SitVLM2Drive: Situational Awareness Vision-Language Models to Enhance Safety and Reliability in Autonomous Driving

Supplementary Material – Dataset

User Guide for the Image Editor GUI Application

This guide provides step-by-step instructions on how to use the Our **Image Annotation Tool GUI**. The application is designed to help users annotate images with various objects, relationships, and metadata and apply adversarial attacks to them.

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1 Our GUI Image Annotation Tools

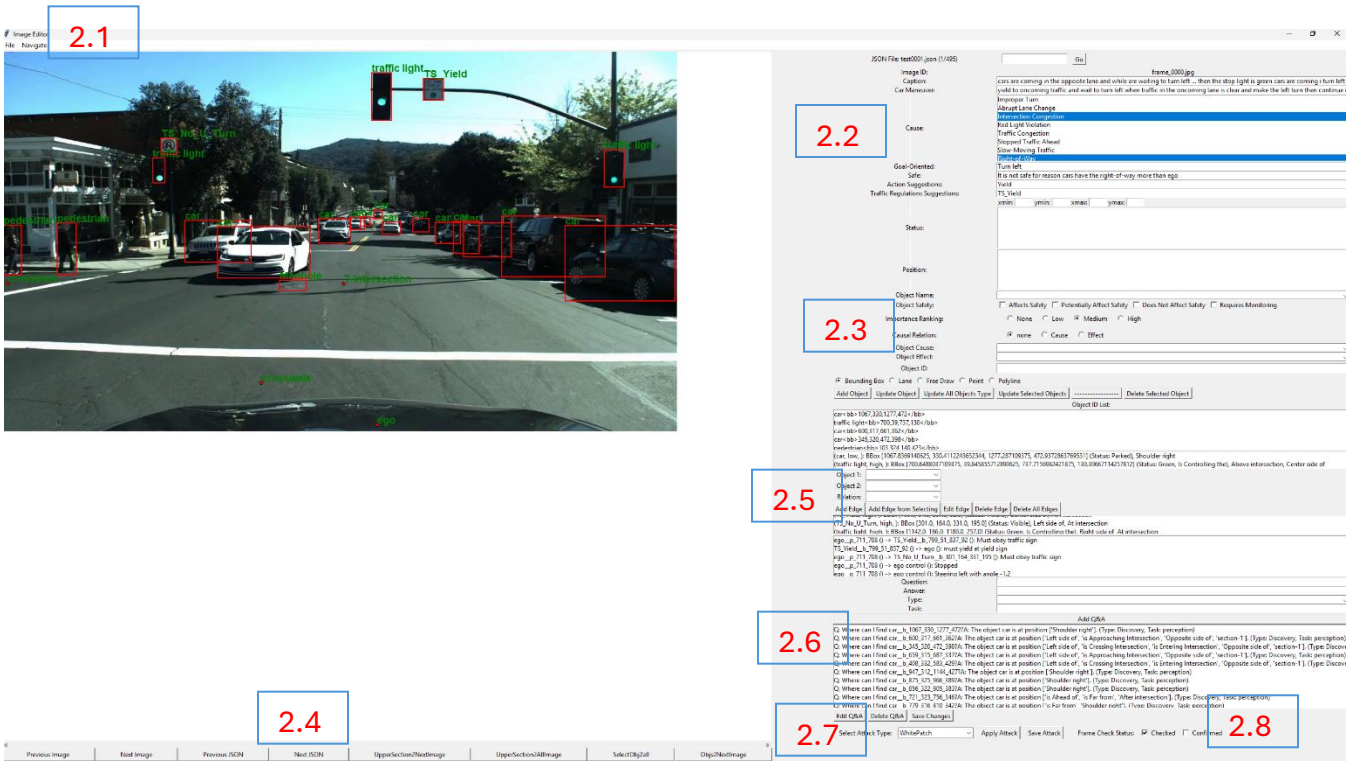
Below are detailed guidelines and instructions to help you navigate and utilize the provided GUI for image annotation, object labeling, and contextual relationship building and apply adversarial attacks to them. Please review these guidelines carefully before starting and refer to them as needed.

2 Understanding the Layout

Main Canvas: The current image and annotations (bounding boxes, lines, points, free draws, or polylines).

Right-Side Control Panel: Contains fields and tools to annotate and modify data:

- Initial Setup and Loading Data (Section 2.1).
- **Text fields** for global attributes: Caption, Maneuver, Cause, Goal-Oriented, Safe, Action Suggestions, Traffic Regulations Suggestions (Section 2.2).
- **Status and Position Lists:** For adding or editing object-specific attributes (Section 2.3).
- **Object Management:** Use combo boxes, list boxes, and radio buttons to define object type, importance ranking, object safety, etc. (Section 2.4).
- **Edges (Relations) Section:** Define relationships between objects (Section 2.5).
- **Q&A Section:** Add and edit question-answer pairs related to the scene (Section 2.6).
- **Attack Tools:** Apply adversarial patches (white, black, noise, sticker) to objects (Section 2.7).
- **Traceability and validation:** To improve traceability, select the annotator's status from the frame check status (Section 2.8).



