



## IIT KHARAGPUR AI4ICPS I HUB FOUNDATION

Hands-on Approach to AI, Cohort-2, July – October 2024

### Assignment 12: GANs, VAEs, LLMs

Due date: Friday 4<sup>th</sup> October 2024, EOD – IST.

#### Important Instructions for submitting solutions

1. Submit the solution to all questions in the assignment should be submitted in a **single PDF file with not more than 500 words**.
2. Any plagiarism if detected will automatically attract **zero marks** for that assignment.
3. It is preferable if the **text of PDF file can be extracted** through a PDF extractor e.g. PyPDF. For example, pictures of handwritten text are not extractable, whereas PDF generated by MS Word, Latex, etc., are.
4. Exceptionally good solutions with extractable text may receive **special appreciation** from the teachers.

#### Questions

1. Discuss the factors that contribute to better domain generalization in Large Language Models (LLMs). How do aspects such as model architecture, training data, and finetuning techniques impact an LLM's ability to perform in domains unseen during pretraining?
2. Explain the concept of mode collapse in Generative Adversarial Networks (GANs). What are its symptoms, and how does it affect the quality and diversity of generated outputs?
3. Compare and contrast Variational Autoencoders (VAEs) with standard autoencoders. What unique capabilities do VAEs offer, particularly in terms of latent space representation and generative abilities?
4. Analyze the runtime complexity of transformer-based text encoder models in relation to input sequence length. How does the self-attention mechanism influence this complexity, and what are the implications for processing long sequences?