

Q1: Edge AI vs. Cloud-Based AI Latency Reduction: Edge AI processes data locally on devices (e.g., sensors, smartphones) instead of sending it to distant cloud servers. This eliminates network transmission delays, enabling real-time decisions (e.g., autonomous drones reacting to obstacles in milliseconds).

Privacy Enhancement: Data stays on-device, reducing exposure to breaches during transmission/storage. Sensitive information (e.g., facial recognition, health metrics) never leaves the user’s control.

Real-World Example: Autonomous Delivery Drones

Latency: Uses on-board cameras and Edge AI to detect trees, power lines, or moving objects, adjusting flight instantly. Cloud-based AI would introduce fatal delays (500ms+ roundtrip).

Privacy: Processes street/pedestrian imagery locally; only anonymized delivery data syncs to the cloud.

Trade-off: Edge devices have limited compute power vs. the cloud, but advances in efficient AI models (e.g., TinyML) mitigate this.

Q2: Quantum AI vs. Classical AI in Optimization

Aspect	Classical AI	Quantum AI
Approach	Uses binary bits (0/1); solves problems sequentially via algorithms (e.g., gradient descent).	Uses qubits (superposition/entanglement) to evaluate multiple solutions simultaneously.

Speed	Struggles with NP-hard problems (e.g., route optimization); complexity grows exponentially.	Solves certain problems exponentially faster (e.g., Shor's algorithm for factorization).
Limitations	Hits hardware limits (Moore's Law); inefficient for massive combinatorial spaces.	Requires near-absolute-zero temperatures; high error rates (NISQ era).

Logistics: Optimizing global supply chains with 10,000+ variables (e.g., FedEx routes).

Finance: Portfolio optimization or fraud detection across billions of transactions.

Energy: Modeling new materials for efficient batteries/solar cells.

Current State: Hybrid models (classical + quantum) dominate until error-corrected quantum computers arrive.

Q3: Human-AI Collaboration in Healthcare Societal Impact:

**Positive:**

Enhanced Accuracy: AI detects subtle patterns (e.g., tumors in X-rays), reducing misdiagnosis.

Efficiency: Automates administrative tasks (e.g., EHR documentation), freeing 30% of clinicians' time for patient care.

Accessibility: Expands reach to underserved areas (e.g., AI triage in rural telemedicine).

### **Risks:**

Job Anxiety: Fears of AI replacing roles, though evidence shows augmentation (e.g., radiologists focus on complex cases).

Equity Gaps: Bias in training data could worsen disparities (e.g., underdiagnosis in minority groups).

Over-reliance: Skill erosion if clinicians defer to AI without scrutiny.

### **Role Transformations:**

Radiologists: Shift from "scan reviewing" to AI-assisted diagnostics. Example: AI flags potential tumors in seconds; radiologists validate findings, correlate with patient history, and plan treatments.

Nurses: Wearable AI monitors patient vitals, alerting nurses to early sepsis signs. Nurses pivot from routine checks to empathic care and critical interventions.

Future Outlook: By 2030, 90% of hospitals may use AI collaboration tools, but human judgment remains irreplaceable for ethical decisions, patient rapport, and contextual nuance.