

## **I. Conduct your own research on Natural Language Processing (NLP)**

Natural Language Processing (NLP) is a branch of AI and Machine Learning whereas the focus of the study relies on the interaction between linguistics, computer science, and machine learning to generate a response similar to a human language by analyzing large amounts of data. Key applications of NLP includes but are not limited to: Sentiment Analysis, Machine Translation, and Chatbot systems. Recent advances can be observed directly by publicly available NLP-based architectures such as GPT that uses transformer-based architecture to advance the capabilities of NLP that results in the world-wide popularity of GPT due to it enabling contextual awareness in machines[12].

In Business Industries, machine learning are prevalent in enhancing customer service as it allows automated queries that can resolve up to 70% of standard queries and provide 24/7 support greatly benefitting companies in their operational capacity as Chatbots are trained using NLP models in order to understand and respond to human queries in real time which results in an overall increase of 30% in customer satisfaction because of a reduce in waiting times[13] [14].

## **II. Identify what NLP has to do with Machine Learning and Deep Learning**

NLP has reached great advancements and are deeply intertwined with both Machine Learning and Deep Learning. Traditional ML techniques such as Support Vector Machines and Decision Trees were initially used for developing NLP in methods such as spam detection, sentiment classification and text categorization. Meanwhile, the NLP heavily relies on deep learning in its ability to deliver accurate response due to its performance in learning from experiences over large amounts of data such as Recurrent Neural Networks (RNNs) for example. We can closely observe the difference between NLP with ML and DL because the latter enables real-time translation, conversational AI, voice assistance, and personalized marketing strategies. In addition, According to Zhong and Zhuang, RNNs and FNNs (Feedforward Neural Networks), which are both architectural principles in the field of deep learning are able to process vast amounts of data such as text and speech to deliver context-aware predictions in business applications[2].

## **III. Identify the potential benefits associated with implementing NLP and Deep Learning in business activities.**

Deep Learning is a set of practice widely prominent throughout the world. As observed around the world specifically companies in the industry leveraging the use of the field of IT

and Computer Science, it has seen numerous benefits in integrating NLP and deep learning in the following methods:

- **Enhanced Customer Experience:** Chatbots and Virtual Assistants helps by providing 24/7 availability which reduces business costs at the same time, it also improves customer satisfaction. For example, DigitalGenius, a company that uses NLP and DL in their customer support, namely, CoPilot System to resolve repetitive inquiries automatically [2].
- **Increased Productivity and Efficiency:** DL by design are used to handle high-volume tasks such as sentiment classification faster and more accurately than humans. This results in innovations such as NLP-based document classification and summarization tools to automate business workflows[1].
- **Improved Sales and Marketing:** An organization called Persado follows the principles of data-driven decisions whereas they explicitly called out that Human creativity, while essential are insufficient and requires detailed insights from AI, in which they specifically use NLP in the way they personalizes marketing messages based on user profiles and emotional tone which are proven to generate conversions by up to 49.5% [2].
- **Cost Reduction:** Chatbots and Voice Assistants as mentioned in the above reduces the need for a large customer service team to cater to the customers 24/7 therefore, lowering operational costs. Businesses that implements such technologies has seen 30% reductions in support costs, 45% faster call handling, and 13.8% increased agent productivity [3] [4].
- **Risk Mitigation:** DL models provides the ability to analyze customer behavior and predict potential churn as observed in Castanedo's model for customer churn prediction using deep learning achieved a performance of 77.9% UAC, while the numbers may not be impressively high as in the ranges of 95%, it is still an acceptable amount as it outperforms traditional methods [2].

### **I. What have you initially learned about ML, DL and NLP?**

Machine Learning (ML) could be considered as the traditional type of AI whereas the most primitive functionalities are present here while Deep Learning is the advanced type of Machine Learning utilizing algorithms that can learn from its own experience and without manual intervention required for the feature engineering, accuracy tests and so on unlike the former. NLP on the other hand, utilizes both technology at some capacity, however, most businesses prefer Deep Learning as it offers more benefits than ML at the cost of expertise. [5] [6] [7]

### **II. What do you expect to further learn about Machine Learning (ML), Deep Learning (DL), and NLP on this course?**

Previous experiences on the subject of Machine Learning included the traditional algorithms of K-Nearest Neighbors, Logistic Regression, Linear Regression, Decision Trees, Support Vector Machines, Ensemble Learning, and Feedforward and backpropagation Neural Networks. Therefore, the more advanced branch of Deep Learning techniques are expected to be learned such as the technology of the popular GPT models, the transformer neural networks for the NLP on the course are highly expected due to its applications and solutions on real-world problems like chatbots, sentiment analysis and text classification. [8] [9]

### **III. How do you anticipate these topics will relate to your future career as an IT professional?**

As an aspiring IT professional, especially in the constantly-evolving fields like software development and data analytics, whereas the technology in a span of 5 years have evolved into such an extent namely, GPT, among the trends in the industry—the knowledge of ML, DL and NLP is invaluable in such that NLP can be used to build applications such as chatbot, voice-activated systems, and automated support help desks that enhances user accessibility, ML and DL would greatly help in deriving insights from large datasets and at some capacity, automate tasks like report generation and anomaly or bug detection within a system or architecture. It must be noted that ML, DL, and NLP enables data-driven

decisions due to its analysis and therefore provide business intelligence and strategy that benefits the organization, businesses then, are increasingly reliant on these topics that will be covered throughout the semester. [10] [11]

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