Generative AI and LLM

Introduction to GenAI and LLM
CS5202

Course Instructor : Dr. Nidhi Goyal

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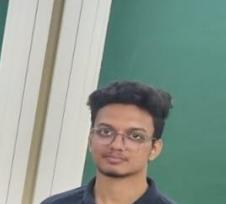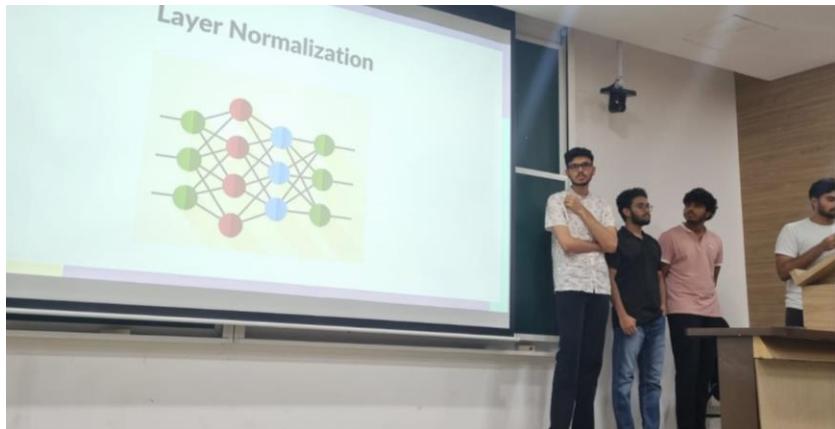
Who am I?

- **Research interests**
  - Generative AI, Large Language Models, Natural Language Processing, Knowledge Graphs, Graph Neural Networks, Computational Neuroscience, Computer Vision, Brain Computer Interfaces, Generative AI and solving real-world problems

- **Experience (Research and Teaching)**
  - Taught NLP for multiple semesters (CS3216/AI5203) at Mahindra University to B.Tech (CSE/AI/ECM) and M.Tech students.
  - Ph.D from IIIT-Delhi and PMFDR fellow in collaboration with InfoEdge India Limited
  - Applied researcher in NLP, Knowledge Graphs, Graph Neural Networks Former Assistant Professor, GGSIPU, New Delhi
  - Former Assistant Professor, DCE, Gurgaon
  - TA for many courses- COA, Privacy and security on Online social media @IIIT, NPTEL, NLP course PGDSAAI@IIIT-Delhi

Dr. Nidhi Goyal
(Assistant Professor, Ecole School of Engineering)

Previous Course Offerings (NLP) /CS3216/AI5203

Lecture Plan

- Course Logistics
- Course Outcomes
- Content/Syllabus
- Grading Policy
- Why should you learn GenAI and LLM?
- What is Intelligence, AI, GenAI?
- Applications
- Resources

Course Logistics

- Attendance is mandatory!!
- All attendance is via QR codes
- "Missing Minor exams will not be given re-test. If a student misses it due to genuine and verifiable reason(s), she/he will be given weightage for the missed exam(s) on a pro-rate basis of performance in the end-sem exam."

- Lecture Timings:
  - Monday: 4:30-5:30 PM
  - Thursdays- 1:35 PM–2:35 PM
  - Fridays- 3:30 PM -4:30 PM   (Strictly adhere to class timings)
- Slack, help sessions/office hours (for all course questions/discussion)
  - Slack for assignments, doubts, course announcements, deadlines, etc.
  - Office hours start **Wednesday (4:00-5:00 pm)**, Location- **IT2 block, 2nd floor, New faculty office!**
- For any queries: *nidhi.goyal@mahindrauniversity.edu.in*
  - Use email judiciously for important/urgent communication
- Follow Course page for resources, materials, etc. We've put a lot of other important information on the class webpage (Link to be published soon).
- Slide PDFs and other resources shall be uploaded before each lecture.

