Developer Guide: Statistical Significance Calculator Application

This guide provides detailed instructions for setting up, understanding, and extending the functionality of the Statistical Significance Calculator Application. The application leverages customtkinter for UI, scipy for statistical calculations, matplotlib and seaborn for graphing, and python-pptx for exporting graphs to PowerPoint.

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1. Install Requirements

Ensure the following dependencies are installed:

1. Required Python Modules:
    - customtkinter for the UI
    - tkinter for additional dialogs and utilities
    - scipy for statistical computations
    - matplotlib and seaborn for visualizations
    - pandas for data manipulation
    - python-pptx for PowerPoint slide generation
2. Install the dependencies:

    bash
    Copy code
    pip install customtkinter scipy matplotlib seaborn pandas python-pptx

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2. Overview

Purpose:

The application calculates the statistical significance between two populations' percentages and visualizes the results via a bar chart. Users can export results to PowerPoint slides.

Features:

- Input Validation: Ensures valid sample sizes and percentages.
- Significance Testing: Tests at confidence levels from 80% to 99%.
- Dynamic Bar Charts: Displays percentage comparisons with customization options (e.g., color).
- PowerPoint Export: Automatically generates a slide with results and charts.

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3. User interaction and flow through your code

Main Components

1. Import Statements
    - Handles imports for dependencies and provides error messages if required modules are missing.
2. Application Initialization (SignificanceCalculatorApp)
    - Sets up the main window using customtkinter.
    - Configures the application theme (dark-blue).
3. UI Creation (create_widgets)
    - Creates input fields for sample sizes and percentages.
    - Adds buttons for computation, reset, and exporting to PowerPoint.
    - Includes a frame for embedding graphs.
4. Input Validation (validate_input)
    - Ensures:
        - Sample sizes are integers.
        - Percentages are within the range of 0–100.
5. Statistical Calculations (calculate_significance)
    - Uses pooled proportions to calculate z-scores and p-values.
    - Determines significance levels iteratively (from 99% to 80%).
6. Graph Generation (update_graph)
    - Creates bar charts with matplotlib and seaborn.
    - Dynamically updates bar colors based on user selection.
    - Includes a significance level table and highlights the relevant row.
7. Export Functionality (export_to_powerpoint)
    - Saves results and the graph into a PowerPoint slide.
    - Allows users to append slides to an existing PowerPoint file or start a new one.

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4. Extending the Application

Add New Features:

- Confidence Intervals: Allow users to manually set confidence levels beyond the predefined ones.
- Custom Graph Types: Add support for pie charts or line graphs.
- Advanced Export Options: Allow exporting results as PDFs or Excel files.

Customize Design:

- Update customtkinter themes and color palettes to align with branding requirements.

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5. Troubleshooting

1. **Missing Modules**: Ensure all required modules are installed:

   bash
   Copy code
   pip install -r requirements.txt

2. **PowerPoint Export Issues**:
   - Ensure python-pptx is installed.
   - Verify that the pptx library is compatible with your PowerPoint version.
3. **Graph Display Errors**:
   - Confirm matplotlib and seaborn are properly installed.
   - Reset the plot.png file if errors occur during chart generation.

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6. Future work

1. Increase the level of customization allowed by the end user in the graphing output.
2. Move over to a more flexible UI language that allows for more control of the power point export to enable customization of the charts in the export. For now thinking this will be PyQt5.

This should help you set up and extend the application.