

# Expert Systems

## BuildWise: Developing an Expert System for Post-War Building Assessment and Rehabilitation

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# Outlines

- 1 Why This Project Matters
- 2 What Will You Learn?
- 3 Project Outline: Step-by-Step
- 4 Imagine This Scenario
- 5 What We're Looking For
- 6 Assessment Criteria

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# Why This Project Matters

- **Real-World Challenge:** Post-war building assessments involve challenges like incomplete data, conflicting reports, and subjective judgments.
- **Your Role:** Develop a prototype of an **expert system** to evaluate building damage and provide reliable recommendations despite uncertainties.
- **Impact:** Lay the foundation for **intelligent recovery efforts** in Gaza and beyond!

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# What Will You Learn?

- How to build **expert system rules** and construct a reliable knowledge base.
- Techniques to handle **uncertainty**, such as:
  - Probabilistic reasoning
  - Fuzzy logic
  - Decision trees
- Breaking down complex problems into manageable, incremental steps.
- Collaboration, creativity, and problem-solving skills.

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# Project Outline: Step-by-Step

## ① Understand the Problem and write down preliminary (1 week):

- Explore challenges of post-war building assessments either from available online resources or from expert persons, later is preferable.
- List these challenges and try grouping them based on your creative opinions based on **specific criteria**.
- Define why **uncertainty** occurs (e.g., incomplete inspections, conflicting data, subjective evaluations, .....).

## ② Build the Knowledge Base (1 Week):

- Identify key criteria for damage evaluation (e.g., structural stability, visual cracks, foundation quality).
- Write **IF-THEN** rules.

## ③ Online meeting for evaluation (At the need of the particular week):



## ④ **Manage Uncertainty and Build the initial Prototype (1 Week):**

- Explore techniques like fuzzy logic and probabilistic reasoning.
- Integrate uncertainty management into rules.

## ⑤ **Finalize the proposed expert system (1 Week)**

## ⑥ **Present and Reflect (20 January 2025):**

- Present your expert system project .
- The deliverable materials are presentation and recorded video from your end.

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# Imagine This Scenario

## Example:

- **Input Data:** - Observed: Cracks in walls, foundation and basement, beams. - Missing: Roof condition (not accessible).
- Can ML algorithm tools be used to enhance the assessment?
- Think and plan what is essential to discuss with the expert domain.
- **Output Recommendation:** - " Moderate Damage: Immediate roof inspection required for confirmation, **what else do you think?** "

**Impact:** Accelerate rebuilding efforts and save lives.

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# What We're Looking For

- Creativity in defining and handling **uncertainty**.
- Clear, logical rules for the **knowledge base**.
- Thoughtful and **incremental approach** to system design.
- Collaboration and teamwork.

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**Total Marks: 100 (converted to 25% of course grade) Deadline: 20th January 2025**

- Your project will be assessed holistically, focusing on the creativity, methodology, and quality of implementation.
- **Similarity checks:** Plagiarism and AI-generated content will be strictly penalized.
- Evaluation tools like **Turnitin** or other similarity detection tools will be used.

# 1. Idea Creation (20 Marks)

- Quality of the problem statement and idea originality.
- Clarity and relevance of the objectives for post-war building assessments.
- Evidence of brainstorming and structured planning:
  - Did students explore creative approaches?
  - Are ideas supported by logical reasoning?



## 2. Knowledge Base and Facts Development (20 Marks)

- How well was the knowledge base constructed?
- Sources used for knowledge gathering:
  - **Civil Engineer Interaction:** Did students consult professionals or conduct interviews?
  - **Surveys:** Were surveys designed to gather data from relevant stakeholders?
  - **Literature Review:** Depth of review and relevance of cited works.
- Clarity and accuracy of the rules and criteria developed.

### 3. Criteria and Methodology (20 Marks)

- How well did students define the damage evaluation criteria?
- Were criteria grouped logically and based on structured reasoning?
- Methodology employed:
  - Are all uncertainty scenarios addressed effectively?
  - Were the rules and decision logic comprehensive and reflective of the problem?

## 4. Code Development (30 Marks)

- Quality of the expert system code:
  - Does it function as intended?
  - Are uncertainty management techniques (e.g., fuzzy logic, probabilistic reasoning) implemented?
  - Clarity and organization of the code (modularity, documentation).
- Innovation and creativity in implementation.
- Originality check:
  - Similarity to existing solutions (penalty for high similarity).
  - Checks against AI-generated content.

## 5. Presentation and Reflection (30 Marks)

- Presentation Skills:
  - Clarity of explanation and engagement of the audience.
  - Use of slides and visuals to convey ideas effectively.
- Reflection:
  - Ability to discuss challenges, lessons learned, and potential improvements.
  - Insight into the process and decision-making steps.
- Deliverables:
  - 3-mins Recorded video of the presentation.
  - Clear documentation of the project work (5 pages is enough).

# Submission Guidelines and Reminders

- **DEADLINE:ALL SUBMISSIONS MUST BE COMPLETED BY 20th January 2025.**
- Deliverables:
  - Expert system code files.
  - Presentation slides.
  - Recorded video explaining your project.
- Late submissions will incur a penalty.

**Let's work together to make this project impactful and meaningful!**

# THANKS