User Guide

Welcome to the Estimation Of Smoking Associated Damage Based On Nuclear Lung Images tool!

Upon launching out tool here is what you can do in the main window:

1: Analyze x-ray lung images: You can analyze any lungs image with our tool in any size.

2: Discover some databases from professional doctors: You can view a histogram that shows the results from the database.

3: Create your own database to save your analysis results.

4: Help option: You can press on the help option to learn more about how our tool works.

Installing:

In bash do the following:

1. Clone the Repository

Open your terminal or command prompt and clone the GitHub repository to your local machine by running:

```
$ git clone https://github.com/tareksleman/Estimation-of-smoking-associated-damage-based-on-nuclear-lung-images.git
```

Once cloned, navigate to the project directory:

```
cd Estimation-of-smoking-associated-damage-based-on-nuclear-lung-images
```

2. Set Up a Virtual Environment (Recommended)

To avoid dependency conflicts, it's recommended to use a virtual environment. Run the following commands to create and activate a virtual environment:

```
python -m venv venv
venv\Scripts\activate
```

3. Installing YOLOv5: (If not installed):

```
pip install git+https://github.com/ultralytics/yolov5.git
```

4. Install Required Dependencies

Once the virtual environment is activated, install the necessary Python packages by running:

```
pip install -r requirements.txt
```

This will install all the dependencies specified in the requirements.txt file, including:

- **PyQt5**: For the graphical user interface (GUI).
- **SQLite**: For database handling.
- **Other necessary libraries** (e.g., OpenCV, matplotlib, etc.).

5. Running the Application

After the dependencies are installed, you can start the application by running the following command:

```
python gui_app.py
```

So how to use our tool?

When you launch the application by running `python gui_app.py`, the main window opens. The following sections describe the buttons and their functionalities.

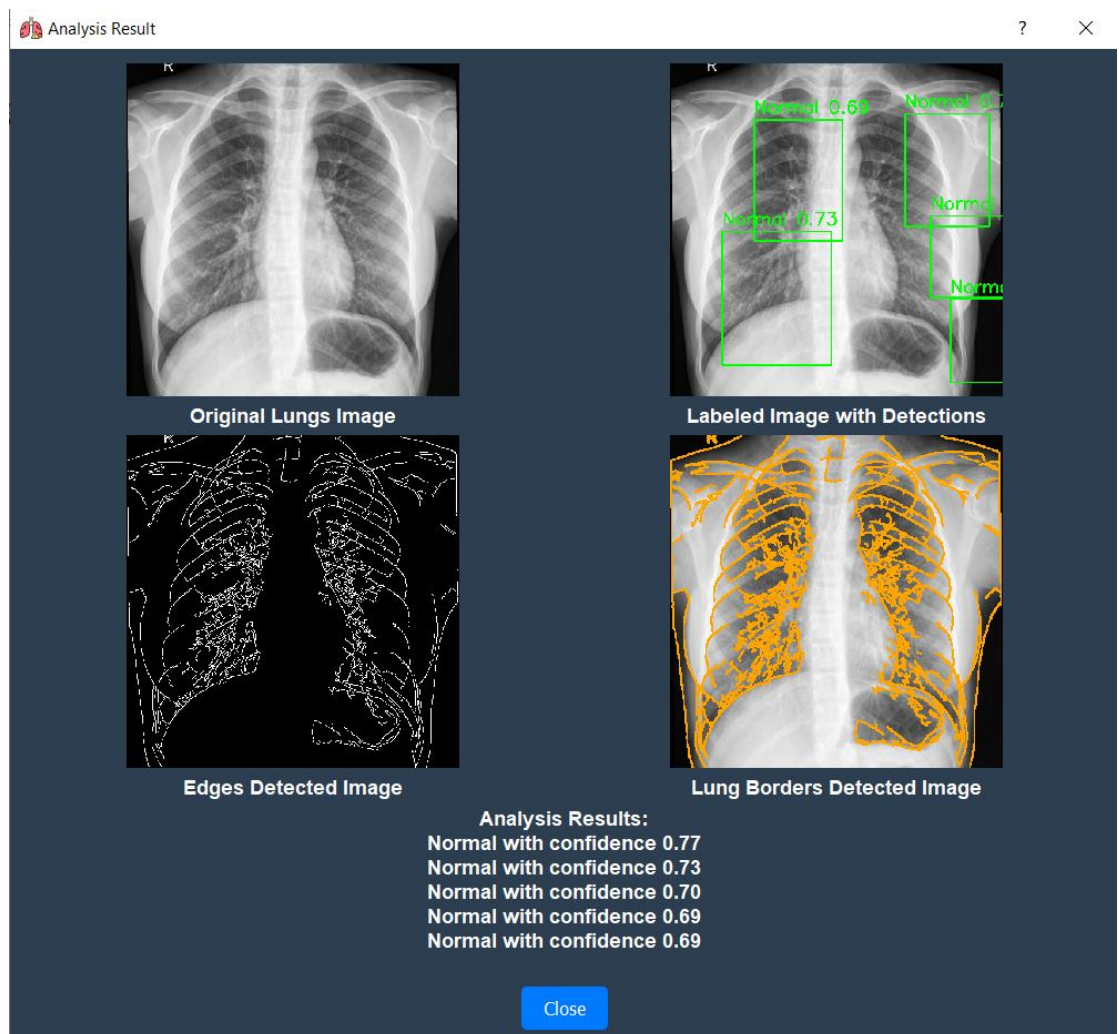Here is the main gui when you run gui_app.py:
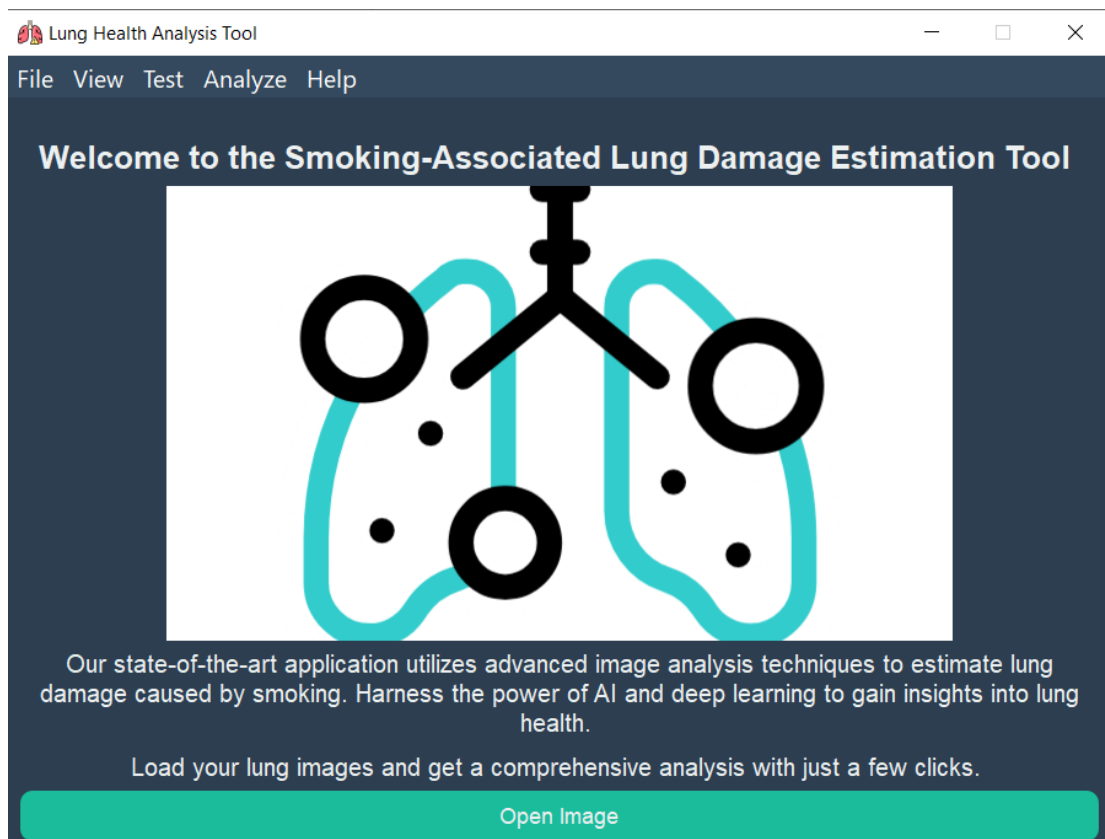
1. Open Image

