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| **AI ASSIGNMENT 1** |
| **ChatGPT: Friend or Foe** |
| **CSY3025** |

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# **Introduction:**

Chatbots are computer programs that use artificial intelligence (AI) and natural language processing (NLP) to understand customer questions and automate responses by simulating human conversation.  Chatbots make it easy for users to find the information they need without the need for human intervention by responding to user questions and requests through text input, voice input, or both. Chatbot technology is almost everywhere, from smart speakers at home to messaging apps at work.

Chat Generative Pre-Trained Transformer (Chat GPT) is an artificial intelligence chatbot developed by Open AI and launched in November 2022. It is built on and refined from Open AI's GPT-3 and GPT-4 families of large language models. It utilizes supervised reinforcement learning techniques to separate itself from its counterparts. Launched as a prototype on November 30, 2022, Chat GPT quickly caught people's attention for its detailed and clear responses across many knowledge domains. After the release of Chat GPT, Open AI estimated net worth was $29 billion in 2023. However, its irregular errors have been recognized as significant drawbacks.

# **2. Background:**

Chat GPT is an AI chatbot developed by Open AI. It's a simulated chatbot designed primarily for customer service. But people also use it for various other purposes. These range from writing essays to designing business plans to generating code. Chat GPT also can generate conversational text which raises ethical concerns about its potential to generate fake messages or other misleading content. This can have serious consequences such as defamation, dissemination of false information, or incitement of violence.  This creates concerns in the sector of education and learning and makes people wonder whether it is a friend or a foe.

# **3. Review:**

**NLP:**

When designing a chatbot, it is essential to identify whether the bot would use.

A simple decision tree or an NLP (natural language processing). Chat GPT is a pre-trained generative chat that uses NLP and AI to generate responses. NLP refers to the branch of computer science, and more specifically the branch of artificial intelligence (AI), which deals with giving computers the ability to understand text and spoken language in the same way that humans do. NLP combines computational linguistics (rule-based modeling of human language) with statistics, machine learning, and deep learning models. Combined, these technologies allow computers to process human speech in the form of text or audio data and fully understand the speaker's or writer's intentions and emotions.   
NLP controls computer programs that translate text from one language to another, respond to voice commands, and quickly summarize large amounts of text in real-time. NLP is also playing an increasingly important role in enterprise solutions that help streamline business operations, increase employee productivity, and simplify mission-critical business processes. The NLP aids the computer in simplifying human text and voice by focusing on factors such as speech recognition, grammatical tagging, word sense disambiguation, named entity recognition, co-reference resolution, sentiment analysis, and natural language generation.

**Large Language Models:**LLM processes large amounts of text data and infers relationships between words in the text. These models have grown in recent years as computing power has advanced. LLM performance improves as the size of the input data set and parameter space increases.

**Self-Recognition:**

The Generative Pre-Training Transformer (GPT) model was first introduced as GPT-1 by open AI in 2018. The model was further developed in 2019 with GPT-2, in 2020 with GPT-3, and most recently with Instruct GPT and Chat GPT in 2022. Prior to the integration of human feedback into systems, the greatest advances in the development of GPT models were driven by the attainment of computational efficiency. This allowed GPT-3 to train on much more data than his GPT-2, giving it extra data. Diverse knowledge base received and ability to perform a wider range of tasks.

 All GPT models use the Transformer architecture. So, there is an encoder that processes the input sequence and a decoder that produces the output sequence. Both the encoder and decoder have multi-headed self-awareness mechanisms that allow the model to weight parts of the sequence differently to infer meaning and context. Additionally, the encoder uses masked language modeling to understand relationships between words and produce more understandable responses.  
  
The self-recognition mechanism that drives GPT works by transforming tokens (chunks of text that can be words, phrases, or other groups of text) into vectors that represent the token's importance in the input sequence. To do the model follows the following process:

1. Creates a query, key, and value vector for each token in the input sequence.
2. Compute the similarity between the query vector from step 1 and the key vector of every other token by taking the dot product of the two vectors.
3. Feed the output of step 2 into a SoftMax function to generate normalized weights.
4. Multiplying the weights generated in step 3 by each token's value vector yields the final vector representing the importance of the tokens in the sequence.

Instead of performing steps 1-4 once, the model iterates through this mechanism multiple times in parallel, each time generating new linear projections of the query, key, and value vectors. By extending self-awareness in this way, the model can capture the partial meaning and more complex relationships in the input data.