2.1 Initial Setup and Loading Data

1. **Open JSON Directory:**
    - From the top menu, select **File > Open JSON Directory**.
    - Choose a directory containing JSON files. Each JSON file defines a set of frames (images) and their annotations.
2. **Open Image Directory (Optional):**
    - To start with images instead of JSON, select **File > Open Image Directory**.
    - Choose a folder of images to auto-generate a combined JSON file. This is useful if you don't already have JSON annotation files (it will create an automatic JSON file for your folder).
3. **JSON File Navigation:**
    - After loading, you can navigate through different JSON files using **Navigate > Next JSON** or **Navigate > Previous JSON**.
    - Alternatively, use the provided search bar and "Go" button to jump directly to a specific JSON file by index or filename.
4. **Image Navigation:**
    - Use **Navigate > Next Image** and **Navigate > Previous Image** to move through images within the currently loaded JSON file.
    - The current image ID and JSON file name are displayed on the right-side panel.

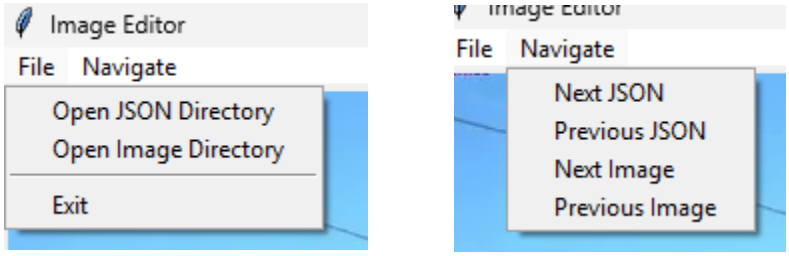


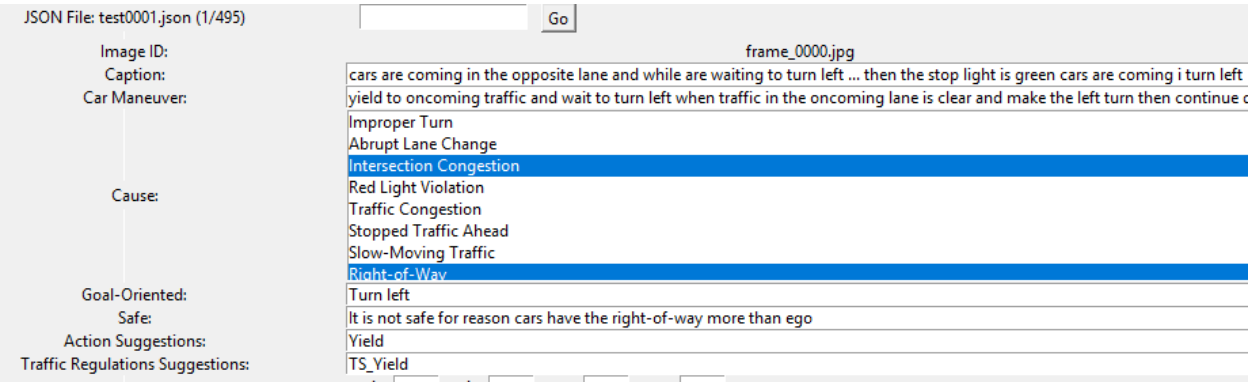
Fig 1: Open JSON or Image Directory and Navigation

2.2 Setting Global Frame-Level Attributes

- **Caption, Maneuver, Goal-Oriented, Safe, Action Suggestions, Traffic Regulations Suggestions: Modify these fields as needed for the current image.**
- **Cause (Listbox): Assign underlying causes to the scenario by selecting from the cause list.**
- **Click Save Changes to apply all modifications to the current frame's JSON data.**

Saving Your Work

- **Save Changes: Saves the current state of annotations and attributes to the currently loaded JSON file.**
- **The status label will indicate successful save or any errors encountered.**



2.3 Adding and Editing Objects

1. **Select Drawing Mode:**
    - **Bounding Box (Bbox)**: Draw rectangular boxes around objects.
    - **Lane**: Draw line segments representing lanes or linear objects.
    - **Free Draw**: Sketch arbitrary lines or shapes.
    - **Point**: Mark a single point of interest.
    - **Polyline**: Create multi-segment lines by clicking points and double-clicking to finish.