- Purpose: Allows the user to select an x-ray lungs image to analyze it.
- How to use:
 1. Click the "Open Image" as you see in the main gui or as you see in the picture below
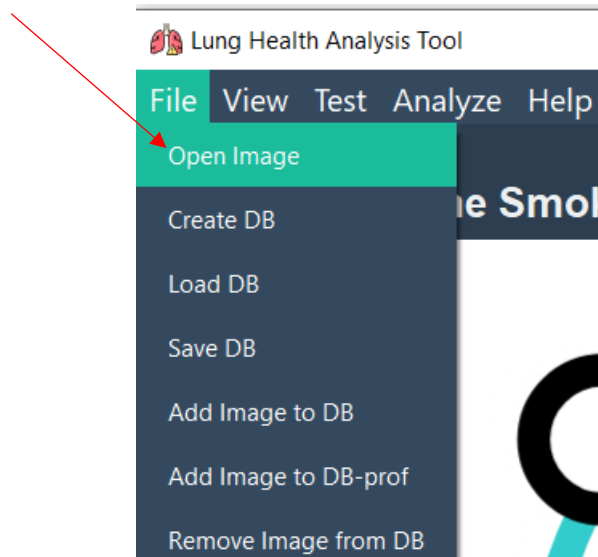
2. Select the image you want to analyze.
3. Press enter then a window will open and shows the image analyzing

Original Lungs Image

Labeled Image with Detections

Edges Detected Image

Lung Borders Detected Image

Analysis Results:
Normal with confidence 0.77
Normal with confidence 0.73
Normal with confidence 0.70
Normal with confidence 0.69
Normal with confidence 0.69
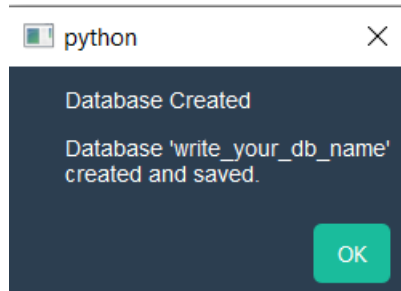
Close

