The index of samples of the waveform (0, n-1) will be used as the horizontal coordinates and will be scaled to 720 pixels. Initially the waveform with ‘SN’=0 will be scatter-plotted ‘waveform’ pane. Afterwards, when a new prpd dot is selected, the ‘SN’ will be updated to the new currently focused waveform and the corresponding waveform will be updated to ‘waveform’ pane.

7. When ‘Exit’ button is clicked. The PDDEA will end.

8. The more detailed instruction will be given when the above is realized.

**Improved Prompt by discussion with ChatGPT:**

Certainly! Here's your revised prompt with some minor adjustments for clarity and consistency:

**Objective:**

Develop a **Partial Discharge Dataset Editing Application (PDDEA)** in Python. This application will display PD datasets, enable modifications, and save the results into a selected folder with the original filenames appended with "\_E".

**PD Dataset Structure:**

Each PD dataset consists of two CSV files:

1. **PRPD File (prpd.csv)**: Contains phase-resolved partial discharge data.
2. **Waveform File (waveform.csv)**: Contains waveform data.

*Note:* The actual filenames may vary, but there will always be one file for PRPD data and one for waveform data.

**File Contents:**

* **waveform.csv:**
  + Contains **m** lines (rows), each representing a PD pulse waveform.
  + Each line has **n** samples (columns), meaning the file represents a 2D array of shape **(m, n)**.
* **prpd.csv:**
  + Contains **2** lines (rows), each with **m** numbers (columns), resulting in a 2D array of shape **(2, m)**.
    - **First Line:** Represents the peaks of the **m** waveforms in waveform.csv.
      * The **ith** number corresponds to the peak of the **ith** waveform in waveform.csv.
    - **Second Line:** Represents the phase angles of each waveform, values ranging from **0 to 360 degrees**.
      * The **ith** number corresponds to the phase angle of the **ith** waveform in waveform.csv.

**PDDEA Design:**

1. **Graphical User Interface (GUI):**
   * Displays the PRPD pattern, individual waveforms, and other features.
2. **Top Row Components:**
   * **Text Boxes/Labels:**
     + **X:** Displays the horizontal coordinate of the cursor within the GUI (Left Pane or "prpd" pane).
     + **Y:** Displays the vertical coordinate of the cursor within the GUI (Left Pane or "prpd" pane).
     + **SN (Serial Number):** Shows the index of the currently focused waveform.
   * **Buttons:**
     + **Open:** Opens a dialog to select the prpd.csv and waveform.csv files.
     + **Save:** Saves the modified dataset.
     + **Exit:** Closes the application.
3. **Second Row Components:**
   * **Graph Panes:**
     + **Left Pane ("prpd"):** Displays the PRPD pattern.
     + **Right Pane ("waveform"):** Displays the waveform corresponding to the selected **SN**.
   * **Dimensions:** Both panes have a width of **720 pixels** and a height of **480 pixels**.
4. **File Loading Mechanism:**
   * Clicking the **Open** button opens a file selection dialog to choose the prpd.csv and waveform.csv files.
   * Upon selection, the program reads:
     + **PRPD Data:** Loaded into a NumPy array prpd of shape **(2, m)**.
     + **Waveform Data:** Loaded into a NumPy array waveform of shape **(m, n)**.
5. **PRPD Pane Functionality:**
   * **Data Plotting:**
     + Plots each (phase angle, peak) pair as a dot.
     + **Horizontal Axis:** Phase angles (0 to 360 degrees).
     + **Vertical Axis:** Peaks, scaled between **-peak\_max** and **+peak\_max**, where:

peak\_max=max⁡(∣waveform∣)peak\\_max = \max\left( \left| \text{waveform} \right| \right)peak\_max=max(∣waveform∣)

* + **Cursor Interaction:**
    - When hovering over the PRPD pane, the cursor's coordinates are displayed in the **X** and **Y** text boxes.
  + **Selection Mechanism:**
    - Left-clicking a dot:
      * Highlights it with a small circle.
      * Updates **SN** to the selected waveform's index.
      * Updates the waveform displayed in the waveform pane.
  + **Initial State:**
    - **SN** is set to **0** by default.
    - The first (phase angle, peak) dot is circled initially.

1. **Waveform Pane Functionality:**
   * **Data Plotting:**
     + Displays the waveform corresponding to the current **SN**.
     + **Horizontal Axis:** Sample indices from **0** to **(n - 1)**, scaled to **720 pixels**.
     + **Vertical Axis:** Amplitude, scaled between **-peak\_max** and **+peak\_max**.
   * **Dynamic Updates:**
     + The waveform updates when a new dot is selected in the PRPD pane.
2. **Exit Mechanism:**
   * Clicking the **Exit** button closes the PDDEA.
3. **Future Enhancements:**
   * More detailed instructions and additional features will be provided once the above functionalities are implemented.

**Clarifications and Notes:**

* **Data Structures:**
  + Ensure that the NumPy arrays are correctly shaped:
    - prpd has shape **(2, m)**.
    - waveform has shape **(m, n)**.
* **Scaling Consistency:**
  + Both graph panes use **peak\_max** for vertical scaling to maintain consistency across the plots.
* **Interaction Logic:**
  + The **X** and **Y** labels reflect the cursor's position relative to the PRPD pane's coordinate system.
  + Selecting a dot in the PRPD pane synchronizes the display between both panes by updating the **SN** and the waveform.
* **Initial State:**
  + The application starts with the first waveform selected, providing a clear starting point for the user.

**Feedback and Suggestions:**

* **File Selection Dialog:**
  + **Clarify File Selection Process:** It might be helpful to specify whether both files are selected simultaneously or if the user selects them one after the other.
* **Error Handling:**
  + **Data Validation:** Include guidelines on how the application should handle invalid or mismatched data between prpd.csv and waveform.csv.
  + **User Notifications:** Outline how the application will inform the user of any issues during file loading or data processing.
* **Axis Labels and Units:**
  + **PRPD Pane:**
    - **Horizontal Axis:** Label as "Phase Angle (degrees)".
    - **Vertical Axis:** Label as "Peak Value".
  + **Waveform Pane:**
    - **Horizontal Axis:** Label as "Sample Index".
    - **Vertical Axis:** Label as "Amplitude".
* **Cursor Coordinates Display:**
  + **Units Clarification:** Ensure that the **X** and **Y** values displayed correspond to the data units (e.g., degrees and peak values) rather than pixel coordinates.
* **Save Functionality:**
  + **Modification Details:** Since modifications are part of the application's capabilities, consider specifying what types of edits users can perform (e.g., adjusting peaks, modifying phase angles, editing waveforms).
  + **Saving Mechanism:** Explain how the application handles saving changes—whether it overwrites the existing data or saves new files with the "\_E" suffix.
* **User Experience Enhancements:**
  + **Keyboard Shortcuts:** Implement shortcuts for common actions like opening files (Ctrl+O), saving (Ctrl+S), and exiting (Ctrl+Q).
  + **Tooltips:** Add tooltips to buttons and interactive elements to improve usability.
  + **Status Bar:** Include a status bar to display messages or updates about the application's state.
* **Future Considerations:**
  + **Scalability:** Plan for larger datasets by optimizing data loading and rendering processes.
  + **Customization:** Allow users to adjust plot settings, such as zooming or scaling options.

Please review these suggestions and let me know if there's any specific area you'd like to focus on or if you have additional requirements you'd like to include. A clear and detailed prompt will indeed help in developing an effective application.