

# Application of AI Chat GPT with Arduino and Micropython

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**Abstract** – Chat GPT is an artificial intelligence chatbot that functions unlike any other chatbot you have ever used. It was educated using a sizable language model that taught it nearly everything in every language and subject. At least, ChatGPT's dataset isn't connected to the Internet. The existing public beta contains little knowledge of events that occurred after 2021 because it was trained with data that was finished at the start of 2022.

The ChatGPT interface is rather basic, with just a text field to enter commands or questions. The outcome will be shown at the head of the website. OpenAI, an artificial intelligence research lab made up of the non-profit OpenAI Inc. and its for-profit OpenAI LP, is the organization that created ChatGPT.

**Keywords-** Artificial Intelligence, ChatGPT, Arduino, IDE, LLM, LED.

## I- INTRODUCTION

On November 30, 2022, ChatGPT went live worldwide. Its capacity to deliver human responses to ad hoc queries startled and delighted people alike. Though ChatGPT's remarkable capacity to generate text with a human voice has garnered most of the attention, it can also write code. Indeed, ChatGPT may be coded in a wide range of languages, including microcontroller-compatible languages like Micro Python and C++. And now we're

putting its code-writing skills to the test on an ESP32 and an Arduino Uno module.

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The majority of the code samples are C++ sketches made with the Arduino IDE, although ChatGPT also has an ESP32 web server that is created with MicroPython.

Unlike any other chatbot you've ever used, ChatGPT is an AI chatbot. It received training from an excellent language model that covered nearly every topic in every language. At least its database is not online; ChatGPT is not online. There isn't much information on occurrences after 2021 in the current public beta because it was trained with data that was finished in early 2022.

The basic interface of ChatGPT consists of a text field where users can type commands or questions. The outcome is shown at the top of the website. ChatGPT is a division of OpenAI, an artificial intelligence research lab made up of the non-profit OpenAI Inc. as its parent business and the for-profit OpenAI LP. The company's main goal is to advance friendly artificial intelligence for the good of humanity. Artificial intelligence and

machine learning are two of Size Pen AI's research areas. Among its original members are:

- Sam Altman, a former Y Combinator president and technology accelerator.
- Elon Musk is the CEO of Twitter, SpaceX, and Tesla.
- Reid Hoffman, the LinkedIn founder.
- Jessica Livingston is Y Combinator's co-founder.
- Peter Thiel, one of the first investors in Facebook and founder of PayPal.

OpenAI produces more products besides ChatGPT. Additionally, they released DALL.E 2, an image generator that builds graphics from word descriptions by utilizing artificial intelligence.

## II- LITERATURE REVIEW

Large-scale language models (LLMs), such as ChatGPT, are a type of artificial intelligence (AI) technology that is "trained" on massive amounts of data, enabling the simulation of human-to-human conversation. For example, ChatGPT can understand the context of questions and text and respond with appropriate answers; it can also generate new text from training data based on previously trained models (Borji, 2023). After the pre-training period, the authors refine an algorithm that allows better performance (Lund, Wang et al.). This fine tuning can be focused on realm specific datasets to create a language for specific fields (medicine, law, etc.) (Kasneji, Seßler et al., 2023). These models can continue to learn over time. Machine learning (ML) and deep learning techniques (Hosseini, Rasmussen, and Resnik, 2023), which allow systems to acquire new knowledge and experience over time without being specifically programmed to do so (Lund, Wang et al. 2023). Chat GPT stands for Chat Generative Pre-Trained Transformer (Teel, 2023; Flanagan, Bibbins-Domingo et al. 2023) and has proven extremely popular since its debut in November 2022. While ChatGPT is probably the most popular of the LLMs, it joined by other ChatGPT ranks, including Bing Chat, Google Bard, Meta's Galactica, and Anthropic's Claude (Webbe. 2023; Hosseini, Rasmussen, and Resnik, 2023). Microsoft introduced Co-Pilot, a generative artificial intelligence that it uses in all Microsoft 365 tools (Webb, 2023). These models were called "big" based on the millions to billions of words collected from the Internet, books, and other sources for the pre-training process. With this information, ChatGPT is able to learn the subtleties of natural language and respond in a natural and logical way (Tate, Doroudi et al., 2023; Norris, 2023). But the sheer size of these systems and their infrastructure has led many to question their impact on the environment -

