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## A05 Module 05 Smart Cities Class Notes

(Hi Professor, I wasn't able to attend the last class, so I took notes from the PowerPoint)

### Smart Cities Building Blocks

- **Core Tech:** IoT, 5G, Edge Computing, AI/ML, Blockchain.
- **Infrastructure:** Smart roads, public transit, parking, environmental monitors.
- **Integration:** Data collection → analysis → action; real-time response, cross-system communication.

### AI in Smart Transportation

- **ML:** Predictive traffic analytics (30-60 mins ahead), weather modeling, event adjustments.
- **Deep Learning:** Computer vision (vehicle/pedestrian detection), decision support (autonomous navigation, safety).
- **Impact:** 20-30% less travel time, 15-25% fewer emissions, 40% faster incident response.

### Intelligent Traffic Management

- **Monitoring:** Cameras, IoT sensors, environmental monitors, vehicle tracking.
- **Control:** AI signals, dynamic speed, congestion prevention, emergency priority.
- **Metrics:** Faster response, less congestion, improved safety.
- **Metrics:** 80% fewer accidents, 60% better traffic flow, 25% less fuel use.

### Next-Gen Public Transit

- **Operations:** Dynamic routes, demand-responsive services, predictive maintenance.
- **AI Experience:** Real-time updates, personalized services, accessibility.
- **Metrics:** 35% less wait time, 45% better on-time performance, 28% more ridership.

## Smart Parking

- **Detection:** Real-time monitoring, AI occupancy prediction, license plate recognition.
- **User Experience:** Mobile apps, automated payments, EV charging.
- **Benefits:** 30% less search time, 40% less traffic, 25% more revenue, 20% fewer emissions.

## Urban Environmental Intelligence

- **Monitoring:** Air quality, noise, weather, water.
- **Analysis:** Pollution patterns, traffic impact, climate metrics.
- **Response:** Traffic adjustments, health alerts, green space management.
- **Impact:** 25% fewer pollution events, 30% better emergency response, 40% better resource use.

## Smart City Data & Analytics

- **Data Architecture:** Real-time streams, predictive modeling, cross-system integration.
- **Tools:** ML, pattern recognition, anomaly detection.
- **Visualization:** Dashboards, 3D modeling, public portals.
- **Security:** Anonymization, encryption, compliance.

## Smart Infrastructure

- **Physical:** Smart roads (self-healing, sensors), bridges (health monitoring), signals (adaptive control).
- **Digital:** Edge computing, real-time monitoring, digital twins.
- **Metrics:** 40% lower maintenance, 35% longer asset life, 50% faster incident response.