Formal Methods in Software Engineering

Project Report

SE-Q (G-02)

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User Guide - Feature Model Analysis and Visualization Tool

Welcome! This guide will help you use the **Feature Model Analysis and Visualization Tool** and interact with the tool in an efficient way. Get started by following these steps:

1. Overview of the Tool

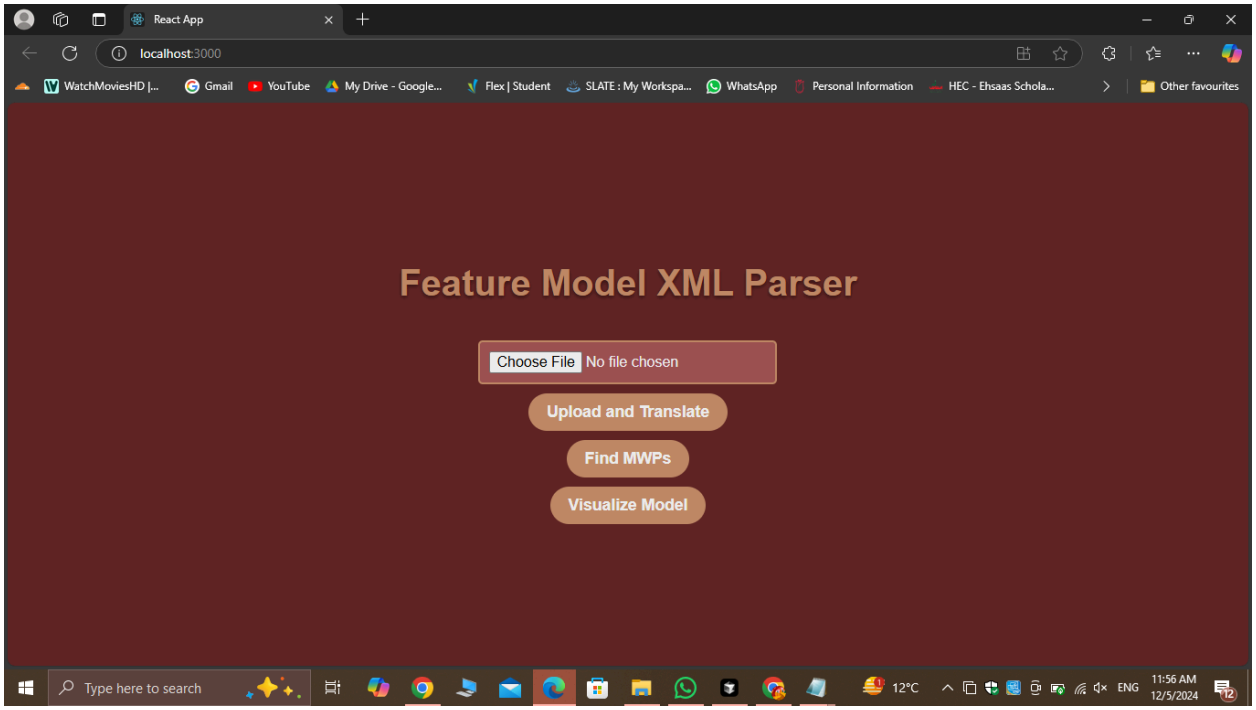
The tool is designed to:

- Parse XML-based feature models.
- Translate them into propositional logic.
- Calculate the Minimum Working Product (MWP).
- Visualize the feature model interactively.
- Handle constraints dynamically during feature selection.

2. How to Use the Tool

Step 1: Uploading the Feature Model

1. Open the application in your browser. (using local host in our case)
2. Click the **Choose File** button and select an XML file from your computer that represents your feature model.
    - Ensure the file adheres to the predefined schema (XSD).
3. Click the **Upload and Translate** button to process the file.



