Bonus Task: Quantum Computing Simulation

Task: Create a Simple Quantum Circuit on IBM Quantum Experience

Code:

```
python
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from qiskit import QuantumCircuit, Aer, execute
qc = QuantumCircuit(2)
qc.h(0)            # Superposition
qc.cx(0, 1)        # Entanglement (CNOT)
qc.measure_all()

simulator = Aer.get_backend('qasm_simulator')
result = execute(qc, backend=simulator, shots=1024).result()
counts = result.get_counts()
print(counts)
```

Explanation: Quantum AI Optimization

This basic **entanglement circuit** (Hadamard + CNOT) creates a Bell state. In AI, such quantum states can help **simulate complex probability distributions** faster than classical systems. For example:

- In **drug discovery**, AI models must explore huge chemical combinations.
- **Quantum-enhanced AI** could collapse this search space exponentially faster by modeling multiple possibilities simultaneously (quantum parallelism).
- Combined with generative models (like GANs), quantum sampling can speed up finding optimal molecular structures for new treatments.

Future Possibility:

By 2030, integrating quantum processors with AI agents could optimize:

- Neural network training time.
- Simulation of natural systems (e.g., brain, climate).
- Real-time AI decision-making in dynamic environments.