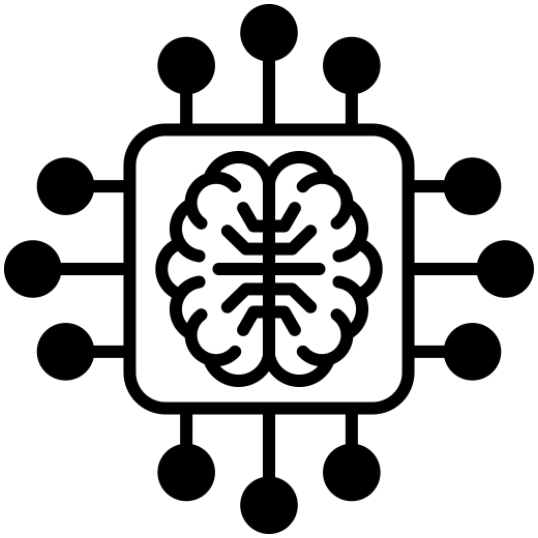
SBS4115 Fundamentals of AI & Data Analytics



AI and Data Science Future Trends

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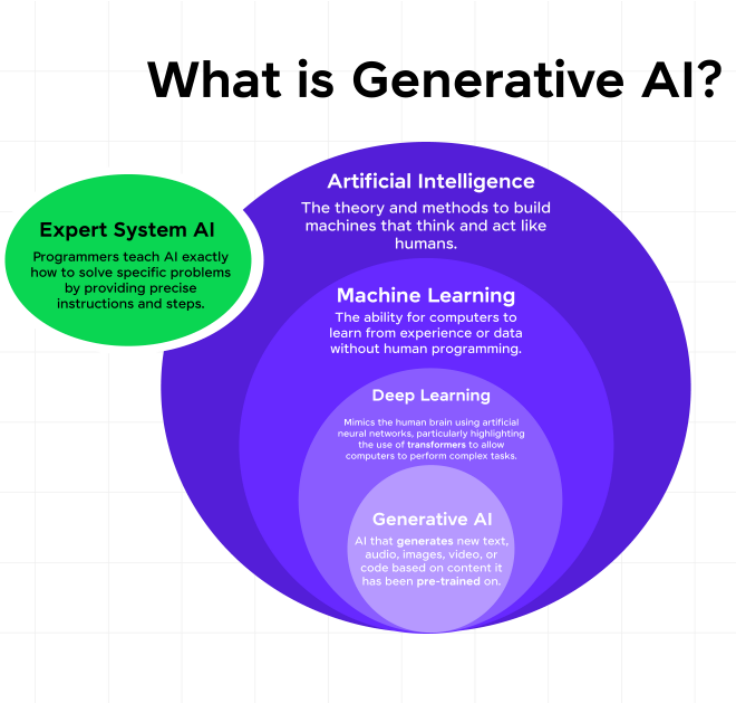
Intended Learning Outcomes

- By the end of this lecture, you will have revised on the following topics:
  1. Future Trends of AI and Data Science.
  2. Smart city and other applications of AI.
  3. Healthcare applications of AI.

Emerging Technologies in AI

- - Generative AI: GPT models, DALL-E for content creation and design.
- - Edge AI: Real-time decisions in IoT applications (smart homes, autonomous vehicles).
- - Quantum Computing: Solving complex problems, with scalability challenges.
- - Explainable AI: Transparency in decision-making (healthcare, finance).



Trends in Data Science

- - Automated Machine Learning (AutoML): Simplifies model building.

Automated Machine Learning (AutoML) is a process that automates the end-to-end tasks of applying machine learning to real-world problems. This includes data preprocessing, feature engineering, model selection, and hyperparameter tuning.

Trends in Data Science

- DataOps and MLOps: Automates pipelines and lifecycle management.

DataOps and MLOps are methodologies designed to streamline and automate different aspects of data and machine learning workflows, respectively.

DataOps

DataOps (Data Operations) focuses on improving the collaboration, integration, and automation of data management processes. It aims to streamline the entire data lifecycle—from data ingestion and preparation to analytics and reporting.

Trends in Data Science

Collaboration: Enhancing communication between data engineers, analysts, scientists, and business stakeholders.

Integration: Connecting various tools and platforms used in the data pipeline.

Automation: Implementing automated testing and deployment procedures to ensure data quality and consistency.

Trends in Data Science

MLOps

MLOps (Machine Learning Operations) focuses on the deployment, monitoring, and governance of ML models to ensure they perform well in production environments.