2. Create DB

- **Purpose:** Allows the user to create a new database to store image paths for analysis.
- **How to Use:**
  1. Click the "Create DB" button.
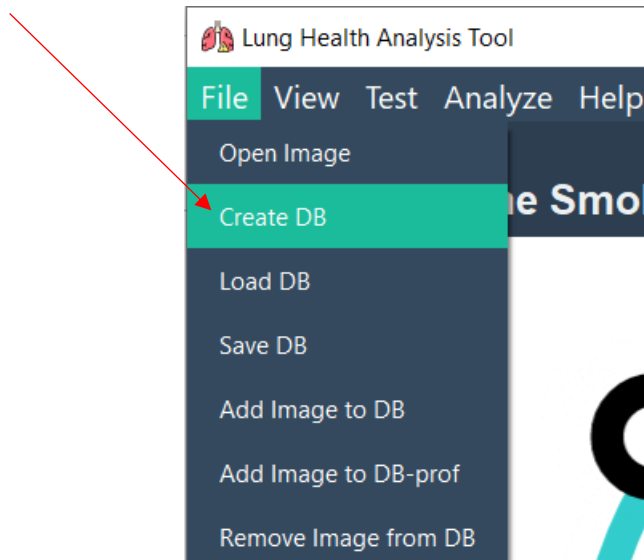
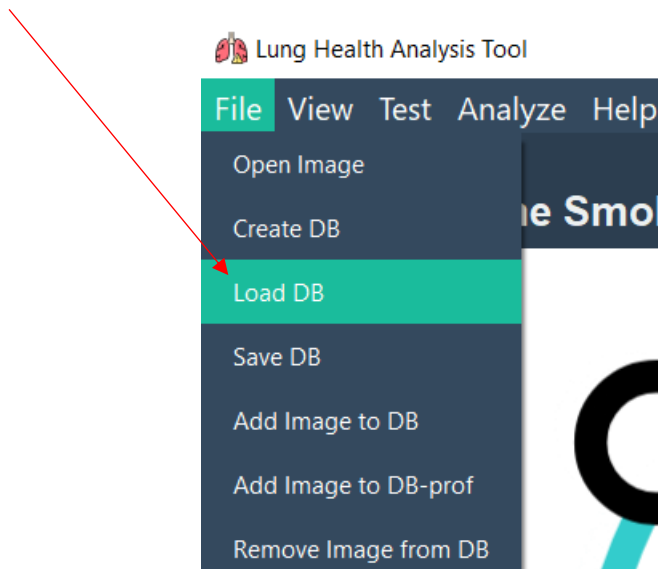 2. A dialog box will prompt you to enter a name for the new database.
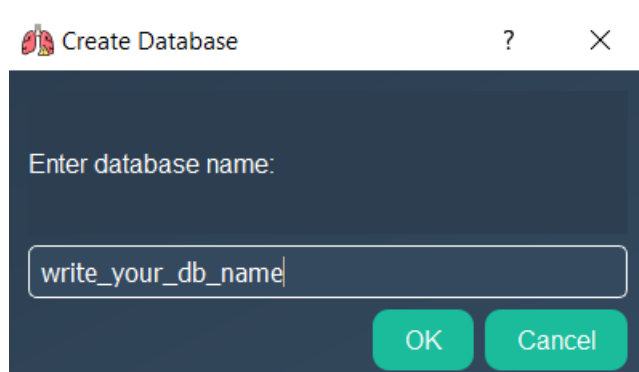
  3. Enter the desired name and click "OK."
  4. The database will be created, and a confirmation message will appear indicating the location where it was saved.
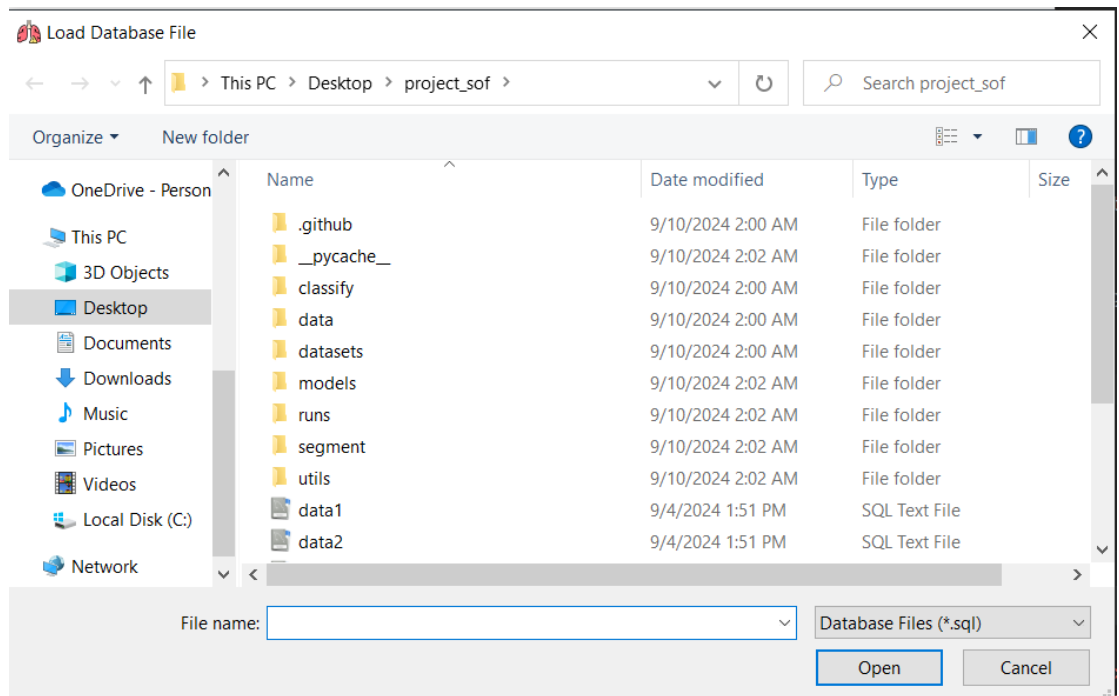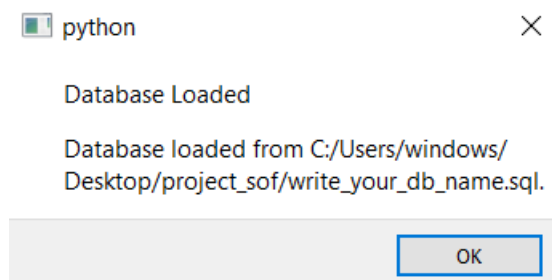
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3. Load DB

- **Purpose:** Loads an existing database containing lung image paths for further operations.
- **How to Use:**
    1. Click the "Load DB" button.

