

Foundations of Artificial Intelligence

Key Concepts, Components and Working Principles

Online Training on
“Leveraging AI for Transforming School Education”



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Introduction & Context

- ▶ NEP 2020 promotes emerging technologies
 - ▶ Need for inclusive, equitable education
 - ▶ AI supports teachers and learners
 - ▶ NCF-FS and NCF-SE: The integration of AI in school education supports competency-based, learner-centric and inclusive pedagogical practices.
- AI-enabled tools such that can assist teachers in addressing diverse learner needs, monitoring progress and enhancing classroom engagement.
 - intelligent tutoring systems,
 - adaptive learning platforms,
 - automated assessment,
 - learning analytics
 - educational chatbots

Program Objectives

- Understanding Fundamentals
- AI concepts & Components
- Working principles
- Classroom relevance
- Ethical & responsible AI use

What is Artificial Intelligence (AI)?

- ▶ Machines performing human-like tasks
- ▶ Learning, reasoning, decision-making
- ▶ **Simple Meaning:** Artificial Intelligence (AI) is the ability of a computer or digital system to think, learn, and make decisions in a way similar to humans, using data and experience.
- ▶ **👉 In simple words:**
AI helps machines learn from information and support humans in making better decisions.
- ▶ AI augments teachers, not replaces them

AI in Education – NEP Alignment

Learner-centric pedagogy

Competency-based education

Technology-enabled classrooms

What is Pedagogy?

- ▶ **Pedagogy** is the **art and science of teaching**.
- ▶ It refers to **how teachers plan, teach, interact with students, and assess learning** to help learners understand and apply knowledge.

- ▶ **Key Elements of Pedagogy**
- ▶ Pedagogy includes:
 - **Teaching methods and strategies**
 - **Classroom interaction**
 - **Learning activities**
 - **Assessment practices**
 - **Understanding learners' needs**

👉 **In simple words:**

Pedagogy is not *what* we teach, but *how* we teach.

How AI supports Pedagogy?

- AI supports **pedagogical practices**
 - Helps in personalized learning
 - Assists in formative assessment
 - Enhances classroom engagement
- ▶ **Important:**
AI supports pedagogy but **cannot replace the teacher's role.**

One-Line Definition:

Pedagogy is the method and practice of teaching that focuses on how learning takes place.

Why is AI Relevant to Teachers?

- ▶ AI is **not about robots replacing teachers.**
- ▶ It is about **supporting teachers** in:
 - ❖ Understanding students better
 - ❖ Personalising learning
 - ❖ Reducing repetitive work
 - ❖ Improving learning outcomes
- ▶ **NEP 2020 Perspective:**
 - AI is an enabler of quality, equity, and inclusion in education.

What AI Can Do (In Education)

- ▶ AI systems can:
 - ❑ **Learn** from student data
 - ❑ **Recognise patterns** (learning gaps, strengths)
 - ❑ **Predict needs** (remedial or enrichment support)
 - ❑ **Provide feedback** quickly
 - ❑ **Adapt content** to student pace and level
- ▶ **Example:**
Just like a teacher understands students better over time, **AI systems improve with experience.**

What AI is NOT

- ▶ It is important to clarify misconceptions:
 - ❌ AI does NOT replace teachers
 - ❌ AI does NOT think like humans
 - ❌ AI does NOT have emotions or values
 - ❌ AI does NOT make final educational decisions
- ▶ ✓ **Teachers remain the decision-makers**

Fundamental Concepts of AI in simple terms

1. Data

- AI works using **data**
- **In schools:** student answers, assignments, learning progress