Key components of MLOps include:

Data Management: Ensuring data quality and consistency throughout the ML lifecycle.

Model Training: Developing robust training pipelines with version control for reproducibility.

Model Deployment: Automating the deployment process using CI/CD techniques.

Monitoring and Maintenance: Continuously monitoring model performance and updating or retraining models as needed

Applications of AI in Smart Cities

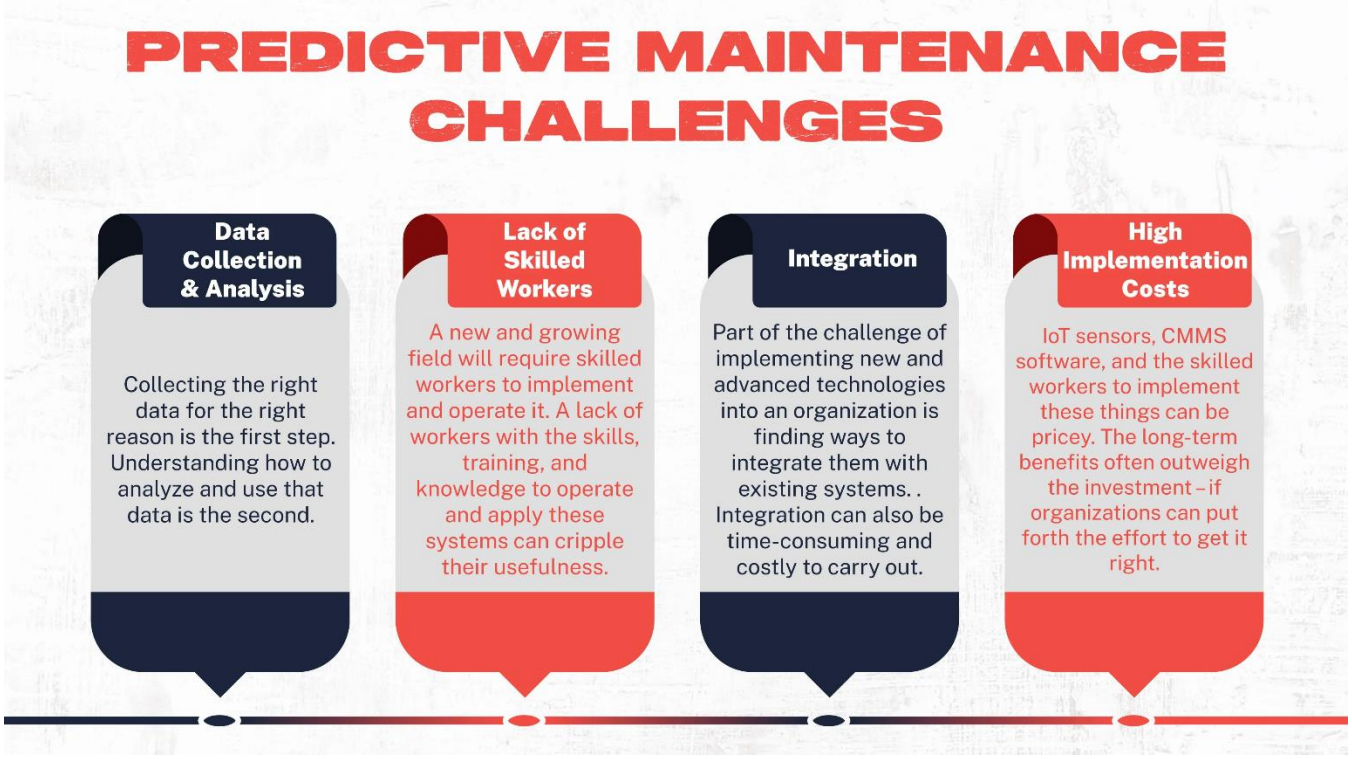
- - Traffic Optimization: Adaptive traffic signals in Los Angeles.
- - Energy Management: AI-powered smart grids for efficiency.
- - Waste Management: Smart bins with sensors (e.g., Singapore).

Applications of AI in Healthcare

- - Diagnostics: Analyzing medical images for anomalies.
- - Personalized Medicine: AI recommends treatments (IBM Watson Health).
- - Early Detection: Improves survival rates for diseases like lung cancer.
- - Benefits: Faster, more accurate diagnoses and tailored treatments.