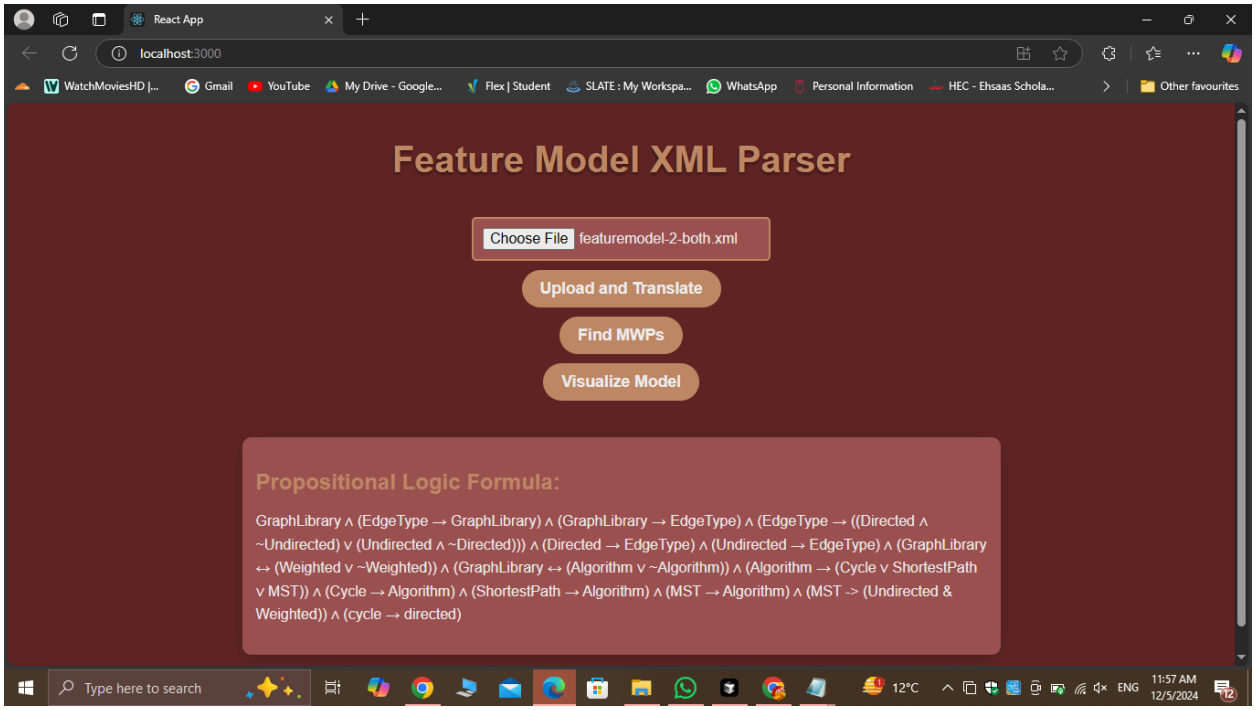
What Happens Next:

- The tool validates your XML file.
- If valid, the file is translated into propositional logic.
- The Minimum Working Product (MWP) is calculated and displayed.