    2. A file dialog will appear, prompting you to navigate to and select the `.sql` database file.
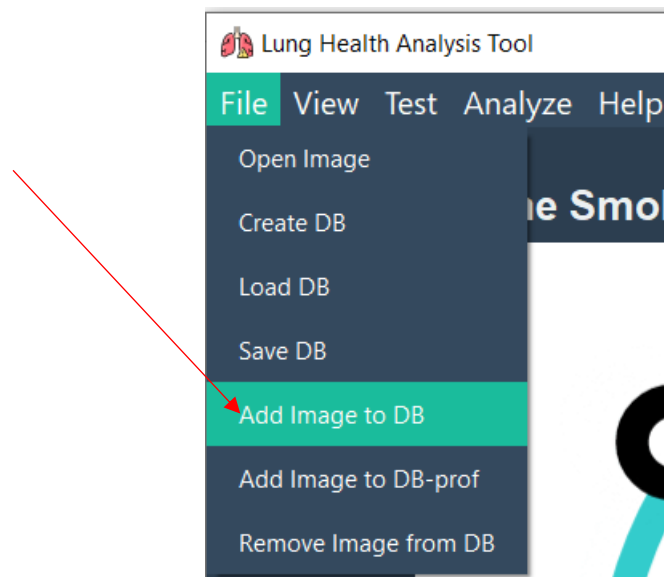
3. Once loaded, you can perform various operations like adding or removing images, viewing image data, etc.
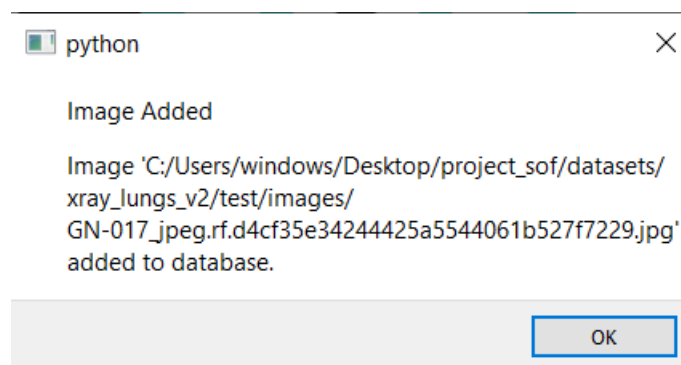

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4. Add Image to DB

- **Purpose:** Adds new lung images to the database for analysis.
- **How to Use:**
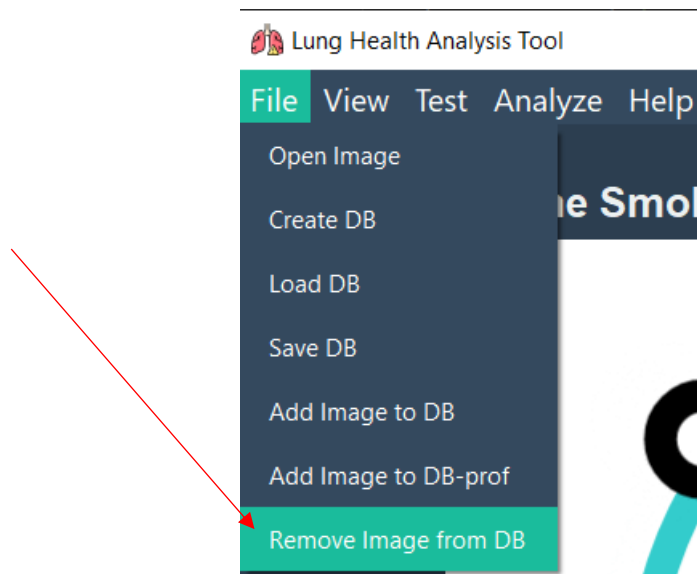   1. Click the "Add Image to DB" button.

2. A file dialog will open, allowing you to select one or multiple images to add.
3. Select the image files and click "OK."
4. The images will be stored in the database, and a success message will appear.
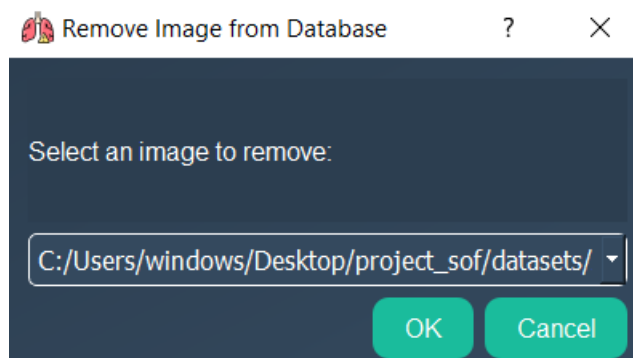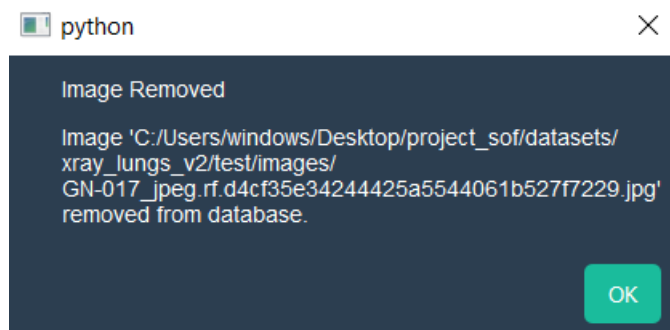

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5. Remove Image from DB

- **Purpose:** Removes an image from the currently loaded database.
- **How to Use:**
    1. Click the "Remove Image from DB" button.