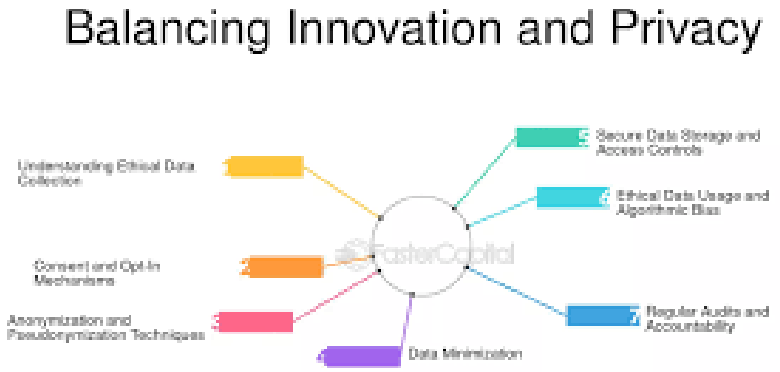
Applications of AI in Construction

- - Predictive Analytics: Forecasts material needs and timelines.
- - Predictive Maintenance: Anticipates equipment failures.
- - Safety Monitoring: Real-time alerts for safety breaches.



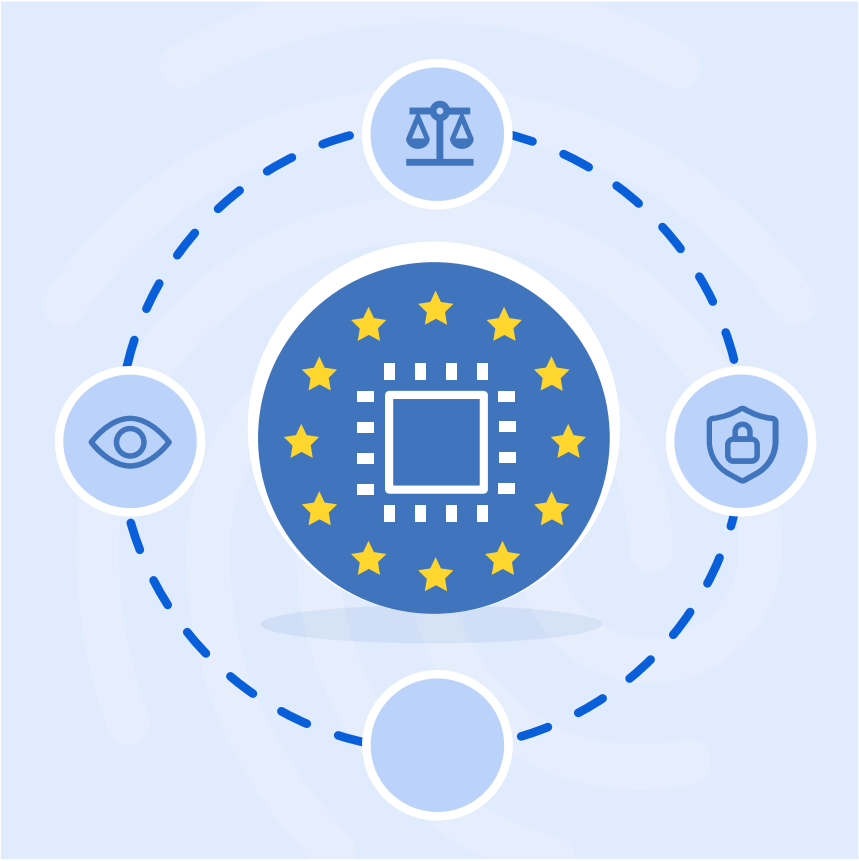
Ethical Aspects of AI: Overview

- - Key Issues: Data privacy, accountability, and algorithmic bias.
- - Challenges: Balancing innovation and ethical compliance.



Ethical Aspect: Data Privacy

- - AI relies on large datasets with personal information.
- - Risks: Data breaches, unauthorized access.
- - Solutions: Robust protection measures, compliance with laws.