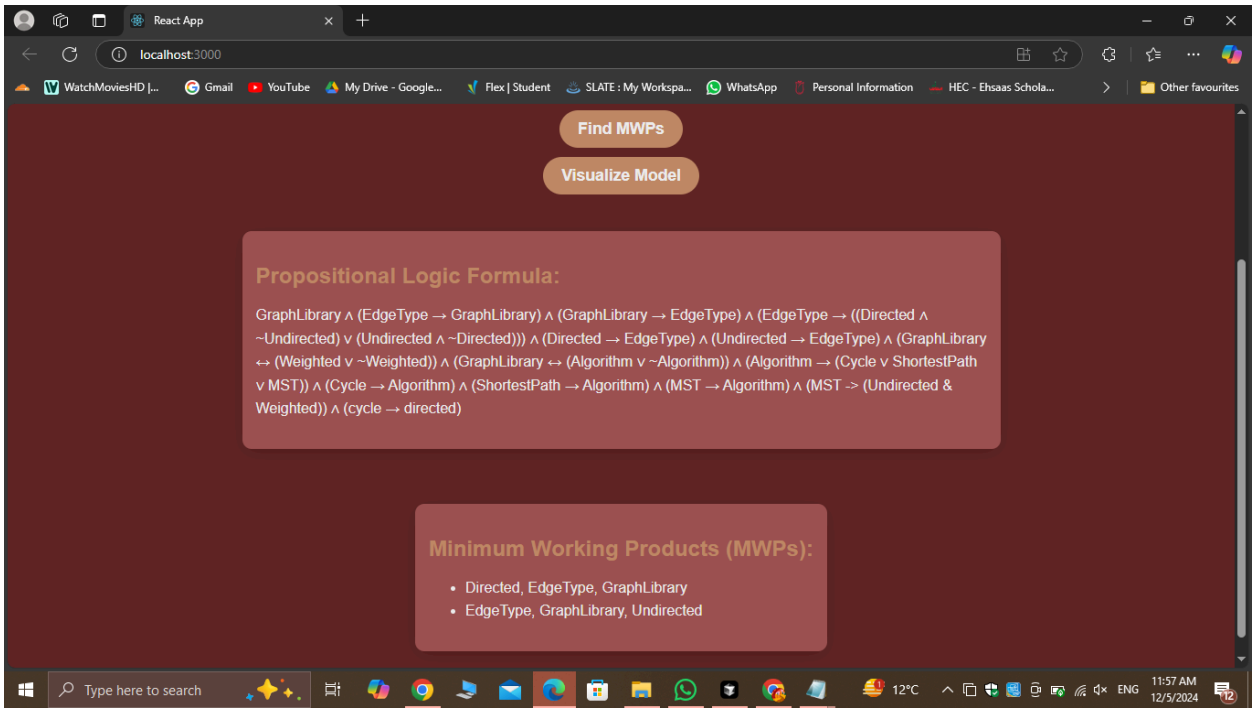
Step 2: Viewing Translation and MWP

After uploading the XML file, you will see:

- **Propositional Logic Formula:**
  The propositional logic based representation of your feature model will be displayed.
  Example:
  - Root → A
  - A ↔ (B ∨ ¬B)



- **Minimum Working Product (MWP):**
  All minimal working products of features will be displayed.
  Example:
    - [Root, A, B]