2. A dialog box will appear, listing all the images stored in the database.

3. Select the image you want to remove and click "OK."
4. The image will be deleted from the database, and a confirmation message will appear.
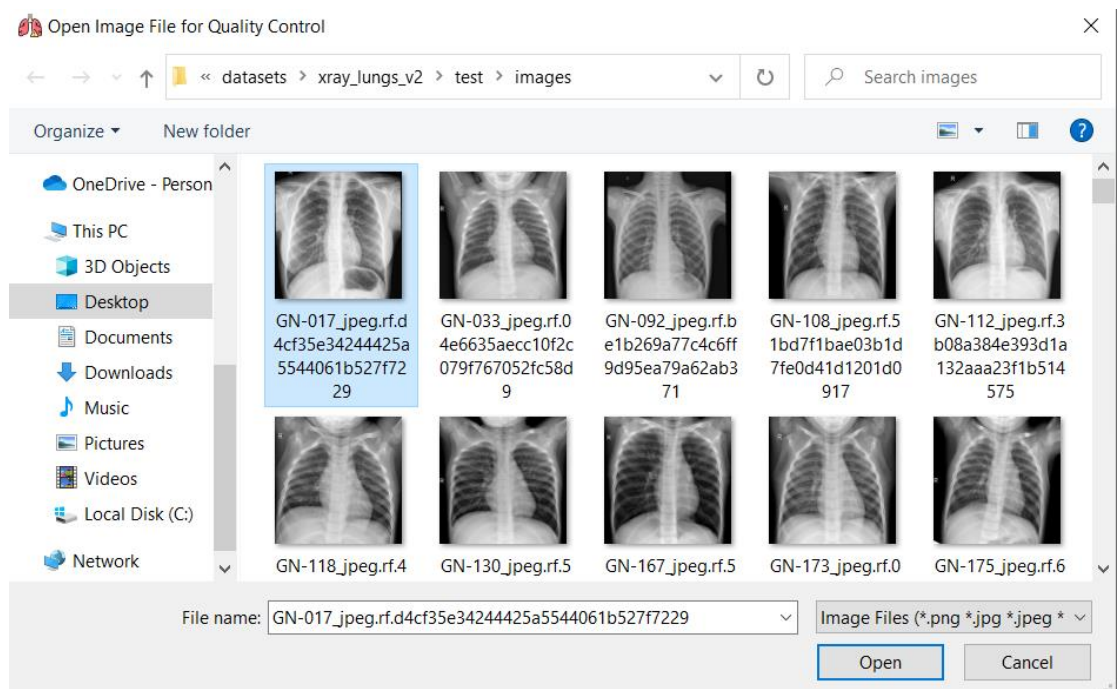
6. Quality Control

- **Purpose:** Allows the user to manually input a diagnosis for the selected image and then showing the results of the manual input and professional doctors result and automatic analysis result
- **How to Use:**
    1. Click the "Quality Control" button.
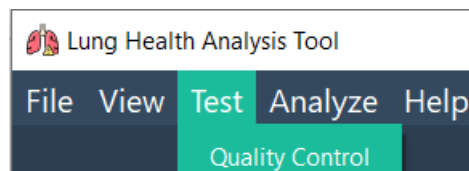
    2. A dialog will appear, allowing you to select an image and a quality control test to perform.

    3. A dialog box will appear, prompting you to input your diagnosis (e.g., "Normal," "Pneumonia," etc.).

4. Enter your diagnosis and click "OK."

5. The diagnosis will be saved and displayed alongside the image for further analysis.
6. Once the test is complete, the system will display the quality control results for the image.
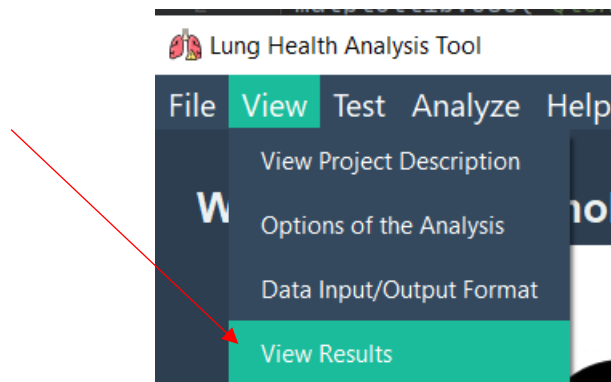

Original Lung Image

Automatic Prediction: Pneumonia with probability 0.65
Manual Annotation: Normal - No notes
Professional Annotation: Normal - Professional annotation

7. View Results

- **Purpose:** Displays the results of the analyses performed on the selected images from a loaded database
- **How to Use:**
    1. Load a database first.
    2. Click the "View Results" button.

    3. The system will show the results, including annotations on the lung images, confidence scores, and detected areas of concern.

8. View Project Description

- **Purpose:** Provides an overview of the project, its goals, and how the application works.
- **How to Use:**
    1. Click the "View Project Description" button.
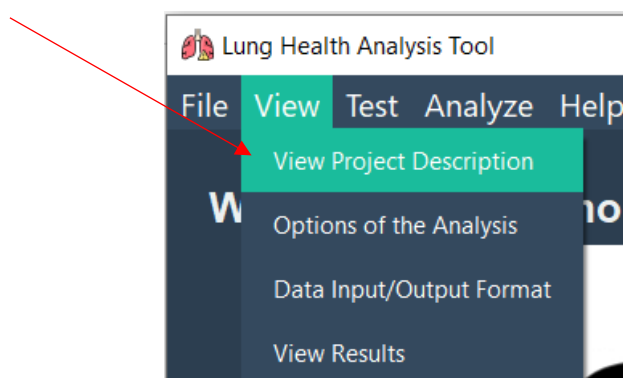
    2. A window will appear, displaying the project details.

