Project Plan: Humanoid Robots and the Future of Work

Overview

Our project focuses on **Humanoid Robots and the Future of Work**, with a strong emphasis on building **mathematical models and equations** to study labor displacement, productivity changes, and job transformation. We will complement the theoretical analysis with a **dashboard** to present results and a **Streamlit app** for interactive exploration.

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1. Dashboard (Static + Analytical View)

The dashboard will act as a structured presentation of our findings. It will include:

- **Graphs and Charts**:
- Automation adoption curves (robots per 1,000 workers).
- Job displacement vs. time.
- Productivity growth vs. robot adoption.
- **Formulas and Results**:
- Employment Risk Index (ERI).
- Skill Gap Function.
- Productivity Gain Equation.
- **Comparative Scenarios**:
- Low automation vs. high automation outcomes.
- With vs. without re-skilling policies.
- **Sectoral Risk Heatmaps**:
- Which industries face the highest displacement risk.

👉 The dashboard will serve as the **final report in a visual format**, presenting clear, evidence-based insights.

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2. Streamlit App (Interactive + Experimentation Tool)

The Streamlit app will provide **interactivity**, allowing users to test scenarios using our equations.

- **User Inputs (Sliders/Fields):**
- Robot adoption growth rate (%).
- Wage factor.
- Speed of automation.
- Re-skilling investment level.
- **Live Outputs:**

- Dynamic recalculation of ERI, productivity, and job displacement.
- Interactive plots that update instantly when parameters change.
- **Mini-Simulations:**
- Example: “If robot adoption grows 5% per year, how many jobs are displaced in 10 years?”

👉The app shows that we not only built models but also created a **tool to explore the future of work mathematically**.

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3. Mathematical Formulas (Core to Project)

We will design simple yet effective equations, such as:

- **Employment Risk Index (ERI):**

$$ERI = f(A, W, S) = \frac{A \times W}{S + 1}$$

  Where *A* = automation speed, *W* = wage factor, *S* = skill/retraining investment.

- **Productivity Gain Equation:**

$$P = P_0(1 + \alpha A)$$

  Where α is elasticity of productivity to automation.

- **Displacement Function:**

$$D(t) = D_0 e^{\beta A t}$$

  Where β is sensitivity of displacement to automation speed.

These formulas will be visualized in the dashboard and made interactive in the Streamlit app.

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4. Value of the Approach

- Combines **mathematical rigor** with **practical interactivity**.
- Provides both a **research-style dashboard** and a **live demo tool**.
- Allows examiners to not only see results but also **experiment with the models** themselves.

👈**In summary:**
- The **Dashboard** will showcase static insights and polished results.

- The **Streamlit App** will act as an interactive sandbox where users can play with parameters and observe how mathematical models predict the future of work under humanoid robot adoption.