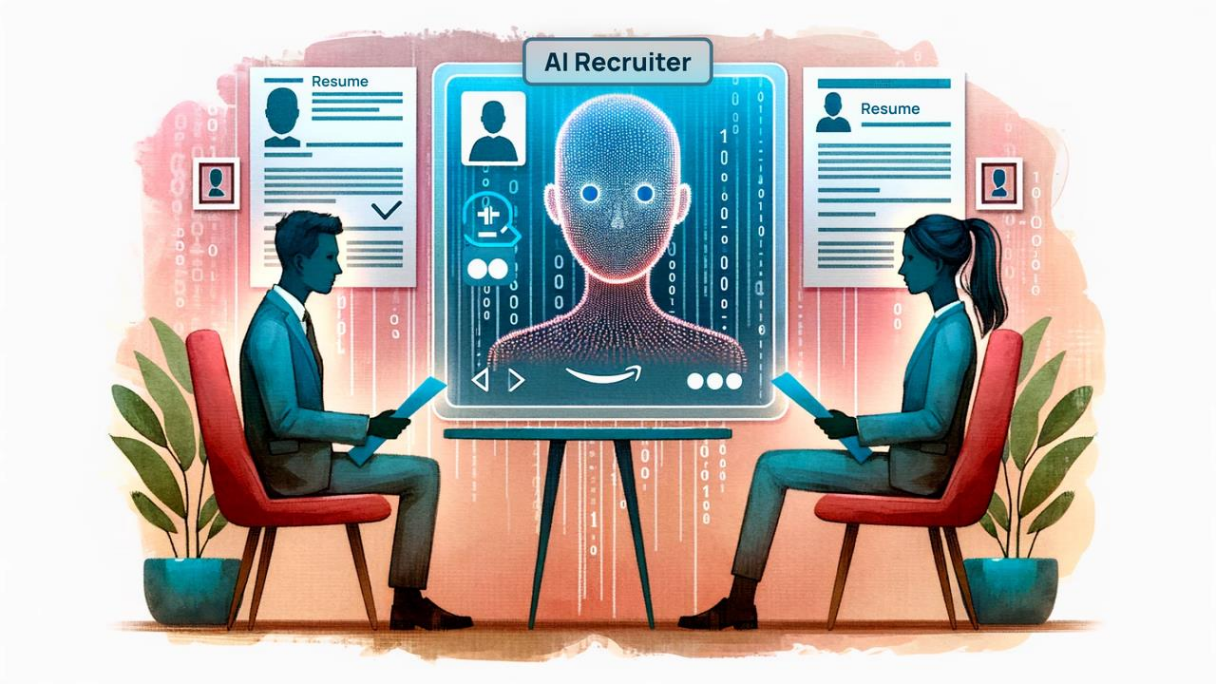


Ethical Aspect: Accountability

- - Impactful decisions in healthcare and law enforcement.
- - Responsibility unclear in cases of errors.
- - Solutions: Clear accountability frameworks.

Ethical Aspect: Algorithmic Bias

- - Bias from imbalanced data or flawed design.
- - Example: Amazon’s biased recruitment tool.
- - Solutions: Diverse datasets, audits, and transparency.



Solutions to Ethical Challenges

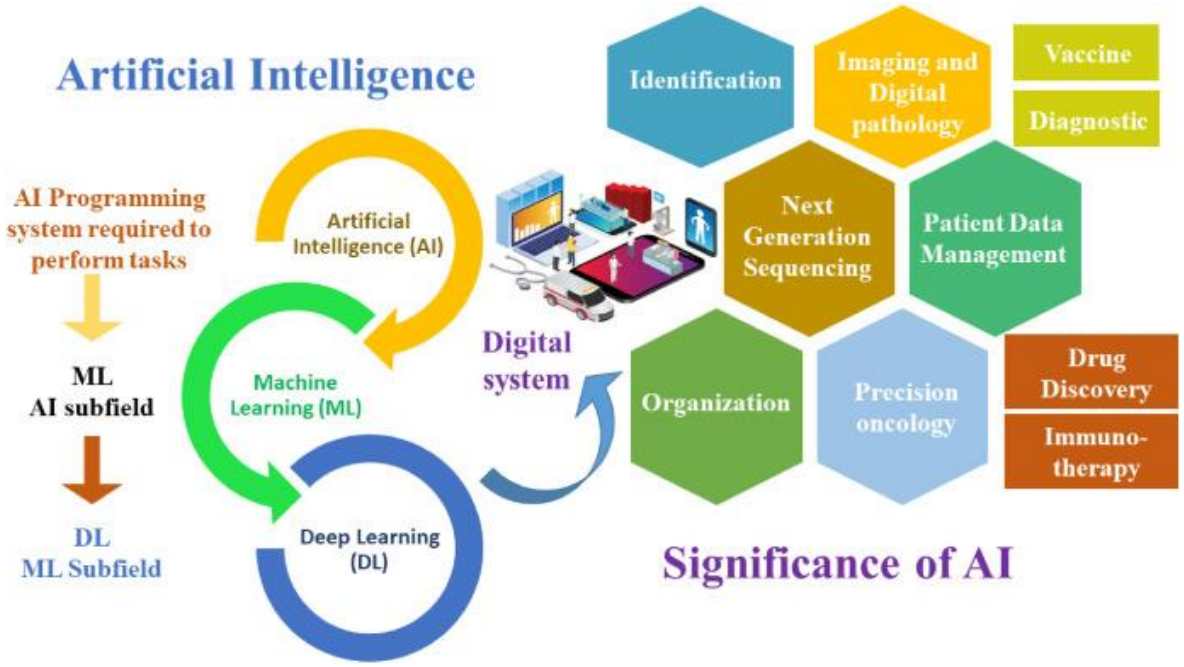
- - Use diverse datasets.
- - Conduct regular audits.
- - Ensure algorithm transparency.
- - Implement fairness algorithms.
- - Establish ethical guidelines.