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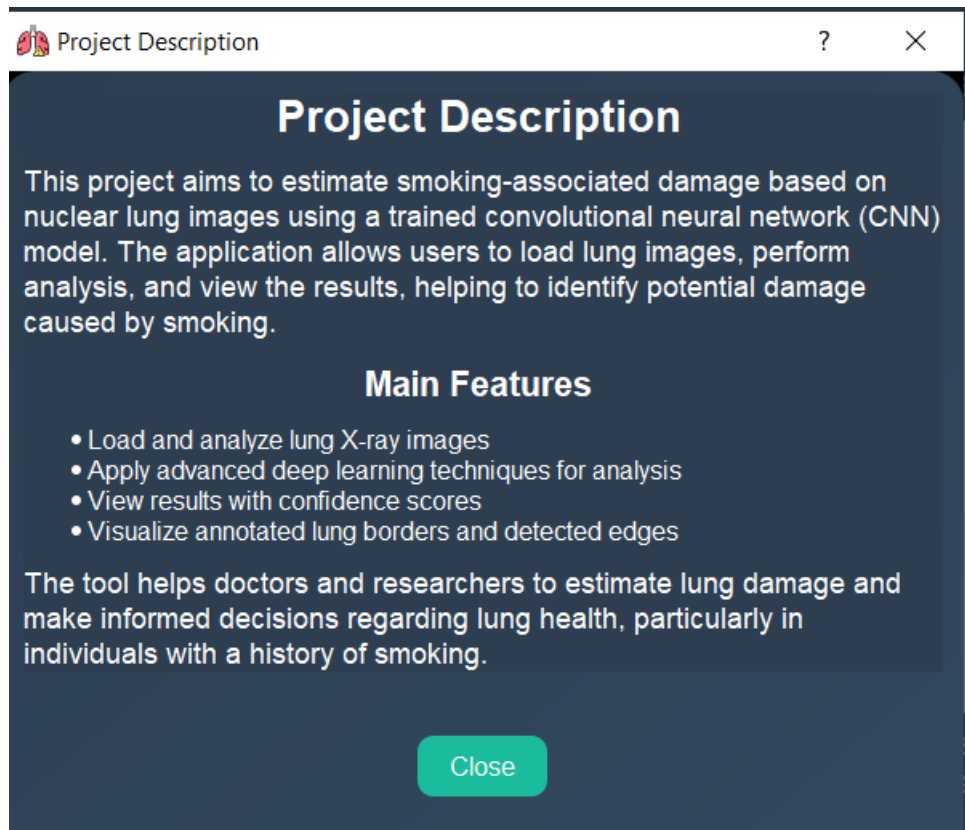
9. Set Analysis Parameters

- **Purpose:** Allows users to configure specific parameters for the image analysis process.
- **How to Use:**
    1. Click the "Set Analysis Parameters" button.
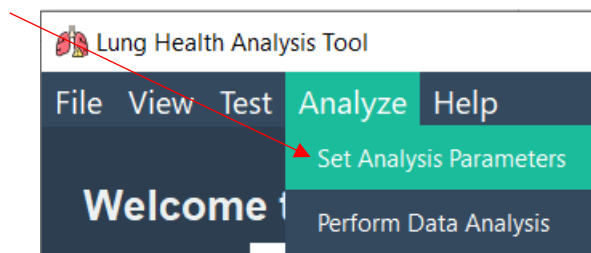
    2. A dialog will appear with options such as brightness, contrast, edge detection sensitivity, etc.
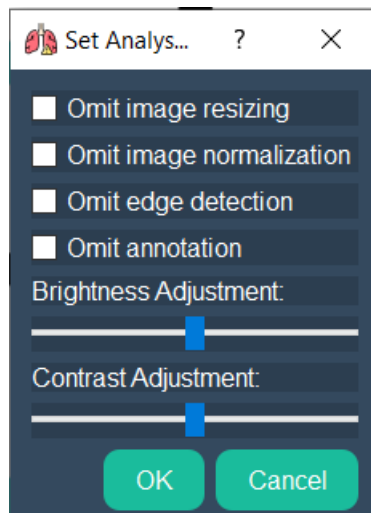
3. Adjust the settings as desired and click "Save."