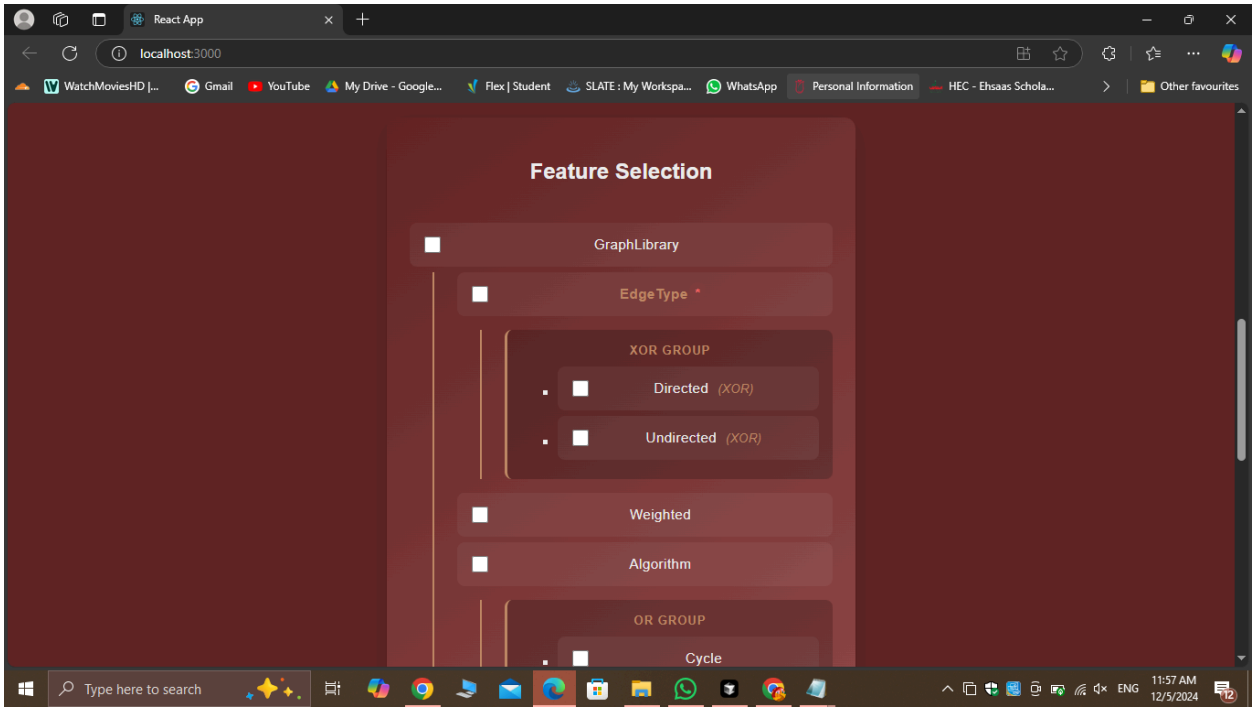


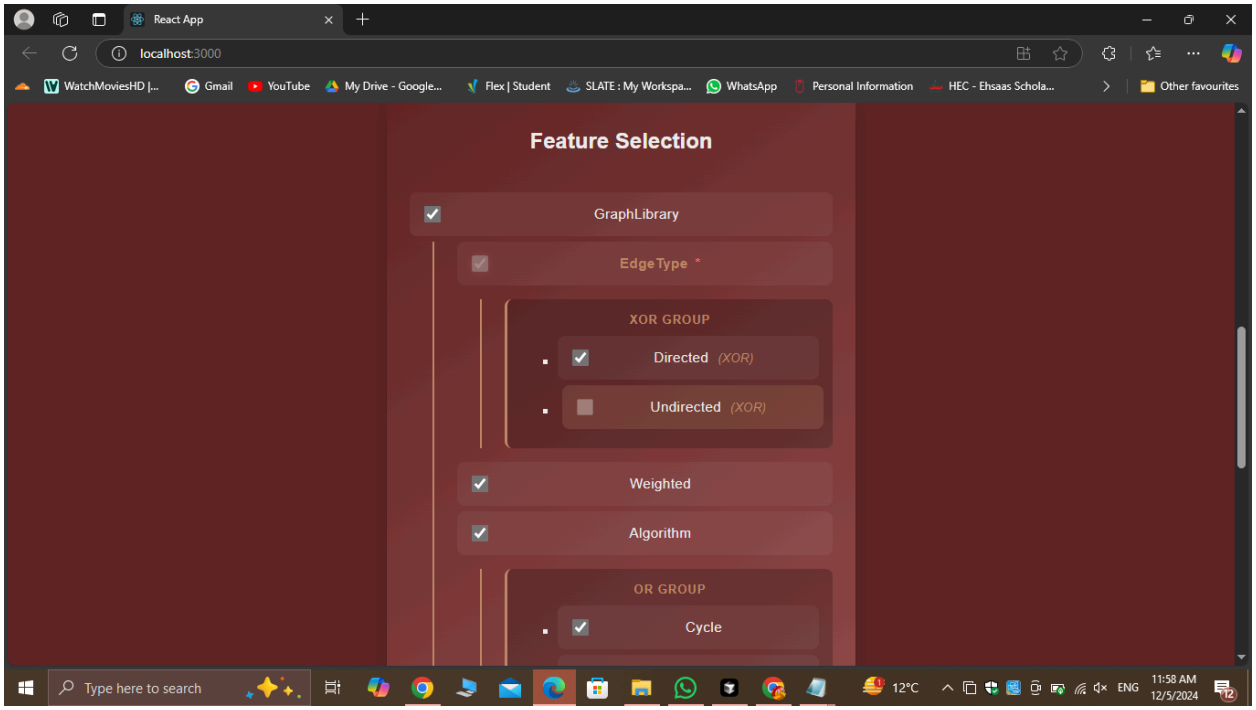
Step 3: Visualizing the Feature Model

1. Click the **Visualize Model** button to view the feature model.
2. The model is displayed as an interactive checkbox tree.