2. Learning

- AI learns patterns from data
- Similar to how students learn from examples

3. Decision Support

- AI suggests actions (not commands)
- Teachers decide what to use

4. Continuous Improvement

- AI improves when more data is available

Working principles of AI Systems

- ▶ **Data:** Information collected for analysis and decision-making.
 - **Example:** Student performance, attendance, and learning behavior data help personalize and improve school education.
- ▶ **Algorithms:** Step-by-step procedures used to process data and solve problems.
 - **Example:** Educational algorithms analyze data to recommend learning paths and identify student strengths and gaps.
- ▶ **Technology platforms:** Digital systems that support and deliver services or applications.
 - **Example:** Digital platforms like LMS and educational apps deliver content, assessments, and feedback efficiently.
- ▶ **Human oversight:** Human involvement to monitor, guide, and ensure responsible use of systems.
 - **Example:** Teachers and educators guide, monitor, and ethically use technology to support meaningful learning.

Types of Artificial Intelligence

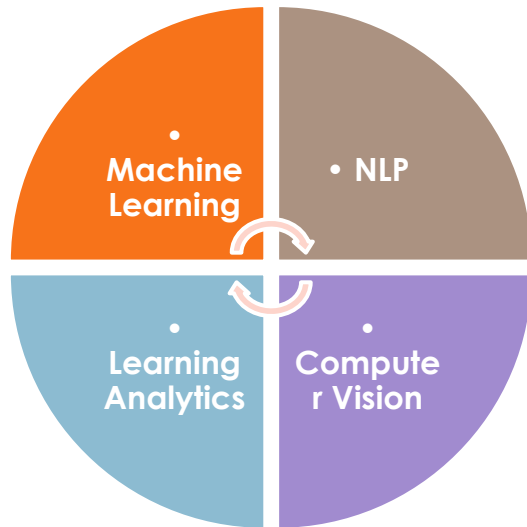
▶ **Narrow AI:**

- Specialized systems designed for specific tasks (e.g., facial recognition).
- **In education**, Narrow AI supports specific tasks such as automated grading, personalized learning recommendations, and attendance monitoring.
- **Example:** Siri, Google Assistant

▶ **General AI:**

- A theoretical concept where a machine can perform any intellectual task that a human can do.
- **In education**, General AI (theoretical) would be capable of teaching, mentoring, and adapting across all subjects like a human teacher.
- **Example:** Not yet realized but a goal for AI researchers

Key Concepts of AI



- ▶ **Machine learning** is a branch of artificial intelligence that enables computers to learn from data and improve performance without being explicitly programmed. It is widely used in applications like image recognition, recommendation systems, and predictive analytics.
- ▶ **Natural Language Processing (NLP)** enables computers to understand, interpret, and generate human language.
- ▶ **Learning analytics** involves collecting and analyzing educational data to improve learning outcomes and teaching effectiveness.
- ▶ **Computer vision** enables machines to interpret and understand visual information from images and videos.

What is Machine learning?

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1 ML is a way for computers to use information (or data) to make decisions or predict outcomes on their own.

2 The key here is that these computers are not directly instructed on how to perform these tasks; instead, they learn from the data provided to them.



3 It's like a student learning from books and lectures in school, gradually getting better at subjects over time.

What is Machine Learning in Simple Words?

intellspot.com



The Mechanics of AI

- **Machine Learning:**
It is a way for computers to learn from examples and improve over time, similar to how students learn from practice.
- **Key Algorithms:**
 - **Supervised Learning:** The computer learns using examples with correct answers, like students learning from a solved worksheet.
 - **Unsupervised Learning:** The computer finds patterns on its own, like grouping students based on similar learning styles.
 - **Reinforcement Learning:** The computer learns by trying, making mistakes, and improving through rewards, like learning through practice and feedback.
- **Role of Data:**
Data is the learning material for AI; better and more examples help the system learn more accurately, just as good textbooks help students learn better.

Natural Language Processing (NLP)

- ▶ **Natural Language Processing (NLP)** is a branch of Artificial Intelligence that enables computers to understand, interpret, and respond to human language.
- ▶ It allows machines to process text and speech in languages used by people.
- ▶ In education, NLP supports tools like chatbots, voice assistants, and language-learning apps.
- ▶ It helps in tasks such as automatic translation, speech recognition, and text analysis.
- ▶ NLP improves communication between humans and machines in a natural and meaningful way.

