**Section 1 : Topic Submission Form**

This form should be submitted by the mentioned deadline.

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Course:             MS(Artificial intelligence and Machine Learning  )    \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_

**Fill your topic/s below**

Project Title/Area 1:

Inter-agent Communication in Simulated Environments: A Study and implementation of the CAMEL Framework                                                                            \_\_

Dataset:       1)  https://huggingface.co/datasets/camelai/ai\_society                                                             2)   https://huggingface.co/datasets/camel-ai/code       \_\_ \_

Description:  This might involve a thorough examination of the CAMEL framework for multi-agent communication and its efficacy in various simulated scenarios.                                                                         \_\_\_

Project Title/Area 2:    Leveraging Large Language Models for Enhanced Multimodal Question Answering

Dataset:https://huggingface.co/datasets/liuhaotian/LLaVA-Instruct-150K                                                                            \_\_ \_

Description: In this research topic, the primary focus would be on exploring the integration of vision models and Large Language Models (LLMs) to improve performance in multimodal question answering from images/docs

Project Title/Area 3

Intelligent Risk Mitigation in Property and Casualty Insurance: An Automated Approach to Address Parsing, Validation, and Natural Hazard Scoring

Dataset:  1) [conll2003 · Datasets at Hugging Face](https://huggingface.co/datasets/conll2003)

2) [xtreme](https://huggingface.co/datasets/xtreme) \_\_ \_

3) [openstreetmap](https://www.openstreetmap.org/#map=4/21.84/82.79)

4) https://earthquake.usgs.gov

Description:

The property and casualty (P&C) insurance market is critical to guaranteeing societal financial stability and resilience in the face of natural disasters and other dangers. The evaluation of various risks, particularly those associated to natural disasters, is an essential part of the underwriting process. Traditional procedures frequently include time-consuming manual evaluations that are not only inefficient but also prone to error.

We are proposing innovative technique for automating risk management in the property and casualty insurance industry. By automatically recognizing and parsing addresses from risk reports, our suggested methodology accelerates the risk assessment process. It then validates these addresses against a large database to confirm the accuracy and dependability of the data. Following validation(OPENSOURCE), the model incorporates data from GIS (OPENSOURCE )to evaluate natural hazard ratings, such as flood risk.

**Fill in this section if a member of staff has agreed to be your supervisor:**

Member of Staff:                                                                                   \_\_\_\_

If you have found a supervisor then you and the member of staff who agreed to supervise your project should sign below.

\_\_\_\_\_Nikhil\_\_\_\_\_\_\_\_\_\_                                                                        \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Signature                                                                         Supervisor Signature

\_\_\_\_\_11/7/2023\_\_\_\_\_\_\_\_                                                                            \_\_\_\_\_\_\_\_\_\_\_\_

Date                                                                                               Date

**Section 2 : Topic Selection Research**

**Table 1 : Topic 1**

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| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| CAMEL: Communicative Agents for "Mind" Exploration of Large Scale Language Model Society | https://arxiv.org/pdf/2303.17760v1.pdf | AI Society dataset is composed of 25K conversations between two gpt-3.5-turbo agents. This dataset is obtained by running role-playing for a combination of 50 user roles and 50 assistant roles with each combination running over 10 tasks. | In this paper, we focus on studying communicative agents under AI-AI cooperative scenarios where they share pure common interests. In particular, we are studying the assistant-user scenario, where a preliminary idea is given at the start. Agents will conceptualize the idea into a specific task and complete it autonomously through conversations. | https://huggingface.co/datasets/camelai/ai\_society |
| Language Models as Agent Models | https://arxiv.org/pdf/2212.01681.pdf |  | The study also reviews the recent literature, showcasing that LMs, despite their training limitations, can infer and use representations of fine-grained communicative intentions, beliefs, and goals. The paper argues that even though LMs are not perfect and can make errors, they can serve as a foundation for systems that communicate and act with intention |  |
| Improving Factuality and Reasoning in Language  Models through Multiagent Debate | https://arxiv.org/pdf/2305.14325v1.pdf |  | The study found that this approach significantly enhances the models' performance across various tasks, improving their mathematical and strategic reasoning abilities. Notably, it also increased the factual accuracy of the generated content, reducing incorrect answers and hallucinations that are common issues with existing models. |  |
| First-Explore, then Exploit:  Meta-Learning Intelligent Exploration | https://arxiv.org/pdf/2307.02276v1.pdf |  | The paper introduces a reinforcement learning (RL) framework called "First-Explore" that aims to address the sample inefficiency problem in standard RL. Despite its successful application to diverse and complex tasks, conventional RL is still significantly less sample efficient than humans, often requiring hundreds of thousands of episodes to learn tasks that humans can grasp in just a few attempts |  |
| Multi-Agent Actor-Critic for Mixed  Cooperative-Competitive Environments | https://arxiv.org/pdf/1706.02275v4.pdf |  | This paper investigates the use of deep reinforcement learning (DRL) methods in multi-agent environments. Traditional DRL algorithms face issues in such scenarios: Q-learning struggles with the non-stationary nature of the environment, while policy gradient methods suffer from increased variance as the number of agents grows |  |
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**Table 2 : Topic 2**