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10. Options of Analysis

- **Purpose:** Configure the options for the analysis process, such as whether to annotate borders, show edges, etc.
- **How to Use:**
    1. Click the "Options of Analysis" button.
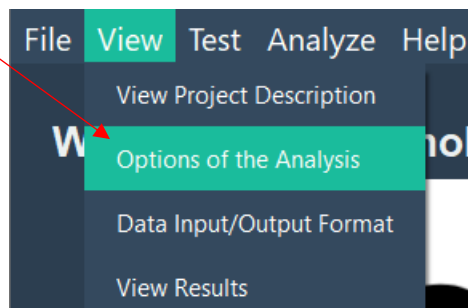
    2. A window will appear with several checkboxes and sliders.
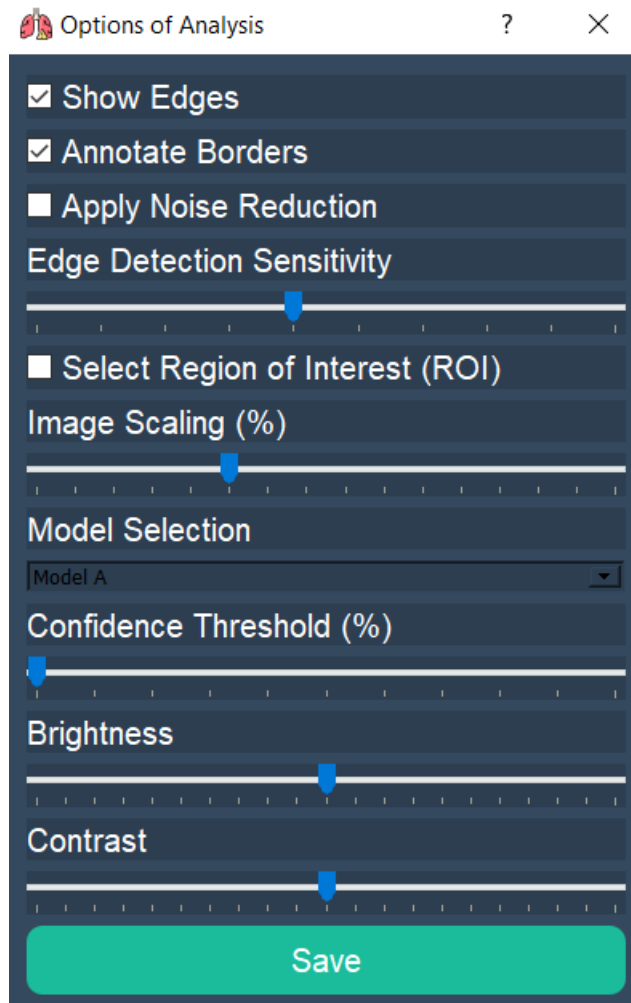
3. Adjust the options and click "Save" to apply the changes.

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11. Data Input/Output Format

- **Purpose:** View and configure the format of the data input and output for image analysis.
- **How to Use:**
    1. Click the "Data Input/Output Format" button.
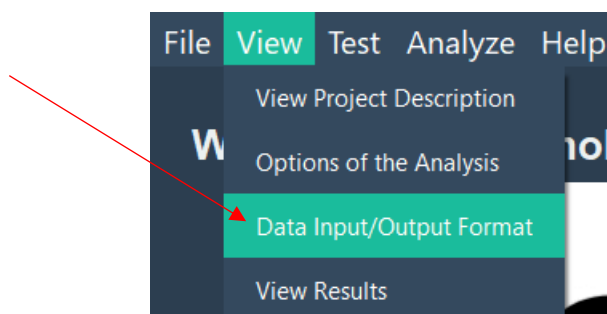
2. Select the input data you want.
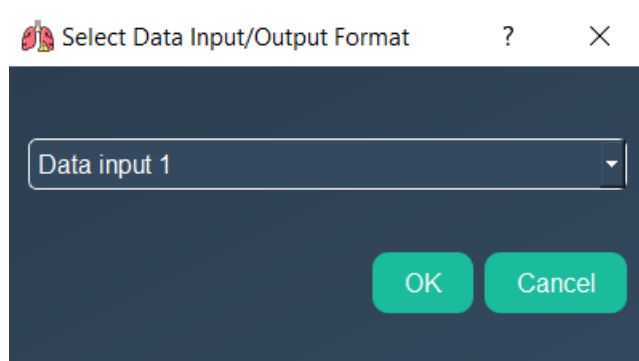
3. A dialog will display the formats of input images and how the output results are presented.
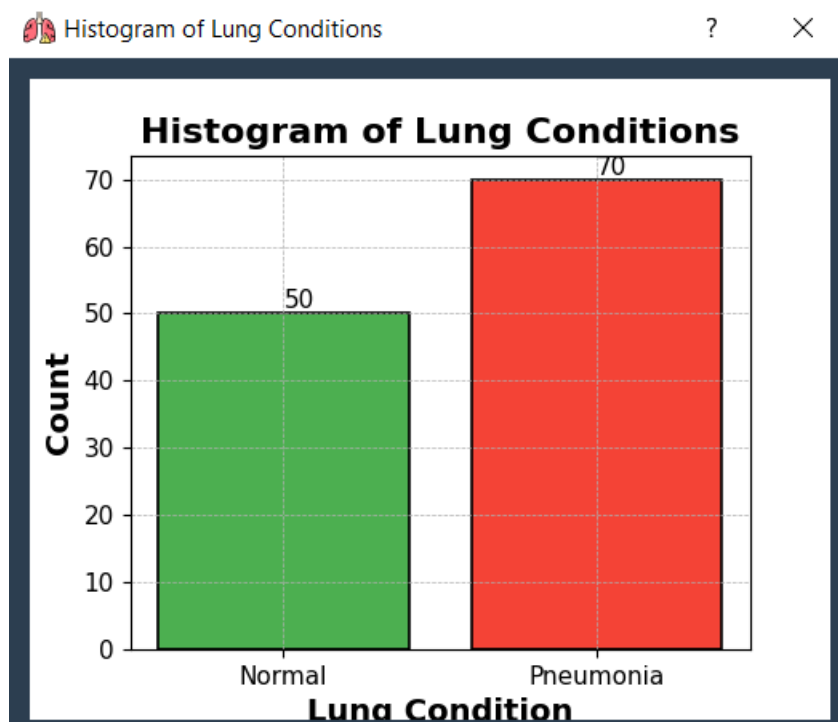
12. Help (User Guide)

- **Purpose:** Displays this user guide to assist users with understanding the tool.
- **How to Use:**
    1. Click the "Help" button in the menu.