Smooth functioning of Course

- Slack for assignments, doubts, course announcements, deadlines, etc.
  - Create your account on slack with Your Roll number as username.
  - Get yourself added to below channels by your instructor or TAs
    - course-announcements
  - Be active to check slack notifications for course related information!!
  - First communication point for doubts on slack (#doubts channel).
  - Healthy discussions among peers lead to effective learning.

Slack workspace

- https://join.slack.com/t/generativeai-b048297/shared_invite/zt-3o182hdom-5hbyGqQSdwNRpq7kp5~y5A

Course Outcomes

After the successful completion of this course , the students will be able to:

CO1: Explain the fundamental concepts and architectures of generative AI and Large Language Models including embeddings, transformers, and training objectives.

CO2. Demonstrate knowledge of prompt engineering techniques and Retrieval-Augmented Generation (RAG) pipelines to enhance GenAI models.

CO3. Develop multimodal generative AI systems using models such as CLIP, BLIP, Stable Diffusion, and ControlNet for various applications.

CO4: Design and implement small-scale GenAI projects, applying learned techniques to real world problems.

Pre-requisites

- Natural language processing
- Neural Networks

Course Content/Syllabus

Details are found here: [Syllabus-GenAI](#)

Grading Policy

Type of Evaluation	% Contribution in Grade
Minor 1 and Minor 2	30 (15+15)
Majors	20
In class activity/quiz	20
Project	30

Cheating Policy

- Exams and quizzes are to be completed individually. Verbal collaboration on homework assignments is acceptable, but
    - you must not share any code or other written material,
    - Everything you submit must be your own work, and
    - you must note the names of anyone you collaborated with on each problem (the only exceptions are the instructors and TAs), and the nature of the collaboration (e.g., "X helped me," "I helped X," "X and I worked it out together.").

- If you find material in published literature (e.g., on the Web) that is helpful in solving a problem, you must cite it and explain the answer in your own words.

- The project is to be completed by a team; you are not permitted to discuss any aspect of your project with anyone other than your team members, the instructor, and the TAs.

- You are encouraged to use existing NLP components in your project; you must acknowledge these appropriately in the documentation.

The influence of technology on academic distraction: A review

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Abstract

The detrimental effects of academic distraction have become increasingly problematic in recent years due to student media multitasking. In recent years, educators have gradually transitioned many classes to the online learning environment, effectively reducing teacher supervision. This has been greatly exacerbated with the advent of coronavirus disease 2019 and subsequent social distancing guidelines. In an effort to help students and educators better understand the implications of technology on academic distraction and academic performance, this literature review discusses the effects of three forms on technology on student distraction: laptops, smartphones, and social media use, particularly the social media platform Facebook. While the effects of student laptops on academic distraction are somewhat ambivalent, the debate is largely moot in the current educational environment. The detrimental effects of student smartphone and social media use on academic distraction are more conspicuous, especially with the pervasiveness of personal digital devices. Potential self-regulatory and environmental interventions are discussed.

KEYWORDS

academic distraction, Facebook, laptops, learning, media multitasking, online learning, performance, phubbing, smartphones, social media

No Mobile phones during the class!!