**Supervised learning:**

Supervised learning, also known as supervised machine learning, is a subcategory of machine learning and artificial intelligence. It is defined by using a labeled dataset to train an algorithm that classifies data or accurately predicts outcomes. As input data is fed into the model, the weights are adjusted until the model fits well. This is done as part of the cross-validation process. Supervised learning uses a training set to train a model to achieve a desired output. This training dataset contains the inputs and correct outputs that allow the model to learn over time. The algorithm measures its accuracy through a loss function and adjusts until the error is well minimized. Supervised learning can be divided into two types of problems, classification, and regression in data mining.

**Training model:**

1. Supervised Fine Tuning (SFT) Model:

In early development, 40 contractors were hired to fine-tune the GPT-3 model and created a supervised training data set with known outputs as inputs for the model to learn from. Inputs or prompts were gleaned from actual user input to open APIs. The labeler then wrote appropriate responses to the prompts and produced known outputs for each input. The GPT-3 model was refined using this new supervised dataset to produce his GPT-3.5, also known as the SFT model.

1. Reward Model:

Once the SFT model is trained in step 1, the model produces better-tuned responses to user prompts. The next improvement comes in the form of training a reward model. The input of the model is a series of prompts and responses, and the output is a scaled value called a reward. The reward model uses reinforcement learning. In reinforcement learning, the model learns to produce outcomes to maximize the reward.

1. Reinforcement Learning Model:

In the final stage, the model is presented with random prompts and responses. The responses are generated using the "guidelines" the model learned in step 2. A guideline represents a strategy that a machine has learned to use to achieve its goals. In this case, we maximize the reward. Then, the scaler reward value for the request-response pair is determined based on the reward model created in step 2. The reward is then fed back into the model for further guideline development.

1. Evaluation of the Model

Model evaluation is performed by setting aside a test set during training that the model is not looking at. A series of evaluations are run on the review unit to determine whether the model is better tuned than its (GPT-3) predecessor.

**Parameters:**

GPT-2, GPT-3, Chat GPT, and possibly GPT-4 all belong to the same family of AI models: Transformers. This differs from previous generations of machine learning models as they are trained to solve more uniform tasks (a.k.a. meta-learning), and do not need to be re-trained for each specific task to produce actionable results. Essentially, AI researchers collect vast amounts of training data. Then use that data and lots of computing power to generate a large language model (LLM).  The deep learning neural network used in GPT-3 consists of approximately 175 billion ML parameters. Microsoft's Turing NLG model with 10 billion parameters was the largest trained language model prior to GPT-3. By early 2021, GPT-3 became the largest neural network ever created. The model must be flexible enough to switch between different data it learns based on user input. The user then provides an input query describing the task and some examples and the model can generate results. This approach is called ‘few-shot learning’ and has become a recent trend when it comes to providing inputs to modern transformer models.

**Hyperparameters:**

A hyperparameter is a parameter whose value controls the learning process and determines the value of the model parameter that the learning algorithm ultimately learns. The prefix "hyper\_" indicates that these are "top-level" parameters that control model parameters in the training process and results. Examples of hyperparameters are:

* Batch size:  
  Batch size refers to the number of samples used in one iteration of training. A larger stack size requires more memory but allows the model to converge faster.
* Token:  
    
  A token is a sequence of characters in text data. For example, in the sentence: "I am a robot", "I", "am", "a", and "robot" are all tokens.
* Learning rate:  
  The learning rate is a hyperparameter that controls the learning speed of the model. A high learning rate means that the model learns faster, but it can also converge to a suboptimal solution.
* Epoch:  
  An epoch refers to a complete pass through the entire dataset during training. For example, if your dataset has 100 samples and you set the batch size to 10, he needs 10 iterations (or "steps") to complete an epoch.
* Fast weight loss:  
  The prompt loss weight is a parameter used to balance the loss function during fine tuning. This is used to control the relative importance of the prompts during training and the model's own predictions.

Other hyperparameters are:

• Train-test split ratio

• Learning rate in optimization algorithms (e.g. gradient descent)

• Choice of optimization algorithm (e.g., gradient descent, stochastic gradient descent, or Adam optimizer)

• Choice of activation function in a neural network (nn) layer (e.g. Sigmoid, ReLU, Tanh)

• The choice of cost or loss function the model will use

• Number of hidden layers in an nn

• Number of activation units in each layer

• The drop-out rate in nn (dropout probability)