Features of the Checkbox Tree:

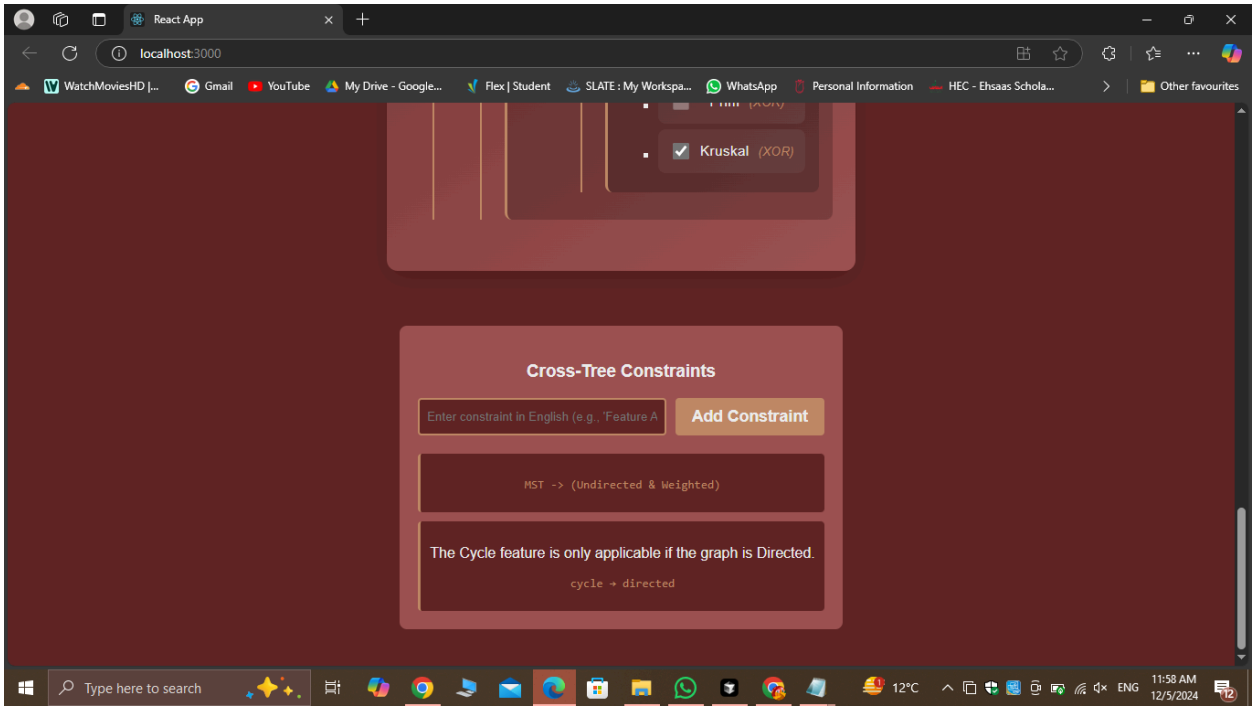
- **Hierarchical Display:**
  Features are visually organized into mandatory, optional, XOR, and OR groups.
- **Dynamic Constraints:**
  - If you select a feature, related features are adjusted dynamically to ensure constraints are maintained.
  - Deselecting a mandatory feature will automatically deselect dependent features.
- **XOR Group Handling:**
  Selecting one feature in an XOR group automatically disables others.





Step 4: Handling Cross-Tree Constraints

1. **Viewing Predefined Constraints:**
    - Existing cross-tree constraints are converted and displayed in propositional logic format.
2. **Adding New Constraints:**
    - Enter a new constraint in plain English (e.g., "Feature A requires Feature B").
    - The tool will translate it into propositional logic (e.g., A → B) and ask for your confirmation to use the translated logic.
    - If you choose not to provide a translation, the tool allows you to leave it empty.



