LABORATORY FINAL EXAM / PROJECT SPECIFICATIONS:

Course: Artificial Intelligence and Machine Learning
Project Type: Hybrid AI System (Python + Visual Prolog)
Group Size: 2 Members
Project Title:

AI-Powered Faculty Stress Detector and Wellness Recommendation Expert System

1. Project Overview

Each group will design and implement a **hybrid intelligent system** consisting of:

1. **A Machine Learning component (Python)** that predicts a faculty member's **stress level** (Low, Medium, High) based on workload-related factors.
2. **A Rule-Based Expert System (Visual Prolog)** that generates personalized **wellness and workload recommendations** using defined rules, based on the stress level predicted by the Python component.

The main goal is to demonstrate understanding of both **data-driven learning** and **symbolic reasoning**, and the ability to integrate these into a unified AI solution.

2. Learning Outcomes

Through this project, students will be able to:

- Apply supervised machine learning to real-world problems.
- Interpret prediction outputs and use them as decision inputs for rule-based reasoning.
- Build a structured knowledge base and rule set in Visual Prolog.
- Integrate two different AI paradigms into a functional hybrid system.
- Collaborate and divide work effectively within a small team.

3. System Description and Required Components

A. Machine Learning Component (Python)

The Python-based ML module must:

1. Use a structured dataset containing information such as: (200-300 rows)
    - Number of subjects handled
    - Total number of students
    - Preparation hours
    - Research load
    - Committee and administrative duties
    - Meeting hours
    - Sleep hours
    - Frequency of weekend work

Faculty_ID	Subjects_Handled	Students_Total	Prep_Hours	Research_Load_Hours	Committee_Duties	Admin_Tasks	Meeting_Hours	Sleep_Hours	Weekend_Work
F001	4	120	10	8	2	3	6	6	3
F002	2	60	6	4	1	1	3	7	1
F003	3	90	8	5	0	2	2	8	0
F004	5	150	12	6	3	4	7	5	4
F005	3	80	7	3	1	1	5	7	1
F006	1	35	4	2	0	0	1	8	0
F007	4	110	9	7	2	1	6	6	2
F008	2	55	5	3	1	1	3	7	1
F009	3	75	6	4	1	1	4	7	0

Faculty_ID	Subjects_Handled	Students_Total	Prep_Hours	Research_Load_Hours	Committee_Duties	Admin_Tasks	Meeting_Hours	Sleep_Hours	Weekend_Work
F010	5	140	11	6	3	4	8	5	3

2. Train a predictive model that determines the faculty member's **stress level** categorized as:
    - **Low Stress**
    - **Medium Stress**
    - **High Stress**

Numerical Basis Formula for Stress Level
We assign a **Workload Stress Score (WSS)** using the variables in your dataset.
Each variable contributes points based on workload intensity.

1. Point Allocation per Variable

Variable	Low	Medium	High
Subjects Handled	1–2 = 1 pt	3–4 = 2 pts	5+ = 3 pts
Total Students	< 60 = 1	60–100 = 2	>100 = 3
Preparation Hours	< 6 = 1	6–10 = 2	>10 = 3
Research Load (hours)	< 4 = 1	4–6 = 2	>6 = 3
Committee Duties	0–1 = 1	2 = 2	3+ = 3
Administrative Tasks	0–1 = 1	2–3 = 2	4+ = 3
Meeting Hours	< 3 = 1	3–6 = 2	>6 = 3
Sleep Hours	7+ = 1	6 = 2	<6 = 3
Weekend Work Frequency	0 = 1	1–2 = 2	3+ = 3

2. Total Workload Stress Score (WSS)
Add all assigned points:

WSS = Sum of all variable points

Minimum score = 9
Maximum score = 27

3. Convert WSS into Stress Level

Total Score (WSS)	Stress Level
9–14	**Low Stress**
15–20	**Medium Stress**
21–27	**High Stress**

⭐ **Simple Example Calculation**
Suppose a faculty member has:

- 4 subjects → 2 pts
- 110 students → 3 pts
- 9 prep hours → 2 pts
- 5 research hours → 2 pts
- 2 committee duties → 2 pts
- 3 admin tasks → 2 pts
- 6 meeting hours → 2 pts
- 6 sleep hours → 2 pts
- 2 weekend work → 2 pts

$$WSS = 2 + 3 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 19$$

→ **Stress Level = Medium**

3. Produce a clear prediction output representing the computed stress level.
4. Generate a simple output file (e.g., text format) summarizing the predicted stress level, which will be used by the Prolog system.

B. Rule-Based Expert System (Visual Prolog)

The Visual Prolog system must:

1. Read the stress level output generated by the Python model.
2. Contain a structured knowledge base with:
    - **At least 10 facts** describing conditions or indicators related to faculty well-being and workload patterns.
    - **At least 6 rules** that map stress levels to appropriate recommendations.
3. Provide **specific and actionable recommendations** for each stress level.

Examples:

- For High Stress: workload adjustments, wellness breaks, reduced committee assignments
- For Medium Stress: time-blocking strategies, monitoring work cycles
- For Low Stress: maintaining routine, preventive wellness planning

4. Display clear recommendations along with a brief explanation of how the rules led to the conclusion.

4. Required Integration Workflow

The two components must function in sequence:

1. **Python ML Module**
    - Processes input
    - Predicts stress level
    - Writes result into an output file
2. **Visual Prolog Expert System**
    - Reads the stress level from the output file
    - Applies rules based on the input
    - Produces tailored wellness recommendations

The final system must demonstrate smooth communication between the two components.

5. Deliverables

Each group shall submit the following:

A. Digital Project Folder

Containing:

- Python program (ML component)
- Visual Prolog project (knowledge base + rules)
- Output file demonstrating the integration
- A consolidated folder structure with clear labeling

B. Project Documentation (2–4 pages)

Must include:

1. **Introduction:** Overview, problem significance, system purpose
2. **Methodology:**
    - Summary of the dataset
    - ML approach and stress level categories
    - Structure of the Prolog knowledge base and rules
    - Integration workflow
3. **System Outputs:** Screenshots or summarized outputs
4. **Reflection:** Roles of each group member, challenges, and insights

C. Demonstration

A brief run-through showing:

- How the stress level is predicted
- How the expert system provides recommendations
- How both components operate together

6. Assessment Criteria (100 Points)

Criteria	Points
ML Component Accuracy & Correct Output	30
Prolog Knowledge Base & Rule Quality	25
Integration & Logical Flow	20
Documentation Clarity & Completeness	15
Presentation & Demonstration	10

7. Roles and Responsibilities (2-Member Group)

To ensure balanced contribution, members should divide tasks as follows:

Member	Focus Area
Member 1	ML model development, dataset processing, generation of stress-level output
Member 2	Prolog knowledge base, rules creation, handling recommendation logic
Both	Integration, testing, documentation, and demonstration