and will continue to do so. Databases used to train LLMs or natural language processing (NLP) systems can be more than 45 terabytes (Hosseini, Rasmussen, & Resnik, 2023), representing enormous computing power and a large carbon footprint (Fister, Head, 2023). Borji (2023) estimates that training the model "would generate carbon dioxide emissions equivalent to more than five times the lifetime emissions of an average car". He further noted that LLM companies will continue to grow in size and capabilities and potentially have an additional impact on the environment.

## III -METHODOLOGY

### GPT-3.5 Linguistic Model

One neural network that makes use of this technology to comprehend and produce human speech is the GPT-3.5 language model.

Although the GPT-3.5 language model and ChatGPT's actual functionality are taught. is significant; OpenAI has published a diagram showing the training process for language models.

In essence, training required a large number of human operators to query the system and enter data. A "reward system" designed by trainers is awarded whenever the machine generates the intended outcome. Over a number of repetitions, the computer's intelligence increased.

Even while the OpenAI graphic can be a little confusing at first, it can be made simpler if you divide the three processes into their component parts:

**1. Step-1** First Step Gather proof, facts, and experience. Simplified guided practice—train using real-world examples.

Building GPT-3.5 started with training the model using human-generated text examples. We refer to this as supervised learning. The model is trained to generate text that resembles the examples by providing it with prompts and sample responses.

**2. Step-2** Gather reference data, train the streamlined reward model, receive feedback, and use what you've learned.

Obtaining input regarding the model's performance was the following stage. From the model-generated responses, OpenAI gathered fresh data and asked human trainers to score them in order of best to worst. To help the model comprehend what constitutes a positive answer, a new model known as the reward model was developed based on this proposal.

**3. Step-3** Make use of PPO's reinforcement learning algorithm to optimize the training and reward models. simplified: make improvements by using feedback Model. Ultimately, the reward model's input was used to

improve the GPT-3.5 model. This indicates that the model was given fresh instructions, and the reward model was used to categorize its answers. The recommendations have helped to enhance the model's functionality. Several iterations of this procedure were conducted prior to OpenAI's public publication of the GPT-3.5 model.

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#### IV-DESIGN

##### ChatGPT Basics of Arduino Coding

Let's utilize ChatGPT to have it generate many lines of code for us. An Arduino Uno and a few other components will be connected to it initially.

##### Connecting the Arduino

Our Arduino Uno has a very appealing and straightforward setup. We'll require the subsequent:

- Any color LED will do
- Arduino Uno or clone
- SSD1306 OLED Display with I2C interface;
- SPST momentary-contact normally-open pushbutton;
- potentiometer, 5K or more, linear taper recommended;
- resistor, 220 ohms or any other value between 150 and 470 ohms.

##### Blink ChatGPT

We don't usually deviate from the norm and start our Arduino programming adventures with the well-known Blink sketch exercise. Therefore, we will turn on the onboard LED or set the Arduino to flash once every

second as our first experiment using AI-generated programming!

##### Code to flash the onboard LED on an Arduino Uno once per second

ChatGPT should start writing code. In some cases, there can be a delay of up to a minute prior to it responds; this is almost certainly a result of the server being taxed by all the active sessions. Sometimes there is not at all delay.

ChatGPT should respond with a code sample. After the code sample, it will give you a concise explanation of the code.

```
const int LED_PIN = 13; // Onboard LED is connected to pin 13
void setup() {
  pinMode(LED_PIN, OUTPUT); // Set pin as an output
}
void loop() {
  digitalWrite(LED_PIN, HIGH); // Turn on LED
  delay(1000); // Wait for 1 second
  digitalWrite(LED_PIN, LOW); // Turn off LED
  delay(1000); // Wait for 1 second
}
```

It's possible that the code you get differs somewhat from the code we received. In fact, you'll probably get a different code and/or explanation if you ask the same question.

Using the "Copy Code" icon at the top of the ChatGPT code output, you can copy the sample of code. You can then paste the code into the Arduino IDE when it has been copied to your clipboard.