3. Error Messages and Feedback

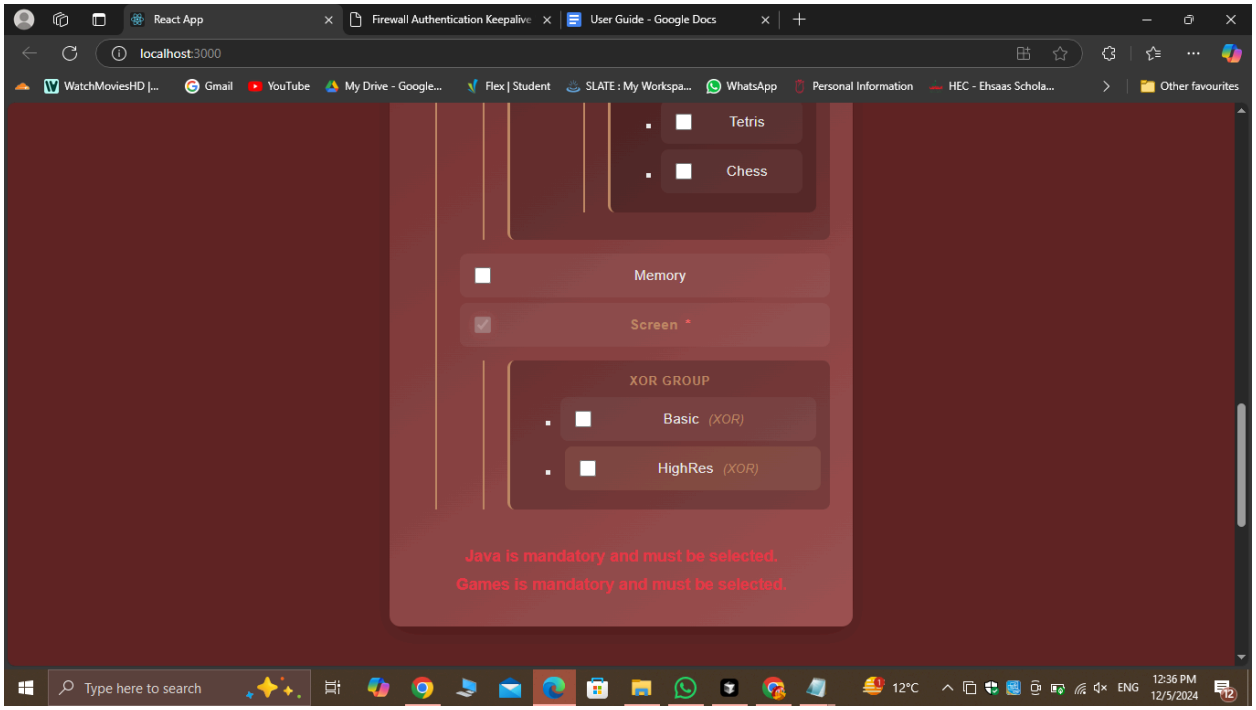
The tool is designed to guide you with clear error messages:

- **Invalid Constraint Translation:**

  If the entered constraint cannot be translated, the tool will prompt for manual input.

- **Message Guidelines in Checkbox Selection:**

  While marking the check boxes, the system will be constantly guiding you about the constraints.



4. Known Limitations

Currently, the tool does **not verify feasibility** of the final feature selection. This will be addressed in future updates.

5. Example Workflow

1. Go to the home page and upload an XML file.
2. Click **Upload and Translate** to view:
    - Propositional Logic Formula.
    - Minimum Working Product.
3. Click **Visualize Model** to:
    - Interact with the feature tree.
    - Dynamically adjust features based on constraints.
4. Add or view cross-tree constraints and confirm translations.

6. Support and Feedback

For assistance or feedback, contact our support team. Thank you for using the Feature Model Analysis and Visualization Tool!