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| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| Visual Instruction Tuning | https://arxiv.org/abs/2304.08485 | LLaVA Visual Instruct 150K is a set of GPT-generated multimodal instruction-following data. It is constructed for visual instruction tuning and for building large multimodal towards GPT-4 vision/language capability. | The study presents a novel method for improving the instruction tuning of large language models (LLMs), specifically within the realm of multimodal applications. The authors leveraged GPT-4 to generate multimodal language-image instruction-following data, and this data was then used to develop a new model known as LLaVA (Large Language and Vision Assistant). LLaVA is an advanced multimodal model that combines a vision encoder and LLM, exhibiting strong multimodal chat abilities and achieving high performance on a synthetic multimodal instruction-following dataset. When further optimized on Science QA, LLaVA and GPT-4 together achieved a record-breaking accuracy of 92.53%. The authors have made their data, model, and codebase publicly available. | https://huggingface.co/datasets/liuhaotian/LLaVA-Instruct-150K |
| MiniGPT-4: Enhancing Vision-Language Understanding with Advanced Large Language Models | https://arxiv.org/abs/2304.10592 | Image text pairs | The study introduces MiniGPT-4, a model that combines a frozen visual encoder and a frozen Large Language Model (LLM) known as Vicuna, using a single projection layer. Despite its compact structure, MiniGPT-4 exhibits many capabilities similar to its full-scale counterpart GPT-4, such as generating detailed image descriptions and creating websites from hand-written drafts | https://huggingface.co/datasets/Vision-CAIR/cc\_sbu\_align |
| SELF-INSTRUCT: Aligning Language Models with Self-Generated Instructions | https://arxiv.org/pdf/2212.10560v2.pdf | contains 52K instruction-following data we used for fine-tuning the Alpaca model. This JSON file is a list of dictionaries, each dictionary contains the following fields:   * instruction: str, describes the task the model should perform. Each of the 52K instructions is unique. * input: str, optional context or input for the task. For example, when the instruction is "Summarize the following article", the input is the article. Around 40% of the examples have an input. * output: str, the answer to the instruction as generated by text-davinci-003. | The study introduces SELF-INSTRUCT, a framework that improves the instruction-following capabilities of pre-trained language models by leveraging their own generations. | https://github.com/tatsu-lab/stanford\_alpaca/blob/main/alpaca\_data.json |
| LoRA: Low-Rank Adaptation of Large Language Models | https://arxiv.org/pdf/2106.09685v2.pdf |  | The paper proposes Low-Rank Adaptation (LoRA), an approach to adapting large pre-trained language models for specific tasks without having to retrain all parameters. This method freezes the pre-trained model weights and adds trainable rank decomposition matrices to each layer of the Transformer architecture, reducing the number of trainable parameters considerably. |  |
| LLM-Adapters: An Adapter Family for Parameter-Efficient Fine-Tuning of Large Language Models | https://arxiv.org/pdf/2304.01933v2.pdf |  | This paper introduces LLM-Adapters, a framework designed to make adapter-based parameter-efficient fine-tuning (PEFT) methods more accessible for large language models (LLMs) like LLaMA, BLOOM, OPT, and GPT-J. PEFT is a popular technique for fine-tuning LLMs because it allows for comparable or better performance while only requiring a few external parameters to be fine-tuned. |  |
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**Table 3 : Topic 3**

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| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| Attention Is All You Need | https://arxiv.org/pdf/1706.03762.pdf |  | The paper proposes a new network architecture, the Transformer, for sequence transduction tasks such as machine translation. Unlike traditional models that use complex recurrent or convolutional neural networks with an encoder-decoder structure, the Transformer is based solely on attention mechanisms, thereby eliminating the need for recurrence and convolutions. |  |
| BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding | https://arxiv.org/abs/1810.04805v2 |  | The paper introduces a new language representation model named BERT (Bidirectional Encoder Representations from Transformers). Unlike previous models, BERT pre-trains deep bidirectional representations from unlabeled text, conditioning on both left and right context simultaneously in all layers. |  |
| Artificial Intelligence on Property and Casualty Insurance | https://www.ejece.org/index.php/ejece/article/view/473 |  | This text discusses the application of advanced technologies, particularly Artificial Intelligence (AI) and Machine Learning (ML), in the Property and Casualty Insurance sector. By leveraging these technologies, insurance providers can offer more efficient and direct services to their customers at lower costs. AI and ML have various uses in this sector, such as preventing fraudulent claims, enabling faster and more accurate business decisions, predictive data analytics, and improving customer satisfaction. |  |
| RoBERTa: A Robustly Optimized BERT Pretraining Approach | https://arxiv.org/pdf/1907.11692v1.pdf |  | RoBERTa (Robustly optimized BERT approach) is a method for pretraining natural language processing (NLP) models that builds on BERT's language masking strategy. The approach dynamically adjusts the masking pattern applied to the training data. In essence, it trains the model on a corpus of text where some percentage of the input words are masked, and the goal for the model is to predict the original vocabulary ID of the masked word based only on its context. |  |
| OpenStreetMap: Challenges and Opportunities in Machine Learning and Remote Sensing | https://arxiv.org/pdf/2007.06277v1.pdf |  | OpenStreetMap (OSM) is a freely available, editable map service created by community volunteers. The quality of OSM is varied due to the different mapping skills of contributors. This work reviews recent machine learning methods aimed at improving OSM data. These methods either improve the coverage and quality of OSM layers using GIS and remote sensing technologies or use existing OSM layers to train models for applications like navigation or land use classification. The integration of OSM with machine learning has the potential to revolutionize remote sensing data interpretation and enhance the quality of participatory map making. |  |
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