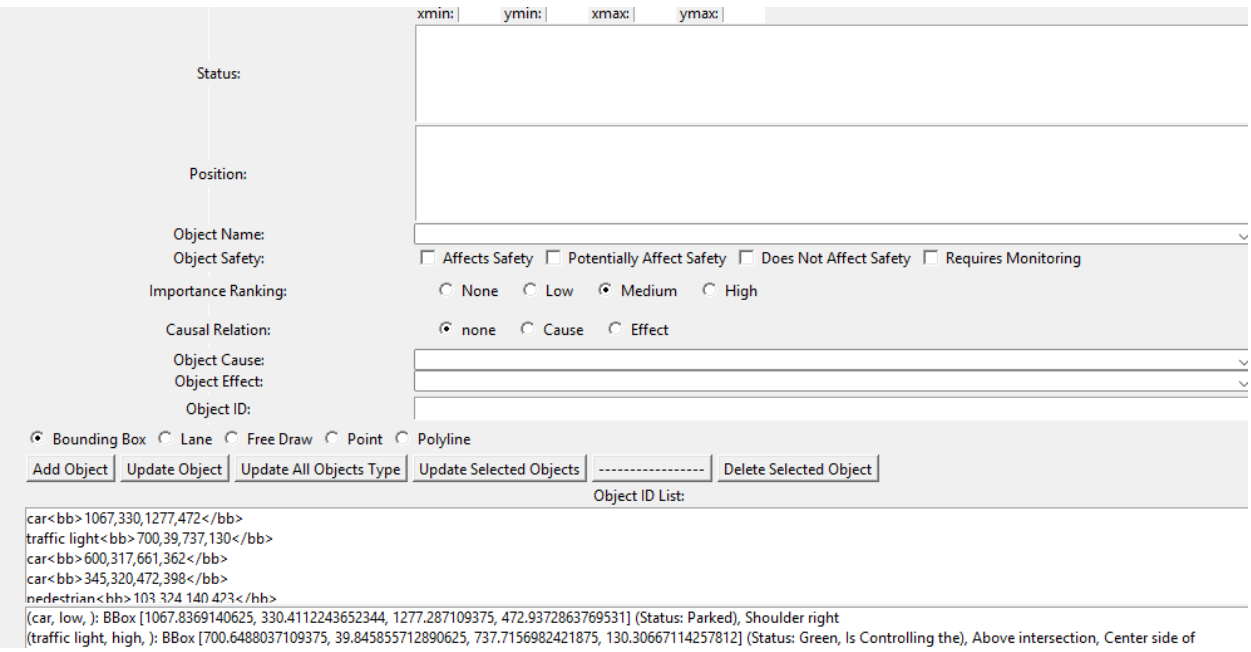
Choose the mode from the set of radio buttons under the "Drawing Mode" label.

2. **Drawing on the Canvas:**
    - **Right-click & Drag** in the canvas according to your selected mode:
        - **BBox**: Press and hold right-click, drag to form a rectangle, and release to finalize the bounding box.
        - **Lane/Free Draw**: This is a similar process. Free Draw allows continuous drawing until you release the button. For Polyline, click to add points and double-click to finish.
        - **Point**: Right-click sets a single point.
3. **Object Properties:**
    - Once drawn, select the object's name from the "Object Name" dropdown.
    - Choose its **object type** (Static or Dynamic), importance ranking (None, Low, Medium, High), and object safety attributes (Affects Safety, etc.).
    - You can also assign **Status** and **Position** tags from their respective listboxes.

4. **Adding the Object to the JSON:**
    - Click **Add Object** once you've drawn and configured the object properties to save it into the JSON data structure.
5. **Selecting and Editing Existing Objects:**
    - Left-click on an object in the canvas to select it.
    - Its properties populate on the right panel. You can then modify status, position, object type, or even move/rescale the bounding box.
    - Use **Update Object** to save modifications to the selected object.
    - **Delete Selected Object** removes it from the JSON after confirmation.

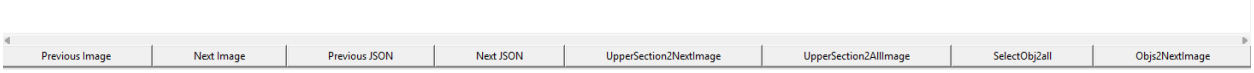
Managing Multiple Objects

- **Object ID List:** The bottom-right list box shows all object IDs for the current frame.
- **Selecting Multiple Objects:**
    - You can select multiple objects in the object list to apply bulk updates to their attributes.
    - After selecting, use **Update Selected Objects** to apply changes to all chosen nodes simultaneously.
- **Update All Objects Type:**
  Automatically classify objects as Static or Dynamic based on their category.