2. A detailed guide will be shown, explaining the features and functionalities of the application.

Help Guide

Welcome to the Smoking-Associated Lung Damage Estimation Tool. This guide will help you understand how to use the application.

Main Features

- **Open Image:** Load an image for analysis.
- **Create DB:** Create a new database to store images and results.
- **Load DB:** Load an existing database.
- **Save DB:** Save the current database.
- **Add Image to DB:** Add an image to the current database.
- **Remove Image from DB:** Remove an image from the current database.
- **View Project Description:** View the project description and objectives.
- **Options of the Analysis:** Configure analysis options.
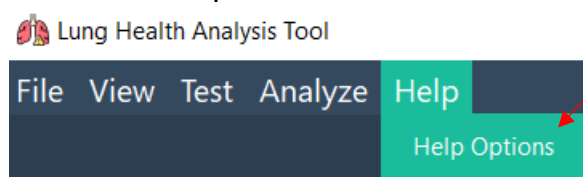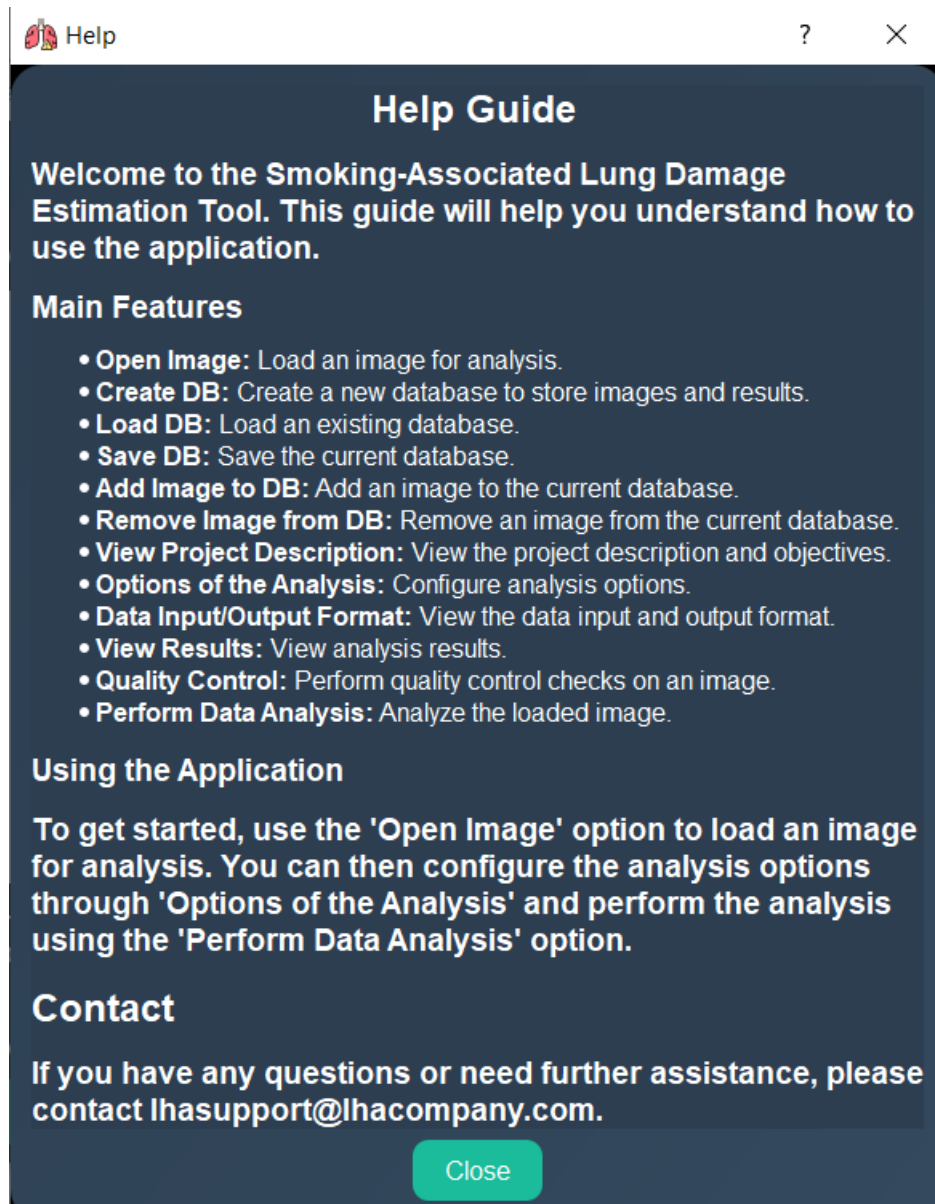- **Data Input/Output Format:** View the data input and output format.
- **View Results:** View analysis results.
- **Quality Control:** Perform quality control checks on an image.
- **Perform Data Analysis:** Analyze the loaded image.

Using the Application

To get started, use the 'Open Image' option to load an image for analysis. You can then configure the analysis options through 'Options of the Analysis' and perform the analysis using the 'Perform Data Analysis' option.

Contact

If you have any questions or need further assistance, please contact lhasupport@lhacompany.com.

Close

Common Workflow

1. **Create or Load a Database**: Start by creating a new database or loading an existing one.
2. **Add Images**: Add lung X-ray images to the database for analysis.
3. **Analyze**: Perform image analysis using the built-in models.
4. **Manual Input**: Enter manual diagnoses or run quality control tests if needed.
5. **View Results**: Review the results and analyze the output for better decision-making.

A Note of Thanks

We would like to extend our sincere gratitude for using our application. Your support and feedback are invaluable in helping us improve and continue developing meaningful tools. We hope this application meets your needs and assists you in your work. Thank you!