View the Arduino Uno after uploading the code. An onboard LED should flash to welcome you.

##### ChatGPT: PWM LED Management

Fortunately, pin 9 of the Arduino Uno can handle PWM. We have an LED attached to it via a drop resistor. Additionally, a potentiometer that is connected as a voltage divider and whose output is coupled to analog input A0 is included in the second stage of the timely break.

Obviously, we need to build code to take advantage of this circumstance.

Using the LED potentiometer on the panel, change the brightness Give it to ChatGPT to handle. Type the following in a new session, or continue in the one you're in now: Using a potentiometer linked to analog input A0,

you can use PWM to adjust the brightness of the LED attached to pin 9 of the Arduino Uno.

Once more, the new AI code assistant ought to get to work and create a sketch similar to this one:

GTP-LED Dimmer

```
int ledPin = 9;
int potPin = A0;
void setup() {
  pinMode(ledPin, OUTPUT);
}
void loop() {
  int potValue = analogRead(potPin);
  int brightness = map(potValue, 0, 1023, 0, 255);
  analogWrite(ledPin, brightness);
}
```

As previously stated, ChatGPT can generate various results for a same request. This draft has been generated both correctly (as in this copy) and incorrectly (due to the map function not being called).

Click the Regenerate Answer option to request a new response via ChatGPT if you don't like the draft.

I was able to use a potentiometer to control the LED because the code we uploaded to the Arduino worked flawlessly.

### Correcting Code with ChatGPT

Additionally, ChatGPT can be used to fix broken code. When combined with the compiler faults that your IDE is displaying, this can be a very helpful tool. Actually, ChatGPT is able to recreate the code with the faults fixed, surpassing even the capabilities of your compiler. We purposefully introduced an error into the previous code (the variable brightness LED sketch) to test this. The code will not compile because we altered the name of one of the variables.

#### Correct the following code

The AI chatbot doesn't really care about text formatting, at least not that we can tell, so we could have just pasted the code right after this statement and ChatGPT would have accepted it. However, placing it on the line below looks much neater.

The issue is that ChatGPT will insert the words "correct the following code" if we press insert, but not the actual code.

In the ChatGPT interface, hold down the Shift key and hit Enter to advance a line. This enlarges the text box and advances the cursor to a new line. After that, you can paste your code there.

## V- RESULT AND DISCUSSION

### Testing with Thonny IDE

Using Thonny IDE for testing. Assumedly, our computer is connected to an ESP32 that has the MicroPython interpreter installed, and that Thonny IDE is open with the ESP32 selected as the source.

Paste the ChatGPT code into the Thonny IDE editor after copying it. Now save it as main.py to your ESP32 rather than our PC. When main.py is used as the filename, the code can execute on every ESP32 boot or reset.

Locate a new wifi network by searching for a wifi-connected device (PC, phone, tablet, etc.). We have the device's SSID ChatGPT server, but we use a different MicroPython code because ChatGPT occasionally returns inconsistent results. The final step is to access 192.168.4.1 using a device that is linked to the ESP32's wifi network. In the event that everything functions, Your ChatGPT screen ought to be visible.

## VI- CONCLUSION

When the microprocessor revolution began in the middle of the 1970s, we believed this new technology had the power to transform everything. When we were granted exclusive access to the internet in 1987 as government employees, it was a similar feeling to ours. This enabled me to retrieve material from servers located all over the world. Naturally, it was the Internet. We believe that both of these innovations have had a significant impact on the world. Although ChatGPT alone won't alter the course of history, it heralds a new age of AI applications that will alter how we live and conduct business.

At the start of the microprocessor revolution in the mid-1970s, we thought this new product could change the world. We felt the same way in 1987 when, as a government employee, we were given exclusive access to the web, which allowed me to access data from servers around the world. It was the Internet, of course. we think it's fair to say that both developments changed the world, and while ChatGPT itself may not change the planet, it represents a new era of AI applications that will modify the way we do business and the method we live.

It will be interesting to see what other AI products are released this year. Given Microsoft's investment in OpenAI, Google and Apple's products are likely to follow suit.

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