• Number of iterations (epochs) in training a nn

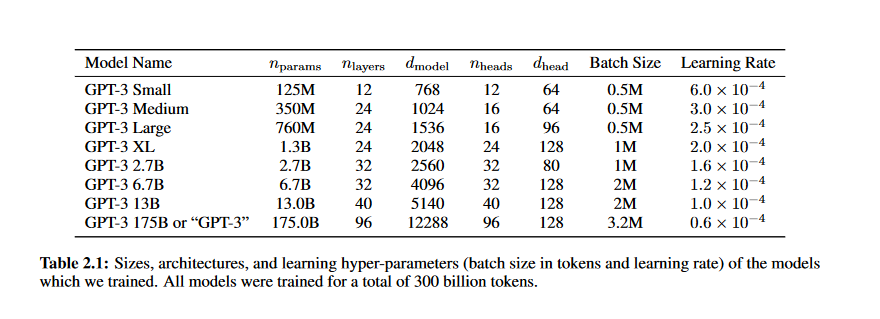
• Number of clusters in a clustering task

• Kernel or filter size in convolutional layers

• Pooling size

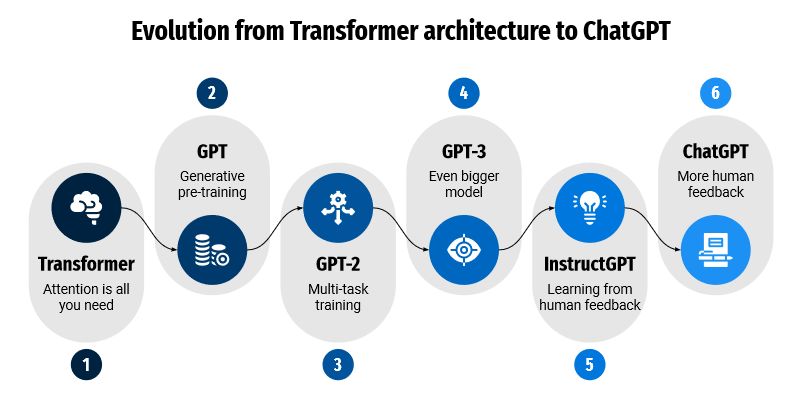
• Batch size

Below are the hyperparameters of GPT3:



**Transformer Architecture:**

As the Generative Pre-training Transformer acronym suggests, Chat GPT is a generative language model based on the Transformer architecture. These models can process large amounts of text and learn how to perform natural language processing tasks very effectively. Notably, the GPT-3 model has a size of 175 billion parameters, making it the largest language model ever trained. For GPT to work, it must be trained on a large amount of text. For example, the GPT-3 model was trained on a text set containing over 8 million documents and over 10 billion words. From this text, the model learns to perform natural language processing tasks and generate consistent, well-written text. Once the model is sufficiently trained, GPT can be used to perform various tasks as described in the previous section. Reinforcement learning based on human feedback was used for training. Ultimately, through supervised fine-tuning, A human AI trainer conducted conversations representing both the user and the AI ​​assistant. In addition, coaches received a written proposal to help draft the proposal. So they merged this new dataset with his Instruct GPT dataset which was converted to dialog format.  
  
To develop a reward model for reinforcement, The first task was to collect comparative data. It consisted of two or more model responses ordered by quality. So, to collect the data, developers took some conversations trainers had with Chat GPT and randomly selected them. As such, they tested different endings for their coaches to rank.  
As such, these reward models can be tuned using Proximal Policy Optimization aka guidelines as mentioned above. Also, the training was conducted on the Microsoft Azure platform on a supercomputer. Finally, text input is provided to the model to use GPT in chat. This input can be in the form of questions or contextual statements. And from that input, GPT will generate good and coherent responses. In fact, this response can be used in chatbots and other applications that need to generate text from certain inputs.



# **4. Analysis of common use cases and their positive and negative impacts on humans:**

Chat GPT is a deep learning tool that essentially tries to "outperform" other models by creating more realistic images, text, and sounds. Labs like Open AI train AI on massive datasets from billions of users to get better and more refined results.  
  
These tools have many exciting and positive applications. But even so, a lot of negligence can be seen regarding the possible exploitation of this technology. The various features that Chat GPT can help users with are:

1. It can translate any text into another language of user’s choice.
2. It can have AI write computer code. Give it a scenario and Chat GPT can write the code for it. It can also debug the code.
3. It can write a poem or an entire song. This learned creativity of Chat GPT sets it apart from other chatbots.
4. It can write essays on any topic. It can even write an entire research paper.
5. Create content for marketing, product descriptions, blogs, and more.
6. Any concept or topic can be explained at the required level of complexity. It can teach quantum physics in a way even a child can understand.
7. Solve math problems and common academic challenges, by providing detailed step-by-step instructions.
8. It can have a conversation.

