🔧 PART 2: Practical Implementation (50%)

✅ Task 1: Edge AI Prototype

Goal: Train and deploy a lightweight image classification model.

Tools:

- TensorFlow/Keras for model training.
- TensorFlow Lite for conversion.
- Google Colab to simulate Edge (or Raspberry Pi if available).

Suggested Project:

- **Title:** *RecycleNet: Real-time Recyclable Waste Classifier on Edge Devices*

Steps:

1. **Dataset**: Use Waste Classification Dataset on Kaggle.
2. **Model Training** (Colab/Jupyter):
    - Preprocess images (resize to 224x224).
    - Use `MobileNetV2` or `EfficientNetLite`.
    - Train with augmented data.
    - Evaluate (accuracy, F1-score).

Convert to TFLite:

```
import tensorflow as tf
converter = tf.lite.TFLiteConverter.from_saved_model('path_to_model')
tflite_model = converter.convert()
with open('model.tflite', 'wb') as f:
    f.write(tflite_model)
```

3.
4. **Simulate/Deploy**:

- Test using `tf.lite.Interpreter` in Colab.
- Optionally simulate hardware constraints (reduced CPU, low RAM).

5. **Write-up** (PDF):
    - Model architecture
    - Deployment steps
    - Accuracy metrics
    - Real-time Edge AI benefits (e.g., offline processing, low latency)

✅ Task 2: AI-Driven IoT Concept

Scenario: Smart Agriculture System

Title:

AgroAI: Intelligent Crop Monitoring and Yield Prediction System

Sensors:

- Soil moisture sensor
- Temperature/humidity sensor
- Light intensity sensor
- pH level sensor
- CO_2 levels (optional)
- Drone imagery (optional)

AI Model:

- Use a regression model (Random Forest or LSTM) to predict **crop yield** based on time-series sensor data.
- Optional: Use satellite or drone image classification for crop health.

Data Flow Diagram:

1. Sensors collect data →
2. Data sent via microcontroller (ESP32/Raspberry Pi) →
3. Stored in cloud/edge DB →
4. AI model processes data →
5. Dashboard shows predictions and alerts

Deliverable:

- 1-page PDF with:
    - Sensor list
    - Model description
    - Diagram (use draw.io or diagrams.net)
    - One-paragraph explanation of how AI improves decision-making in precision agriculture

---

✅ Task 3: Ethics in Personalized Medicine

Dataset: TCGA – The Cancer Genome Atlas (can reference existing studies if direct access is restricted).

Analysis Points:

- **Biases**:
    - Underrepresentation of minority groups in genomic datasets.
    - Historical medical inequities reflected in training data.
    - Data collected from one region/ethnicity generalized to all.
- **Fairness Strategies**:
    - Collect more diverse patient samples.
    - Implement fairness-aware algorithms.
    - Audit models regularly for biased outputs.

- Transparency in AI decision paths.

Deliverable:

- 300-word PDF/Markdown analysis titled:
  "Mitigating Bias in AI-Powered Cancer Treatment Recommendations"

🚀 PART 3: Futuristic Proposal (10%)

Prompt: Propose an AI system for 2030.

✅ Example Title:

NeuroLink AI: Brain-Computer Interface for Adaptive Learning

Problem:

- Many learners have different cognitive styles, and standardized education doesn't serve neurodiverse populations well.

AI Workflow:

- **Data Input**: Brainwave patterns (EEG), gaze tracking, biometric feedback.
- **Model**: Reinforcement learning model adapting content delivery based on real-time brain engagement.
- **Output**: Personalized learning content streamed via AR or neural interfaces.

Risks:

- Data privacy & mental manipulation.
- Cognitive dependency on machines.
- Brain health risks from prolonged interface use.

Benefits:

- True personalized education.

- Support for dyslexia, ADHD, and learning impairments.
- Lifelong learning enhancement.

Deliverable:

- 1-page concept paper PDF with:
    - Problem
    - AI system diagram
    - Workflow explanation
    - Ethical/social impact analysis

🧪 BONUS TASK (Extra 10%)

✅ Task: Quantum Computing Simulation

Tool: **IBM Quantum Experience**

Example Project:

Title: Quantum Drug Molecule Classifier

Task:

- Create a basic quantum circuit using Qiskit.
- Simulate a binary classifier (e.g., XOR logic gate).
- Discuss how Grover's algorithm could speed up molecular search (drug discovery).

Deliverable:

- Code screenshot or GitHub link
- Short explanation (200 words) of how quantum search optimizes AI workflows

---

✅ Submission Checklist

Task	Format	Submitted On
Edge AI Project	Code + PDF	✅ GitHub, Article
AIoT Smart Farm Proposal	PDF Diagram	✅ GitHub, Article
Ethics in Personalized Medicine	PDF Analysis	✅ Article
Futuristic Proposal	Concept PDF	✅ Article
Quantum Bonus	Code + Note	✅ GitHub

🔗 Resources

- TensorFlow Lite Guide
- IBM Quantum Docs
- Kaggle Edge AI Datasets
- Draw.io for Diagrams
