Proposal for a New Course

Department of Computer Science and Engineering, Indian Institute of Technology Kanpur

Title: Generative Artificial Intelligence

Course number: CS787

Proposers: Dr. Subhajit Roy and Dr. Arnab Bhattacharya

Units: 3-0-0-0 [9]

Pre-requisites: Bachelor-level algorithms, statistics and programming courses or consent of instructor

Estimated student enrollment: 50

Course Description:

Artificial Intelligence (AI) has become an important tool in almost every discipline. Recent advances in large language models (LLMs) has generated a lot of interest in generative AI techniques.

In this course, the basics of generative AI will be covered. The course will have three broad dimensions. First, it will discuss how language models are trained and how they generate output. Next, the course will discuss effective ways of using these generative AI models. Finally, important applications using generative AI techniques will be discussed.

Besides the lectures by the instructor, the students will be asked to present a recent paper in the class and to participate in the discussion. They will also be required to complete a group project that will provide them with a hands-on experience on working with the techniques taught in the class.

Course Contents: 27 lectures/40 hours

1. Artificial Neural Networks – 7 lectures

    - Feed-forward Networks
    - Recurrent Neural Networks (RNN)
    - Convolutional Neural Networks (CNN)

2. Transformers – 3 lectures

3. Large Language Models (LLMs) – 2 lectures

   - Pre-training
   - Continual pre-training
   - Fine-tuning

4. Using LLMs – 2 lectures

   - Prompting strategies
   - Thought structures

5. Retrieval-augmented Generation (RAG) – 2 lectures

6. LLM Agents – 3 lectures

7. Multi-modal LLMs – 4 lectures

8. Applications of Generative AI – 4 lectures

Reading Material: The material will be mostly taken from various journal articles, conference proceedings, blog posts, teaching videos, etc. available online.

Signature of proposers

The course is approved / not approved.

Convenor, DPGC   Chairman, SPGC
Dept. of CSE