Learning Analytics

- ▶ **Learning Analytics** refers to the collection and analysis of student learning data to understand how students learn.
- ▶ It helps teachers track progress, identify learning gaps, and recognize strengths.
- ▶ Based on these insights, teachers can provide timely support and personalized instruction.
- ▶ Learning analytics supports data-informed teaching and improves overall learning outcomes.

Computer Vision

- ▶ **Computer Vision** is a branch of Artificial Intelligence that enables computers to see and understand images and videos.
- ▶ It allows machines to recognize objects, faces, text, and patterns in visual data.
- ▶ In education, computer vision is used in tools like facial recognition for attendance and image-based learning apps.
- ▶ It helps enhance interactive and visual learning experiences for students.



What is Generative AI?

What is Generative AI?

- **Definition of Generative AI**

- Generative AI is a subset of artificial intelligence that empowers machines to create original content, such as images, audio, text, and more.
- Unlike traditional AI, which focuses on analyzing data for predictions or decision-making, Generative AI generates new data by learning patterns from existing information.

- **Significance**

- Generative AI is revolutionizing industries by automating creative workflows, boosting productivity, and opening up new avenues for innovation and expression.
- Its influence stretches across various fields, from art and entertainment to healthcare and beyond.

Applications of Generative AI

- **Fields of Application**

Generative AI is revolutionizing several domains, including:

- **Art and Design:** Tools like DALL-E and DeepArt enable users to create visually captivating art.
- **Music Creation:** AI systems can compose original music, opening up new possibilities for sound exploration and artistic expression.
- **Text Generation:** Models like ChatGPT generate human-like text for a variety of applications, from chatbots to articles.

- **Real-World Examples**

- **DALL-E:** An AI model that generates unique images based on textual descriptions, transforming creative ideation.
- **ChatGPT:** A conversational AI that produces context-aware text responses, enhancing interactions and content generation.

Benefits and Challenges of Generative AI

Advantages

- **Creativity:** Boosts artistic expression by generating novel ideas and content.
- **Efficiency:** Automates repetitive tasks, enabling creators to focus on more complex and meaningful work.

Ethical Considerations

- **Misuse:** There is a risk of generating deepfakes and spreading misinformation.
- **Bias:** AI systems may inadvertently amplify biases that exist in the training data.

Conclusion

It is crucial to understand both the potential and the challenges of Generative AI in order to use its power responsibly.

AI in Classroom Practices

▶ **Personalized learning**

- AI helps each student learn at their own pace by providing content suited to their level and needs. It supports slow learners with remediation and advanced learners with enrichment.

▶ **Adaptive assessments**

- AI-based assessments automatically adjust the difficulty of questions based on student responses. This helps assess true understanding rather than rote memorization.

▶ **Automated feedback**

- AI provides instant feedback on quizzes, assignments, and practice activities. This helps students correct mistakes quickly and supports continuous learning.

▶ **Student support**

- AI tools like chatbots and learning assistants help students clear doubts anytime. They provide guidance and resources, especially outside classroom hours.

Pedagogical Integration

- ▶ • Align with learning outcomes
- ▶ • Support formative assessment
- ▶ • Differentiated instruction

Common AI Technologies Teachers Already Use & Can Use

- ▶ **Many teachers are already using AI unknowingly:**
 - ◆ Google Search suggestions
 - ◆ YouTube video recommendations
 - ◆ Voice assistants
 - ◆ Spell check & grammar tools
 - ◆ Online quizzes with instant feedback

- ▶ These are **basic AI applications**.