**Literature Review:**

Is Chat GPT Biased Against Conservatives?

In this article, the researchers use Chat GPT to create Irish Limerick. During the creation process, patterns were observed that appear to produce positive limericks for Liberal politicians and negative limericks for Conservative politicians. After identifying this pattern, the sample size is increased to 80, and performed some mathematical calculations to see if the actual results differed from the probability theory assumptions. The AI, at least in some cases, turns out to be biased toward supporting liberal politicians and opposing conservatives.

Chat with Chat GPT on Interactive Engines for Intelligent Driving:

Chat GPT, a chatbot introduced by Open AI, has been making waves on the internet. Their potential functionality and implications for various industries are widely debated. In the field of intelligent vehicles, the integration of human-machine interaction systems and Chat GPT could be a game changer. For example, Jidu Auto, Baidu's electric vehicle division, announced in February 2023 that it would integrate his ERNIE Bot, Baidu's Chat GPT-like service, into its vehicles. Chat GPT has advanced the development of intelligent interactions, but there are still some limitations that prevent its practical use. This article describes potential applications in smart vehicles and analyzes the challenges faced.

ChatGPT: Fundamentals, Applications, and Social Impacts:

Recent advances in large-scale language models have pushed the boundaries of natural language processing and set new performance standards. It is worth noting that artificial intelligence can mimic human behavior and writing style in convincing ways. Therefore, it is difficult to tell whether something was written by a human or a machine. Deep learning and natural language processing have recently advanced large-scale language models. These new models are more accurate and robust than ever before, as they can learn from massive amounts of data to better capture the nuances of language. Additionally, these models can now be applied to tasks such as text summarization, translation between languages, and even original content generation. Chat GPT is an NLP model developed by Open AI for open conversations. It is based on GPT-3.5, Open AI's 3rd-generation language processing model. Chat GPT can support conversational AI applications such as virtual assistants and chatbots. This article describes the current version of Chat GPT and discusses the model's potential social impact.

Chat GPT: Jack of all trades, master of none

Open AI released the Chat Generative Pre-Trained Transformer (Chat GPT), revolutionizing the artificial intelligence approach to human-model interaction. Initial contact with a chatbot reveals its ability to provide detailed and accurate answers in a variety of areas. Testing for validity. However, existing research has been largely unautomated and tested to a very limited extent. In this work, the researchers examined Chat GPT's capabilities on 25 different analytical NLP tasks. Most of it is subjective even to humans. The researchers automated the Chat GPT query process and analyzed over 38,000 responses. Comparing the results with available state-of-the-art (SOTA) solutions, the researchers found that the average quality loss of the Chat GPT model is about 25% for zero-shot and few-shot evaluations. It has been shown that the more difficult the task (lower SOTA performance), the greater the Chat GPT loss. Specifically, it relates to practical NLP problems such as emotion recognition. The paper also tested the ability to personalize Chat GPT responses for selected subjective tasks via random contextual few-shot personalization, which significantly improved predictions for our user base. Additional qualitative analysis revealed Chat GPT bias. This is probably due to the rules Open AI imposes on human trainers. The results address whether the high quality of current predictive NLP models can indicate the social utility of tools, and how training and validation procedures for such systems should be established.

Chat GPT: The End of Online Exam Integrity?

In this study, the researchers evaluated the features of the recently developed Chat GPT. Artificial intelligence (AI) agents perform high-level cognitive tasks and generate text that is indistinguishable from human-generated text. Such capacity raises concerns about the potential use of Chat GPT as a tool e.g.: Cheating in online exams. According to research, Chat GPT shows critical thinking and can be very realistic. The input is minimal text and poses a potential threat to the integrity o a document, especially for online exams at such higher education institutions. Exams are becoming more and more popular. Supervised and back to verbal  
Exams can be part of the solution while using advanced proctoring techniques and AI Text Output Detector are effective in addressing. It's probably not a solid solution to this problem. Further research is to be done to fully understand the meaning of large language models.  
Development of strategies to combat the risk of fraud via Chat GPT should be established. It is important that educators and institutions recognize that Chat GPT can be used for fraud and investigations. Countermeasures to maintain fairness and effectiveness of online exams for all students is needed to be carried out.