Academic Performance Degradation
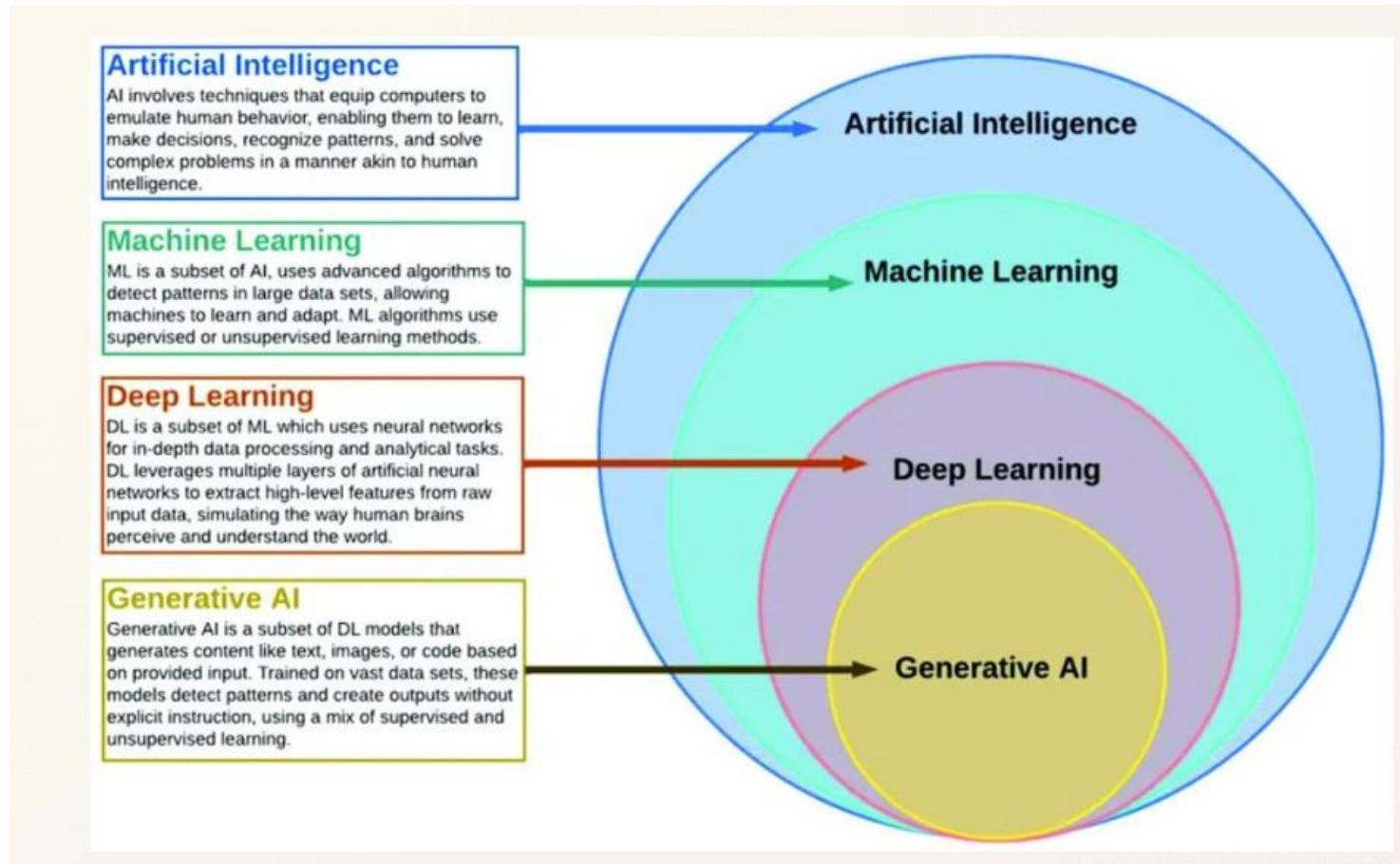
A study by the National Center for Education Statistics revealed that students who engaged with their phones during class sessions scored an average of **11% lower** on tests and assignments.

The underlying mechanisms responsible for this performance degradation include:

• **Reduced Attention Span:** The constant stream of notifications and digital stimuli primes the brain for instant gratification, diminishing the capacity for sustained focus on complex academic material.

• **Working Memory Overload:** Frequent task-switching between academic content and digital distractions can overload working memory, hindering the encoding of new information into long-term memory.

• **Context Switching Costs:** Shifting focus between different tasks, even momentarily, incurs a cognitive cost. Re-engaging with the primary task requires additional processing power, further diminishing overall efficiency.

Mobile phone Replacement with Neurobics (Some mental exercises for 2-3 mins!)

References

https://research.google/research-areas/

https://research.ibm.com/topics/natural-language-processing

https://openai.com/research/better-language-models

Resources

Foster D. Genera 6. Deep Generative Modeling, Jakub M. Tomczak, Springer 2022
Building a large language model from scratch -Generative deep learning. " O'Reilly
Media, Inc.; 2023