AI in the Classroom – Simple Examples

- Adaptive worksheets based on student level
- Automatic feedback in online tests
- Language learning apps
- Chatbots for doubt clarification
- Learning analytics dashboards

National Digital Platforms


- ▶ **DIKSHA (Digital Infrastructure for Knowledge Sharing)**

 **Website:** <https://diksha.gov.in/>

 A national digital education platform by NCERT/MoE providing free curriculum-linked learning resources, teacher courses, and interactive tools for students and educators.


- ▶ **PM e-Vidya**

 **Website:** <https://pmevidya.education.gov.in/>

 A Government of India initiative that unifies online, TV, radio, and other multimedia channels to ensure widespread access to educational content for school learners.

- ▶ **CIET – NCERT (Central Institute of Educational Technology)**

 **Website:** <https://ciet.ncert.gov.in/>

 A constituent unit of NCERT focusing on development and dissemination of educational technology, digital content, and media for improving teaching-learning processes.

Online AI platforms available for classrooms

- ▶ Dedicated AI Educational Assistants
- ▶ **Khanmigo (Khan Academy):** A top-rated AI personal tutor and teaching assistant. Unlike generic AI, it is designed to guide students toward finding answers themselves rather than giving direct answers. It covers math, science, and humanities, and helps teachers with lesson planning and scaffolding.
- ▶ **MagicSchool.ai:** A widely used platform for teachers that offers over 80 specialized tools for lesson planning, creating IEPs, and generating rubrics.
- ▶ **Eduaide.Ai:** Designed by educators, this tool helps create instructional materials, graphic organizers, and educational games, allowing teachers to quickly generate and customize lesson content.
- ▶ **SchoolAI:** Focuses on real-time student insights and personalized learning, offering tools for in-class activities and providing teachers with data on student progress.

General AI Tools Adapted for Education

- ▶ **Google Gemini (in Education):** Integrated into Google Workspace, it assists teachers with lesson planning and students with research.
- ▶ **NotebookLM:** Allows users to upload documents, such as textbooks or lecture notes, to create a focused, AI-driven study guide.
- ▶ **ChatGPT/Claude:** These tools are used for brainstorming, generating study tips, and simplifying complex topics.
- ▶ **QuillBot:** This writing assistant is frequently used for summarizing text, paraphrasing, and checking for grammatical errors.
- ▶ **Gamma AI:** Gamma AI is used for creating presentations and slideshows from text prompts.

Ethical & Responsible AI (Teacher's Responsibility)

- ▶ Teachers must ensure:
 - **Student data privacy:**
 - Student personal and learning data must be protected and used only for educational purposes.
 - **Fair and inclusive use:**
 - AI tools should treat all students equally without bias or discrimination.
 - **Age-appropriate tools:**
 - AI applications used in schools must be suitable for students' age and maturity level.
 - **Human judgment in assessment:**
 - Teachers must make the final decisions in assessment, not AI systems.

- ▶ This aligns with **NEP 2020's values-based education.**

Governance & Policy Perspective

- ▶ **Human-in-the-loop:** Teachers remain actively involved in guiding, monitoring, and validating AI-supported decisions.
- ▶ **National education goals:** AI use should align with curriculum standards and broader educational objectives of the nation.
- ▶ **Teacher capacity building:** Training teachers to effectively and confidently use AI tools in teaching and learning.

Key Takeaways

- ▶ • AI supports quality education
- ▶ • Teachers remain central
- ▶ • Ethical AI is essential

One-Line Takeaway for Teachers:

Artificial Intelligence is a powerful digital assistant that helps **teachers personalise learning, improve teaching effectiveness, and support every learner**—ethically and responsibly.

Reflection & Closing

- ▶ **How can AI support your classroom?**
- ▶ AI can support the classroom by helping teachers personalize learning, save time on routine tasks, and better understand student progress.
- ▶ **Responsible and informed use of AI**
- ▶ When used responsibly and with proper guidance, AI becomes a **supportive teaching tool—not a replacement—empowering teachers** to focus more on creativity, critical thinking, and student engagement.

Thank you