2.4 Navigation and Data Sharing

- **Switching Images and JSON Files:** Use **Next Image**, **Previous Image**, **Next JSON**, and **Previous JSON**.
- **Share Data with Next Image:**
    - **UpperSection2NextImage:** Copies top-level attributes (caption, maneuver, causes, etc.) to the next frame.
    - **UpperSection2AllImage:** Copies top-level attributes to all frames.
    - **SelectObj2all:** Copies selected object attributes to subsequent frames where that object doesn't exist yet.
    - **Objs2NextImage:** Copies current objects and relations to the next image.



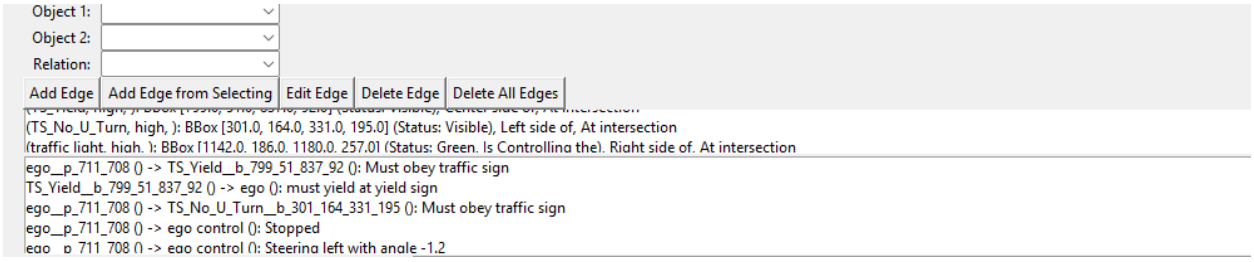
2.5 Relationships (Edges) Between Objects

1. **Adding Relations:**
    - Select one object (F2 key sets that object as “Object 1”) and choose another via the dropdowns.

Pick a **Relation** (e.g., "is Behind", "is Approaching", "Contains") from the combo box and Click **Add Edge** to create the relationship.

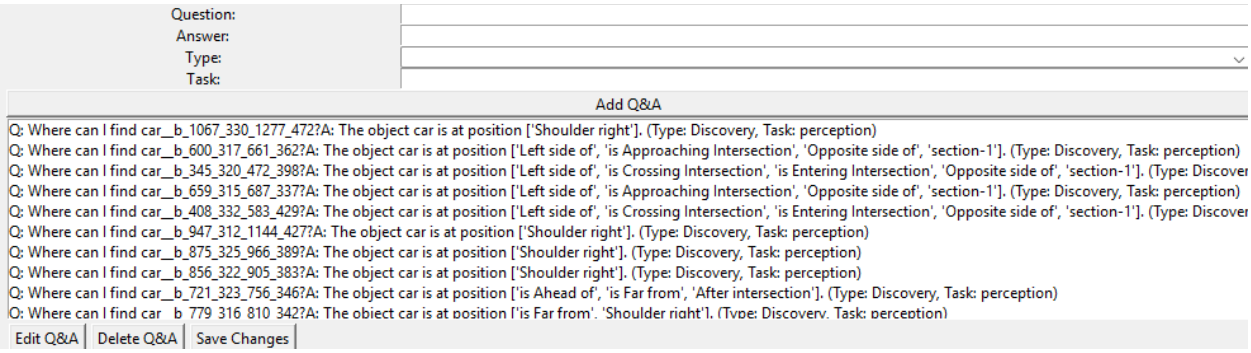
- You can also add edges by selecting objects on the canvas and using the "Add Edge from Selecting" button.

2. **Editing or Deleting Edges:**
    - Select an edge from the edges listbox, make changes to the relation, and click **Edit Edge**.
    - Use **Delete Edge** or **Delete All Edges** to remove unwanted relations.



2.6 Q&A Annotation

- Use the Q&A section to add question-answer pairs relevant to the scene.
- Fill in the Question, Answer, Type (Discovery, Association, Intervention, Counterfactual), and Task.
- Click **Add Q&A** to append it to the JSON.
- Select an existing Q&A to edit or delete.

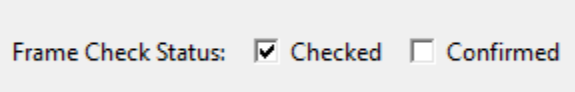


2.7 Applying Adversarial Attacks

- From the attack's dropdown, choose a method (WhitePatch, BlackPatch, StickerPatch, GaussianNoise, RandomNoise).
- Select an object (must have a bounding box) and click **Apply Attack**.
- **Save Attack** to store the attacked image and reflect it in the JSON.

2.8 Traceability and validation

- From the frame check status, choose the status of the annotator for more traceability.
- **Save automatic after checking**



2.9 Keyboard Shortcuts

- **Delete**: Deletes the selected object.
- **F1**: Copies the Object ID of the selected object to the clipboard.
- **F2**: Sets the selected object as **Object 1** in the relations section.
- **Arrow Keys**: Moves the selected annotation by one pixel in the corresponding direction.