

KIRO – AI-Powered Physics Learning Platform

1. Vision & Problem Statement

KIRO is designed to bridge the gap between textual physics problems and conceptual understanding. Students often struggle to visualize abstract concepts such as motion, forces, temperature, and relationships. Our system converts natural language physics problems into interactive visual simulations, enabling learners to explore, manipulate, and understand concepts dynamically.

2. Website Architecture Overview

- Homepage – Futuristic landing page with animated background and project branding.
- Physics Module – Topic-based structured learning system.
- Concept Categories – Kinematics, Dynamics, Thermodynamics (2–3 fully structured modules).
- Lessons – Easy, Medium, Hard problem sets under each concept.
- Interactive Simulation Engine – Converts word problems into live visual simulations.
- Progress Tracking – Mark lessons as read and unlock next modules.
- Concept Test – Short quiz after each lesson to reinforce understanding.

3. Core Working Prototype (Demo Module)

Primary fully working module: Vertical Projectile Motion under Kinematics.

- AI extracts motion type, initial velocity, gravity from text.
- Real-time animated simulation of a ball motion.
- Interactive sliders for velocity and gravity.
- Live Height vs Time graph.
- Auto-calculated Maximum Height and Time of Flight.

4. Additional Structured Concepts

- Dynamics – Basic force visualization template (future scalable design).
- Thermodynamics – Temperature relationship visual template.
- Uniform Motion – Linear motion animation template.

5. AI Processing Pipeline

Step 1: User enters physics word problem. Step 2: LLM extracts structured JSON representation. Step 3: Physics Engine maps parameters to motion equations. Step 4: Simulation and graph render dynamically. Step 5: User modifies parameters to explore what-if scenarios.

6. UI/UX Design Philosophy

Dark futuristic theme with neon accents. Clean layout divided into: Left – Problem Input Center – Simulation Canvas Right – Parameter Controls Bottom – Live Graph Minimalistic design to enhance focus and visual clarity.

7. Scalability & Future Scope

- Support for multiple physics domains beyond motion.
- AI-generated adaptive difficulty levels.
- Gamified reward system for completed modules.
- 3D simulation expansion using WebGL or Three.js.
- Full curriculum mapping for STEM education.

KIRO is not just a simulation tool; it is a scalable AI-powered physics learning ecosystem designed to transform static problem statements into living conceptual experiences.