Exploring AI Ethics of Chat GPT: A Diagnostic Analysis

Recent Breakthroughs in Natural Language Processing (NLP) make synthesis and understanding possible. Large Language Models (LLM) have had a major impact on industries,  
Such as report summarization software and copywriters. However, observations suggest that LLM may exhibit social behavior. Prejudice and toxicity pose ethical and social dangers due to   
irresponsible results. Therefore, there is a need to develop large-scale benchmarks for accountable LLM. Further education for future efforts to build ethical LLM requires conducting qualitative research responsibly.

Generating scholarly content with Chat GPT: ethical challenges for medical publishing

The impact of generative artificial intelligence (AI) on medical publishing practices is currently unknown. But as the experiment highlights, generative AI can have significant ethical implications. The platform is developed with human feedback and is freely accessible. We have already collected millions of interactions. Every time a request is made, Chat GPT automatically generates a response based on thousands of internet sources. In many cases, no additional input from the user is required. As a result, an individual reportedly used his Chat GPT to draft college essays and academic papers, and the system can provide references upon request. Given these accounts and their widespread use, the researchers have commissioned Chat GPT to write an op-ed for The Lancet Digital Health on AI and medical publishing ethics. The researchers then asked Chat GPT how the editorial team should handle scientific content created by AI.

Comparing scientific abstracts generated by Chat GPT to original abstracts using an artificial intelligence output detector, plagiarism detector, and blinded human reviewers.

Large language models like Chat GPT can generate more realistic text of unknown information with accuracy and integrity. The researchers collected and examined 10 research abstracts from high-impact medical journals. Chat GPT was then used to generate research summaries based on title and journal. Artificial intelligence (AI) output detectors, plagiarism detectors, and blind human inspectors try to distinguish whether the abstract is original or generated.  
  
 results

* All abstracts generated by Chat GPT were clearly written, but only 8% of them correctly understood specific content.
* Most of the generated abstracts were detected with the AI ​​output detector.   
  Plagiarism detector: The generated abstract had a similar patient cohort size as the original abstract.
* A blinded human reviewer correctly identified 68% of the abstracts generated as being generated by Chat GPT, and 14% of original abstracts were incorrectly identified as generated. reviewers said it was amazing. It's hard to separate the two, but the generated abstract felt vaguer and more formulaic.

Issues according to Chat GPT:

* There are some legal and ethical issues with using Chat GPT and other major language models. Legal issues are related to potential copyright infringement, as the model may generate text that is similar or identical to existing copyrighted content.
* Another legal issue concerns potential data breaches. This model can generate personally identifiable or sensitive data that can be used to identify or harm an individual. From an ethical point of view, there are concerns about the possible misuse of the model. For example, creating grossly forged audio or text files, or disseminating false or misleading information.
* There is also concern that there may be unintended biases in the training data and that the model may perpetuate harmful stereotypes and discrimination. Another ethical issue relates to the transparency of the model's decision-making process, as it can be difficult for users to understand how the model reached a particular outcome.
* Additionally, GPT-3 and other similar models have been trained on vast amounts of data that may have come from questionable sources such as Website scraping or other data collection methods that may raise legal and ethical concerns.  
    
  In summary, using Chat GPT raises legal and ethical issues related to copyright, privacy, abuse, bias, and transparency. It is important that users are aware of these issues and take steps to mitigate them.

Solution:

Organizations like Open AI will continue to develop language models like Chat GPT and people will continue to use them. Addressing the legal risks associated with their use has become increasingly important. This includes ensuring that companies and individuals are using technology ethically, legally, and responsibly.  
  
It is also important for organizations and governments to develop language models to provide policies, regulations, and best practices to mitigate such risks and ensure the responsible use of technology. This protects the rights and interests of everyone involved, including developers, users, and the public.

# **Personal Opinion:**

I do not use Chat GPT that often so I do not have a preference. The only experience I have shared with the chatbot is when I tried it at my internship to generate CSS for a project. The overall process was very fast but still for a computer, the code was loading very slowly. The CSS designed by Chat GPT was just subpar and not presentable at a professional level. I hope that GPT4, which has just been released, can amaze me even more. Also, I have not tried its debug feature but I look forward to it soon. Regarding the state of confusion that surrounds the ethics of Chat GPT, it is quite understandable why many people feel this way. The machine is capable of generating human-like texts. This deteriorates the integrity of assignments or reports in an academy. The answers generated are also sometimes either biased because of the data set provided having the majority in a certain matter. This might be due to questionable sources, from which Chat GPT was trained, therefore it does not seem to be a trustable site. Lastly, there are no laws equipped to deal with the current issues surrounding Chat GPT therefore I believe new laws must be formulated or updated concerning the current situation of the world.

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