Workforce Trends

- - Reskilling and upskilling for hybrid roles.
- - Collaborative AI enhances productivity.
- - Examples: AI in coding and creative workflows.

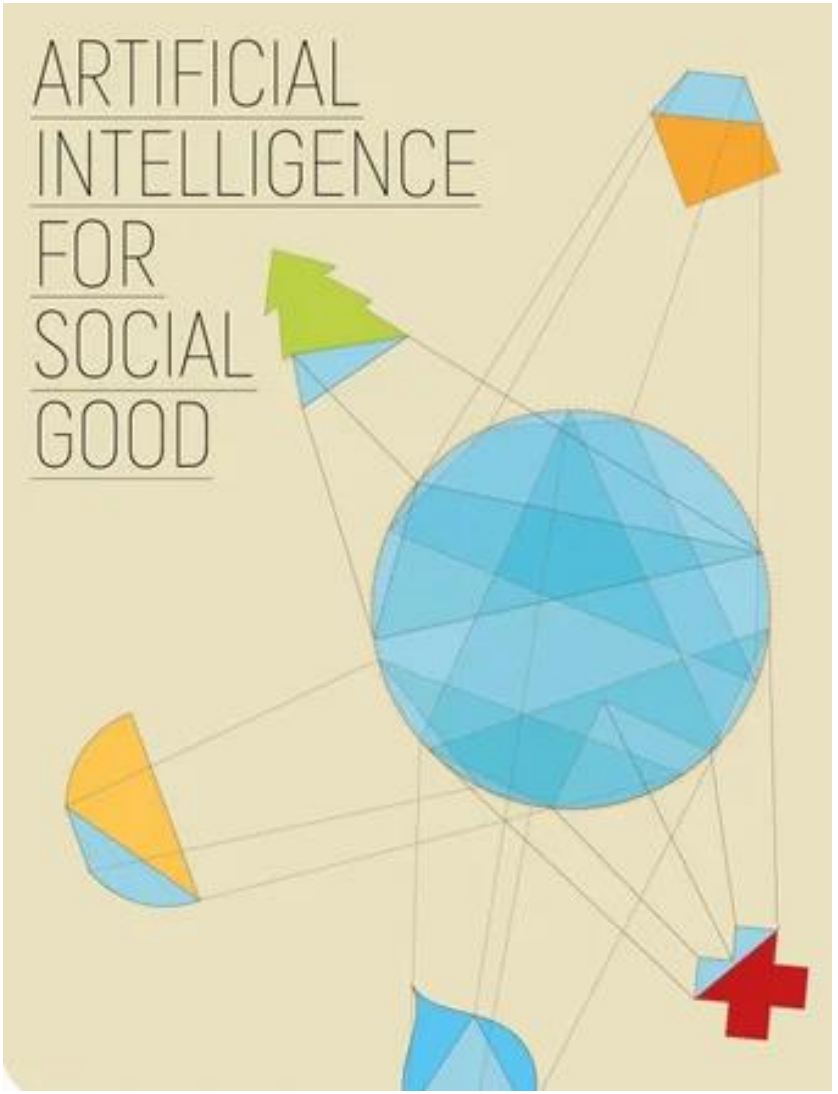
Future Research Directions

- - Narrow AI to General AI.
- - AI accelerating scientific discovery.
- - Interdisciplinary AI: Neuroscience, linguistics.



Global Impact of AI

- - Economic Transformation: Job automation vs. creation.
- - AI for Social Good: Education, disaster management.
- - Governance: Policymaking, cybersecurity, defense.



Conclusion

- - AI and Data Science drive innovation.
- - Addressing ethical challenges is crucial.
- - Responsible development shapes a better future.

Checklist

- Can you:
- 1. Describe future trends of AI and Data Science.
- 2. Describe smart city and other applications of AI.
- 3. Describe healthcare applications of AI.