

Lab: Building a Basic Chatbot Using ChatGPT



Estimated Time: 90 minutes

In this lab, you will get familiar with the process of developing a basic chatbot capable of responding to software development-related questions. We'll be utilizing OpenAI's API along with Node.js using the Express.js framework to build this interactive chatbot. Let's get started!

Learning Objectives:

After completing this exercise, you should be able to perform the following tasks:

- Build a basic chatbot using the free Skills Network-provided OpenAI APIs.
- Converse with the chatbot to ask any questions related to software development and receive the appropriate response.

Please note Generative AI is an evolving field. As you attempt the labs, your experience and output might be different than what is seen here.

Pre-requisites

Understanding the basics of Node.js and Express.js

- Node and Express are two technologies that are commonly used to create web applications.
- Node is a runtime environment that allows you to run JavaScript code on the server side, without a browser.
- Express is a framework that provides a set of features and tools to simplify the development of web applications with Node.

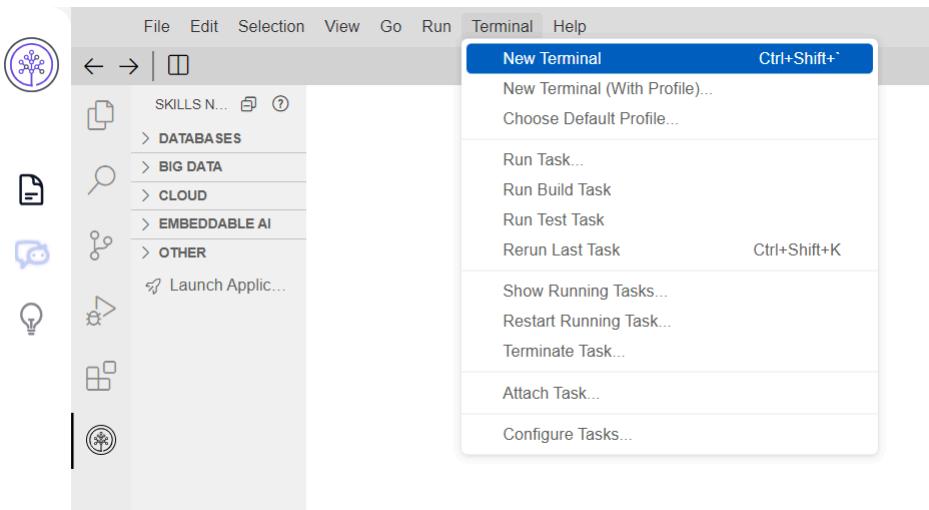
Some of the benefits of using Node and Express are:

- They are fast and scalable, as they use an event-driven, non-blocking I/O model that can handle many concurrent requests.
- They are flexible and modular, as they allow you to use various libraries and middleware to customize your application according to your needs.
- They are easy to learn and use, as they are based on JavaScript, which is a popular and widely used programming language.

Task 1: Set Up Your Project

- Here, we are setting up a Node.js project using the Express.js framework.
- Node.js is a JavaScript runtime that allows you to run JavaScript on the server, while Express.js is a web application framework for Node.js.
- Follow the below instructions and refer to the screenshots for creating a Node.js Project.

Step 1: Open a terminal, click on "Terminal", and then select the "New Terminal" option.



Step 2: Create a new directory for your project named `software-dev-chatbot`, navigate to the directory, and initialize a Node.js project using the commands below.

```
mkdir software-dev-chatbot
cd software-dev-chatbot
npm init -y
```

The screenshot shows the Theia IDE interface. The top menu bar includes File, Edit, Selection, View, Go, Run, Terminal, and Help. The left sidebar has icons for Explorer, Open Editors, Project, and other development tools. The main area has three tabs: package.json, software-dev-chatbot, and theia@theiaopenshift-ritikaj: /home/project/software-dev-chatbot. The package.json tab shows the following JSON code:

```
1 {  
2   "name": "software-dev-chatbot",  
3   "version": "1.0.0",  
4   "description": "",  
5   "main": "index.js",  
6   "scripts": {  
7     "test": "echo \\\"Error: no test specified\\\" && exit 1"  
8   },  
9 }
```

The terminal tab shows the command line history:

```
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$ mkdir software-dev-chatbot  
theia@theiaopenshift-ritikaj:/home/project$ cd software-dev-chatbot  
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$ npm init -y  
Wrote to /home/project/software-dev-chatbot/package.json:  
  
{  
  "name": "software-dev-chatbot",  
  "version": "1.0.0",  
  "description": "",  
  "main": "index.js",  
  "scripts": {  
    "test": "echo \\\"Error: no test specified\\\" && exit 1"  
  },  
  "keywords": [],  
  "author": "",  
  "license": "ISC"  
}  
  
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$
```

Step 3: Install express and openai dependencies by executing the following command.

```
npm install express openai
```

```
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$ npm install express openai  
added 89 packages, and audited 90 packages in 3s  
12 packages are looking for funding  
  run `npm fund` for details  
found 0 vulnerabilities  
npm notice New major version of npm available! 9.6.3 -> 10.2.5  
npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.2.5  
npm notice Run npm install -g npm@10.2.5 to update!  
npm notice  
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$
```

Step 4: Create a new directory named public inside a project directory using the below command.

```
mkdir public
```

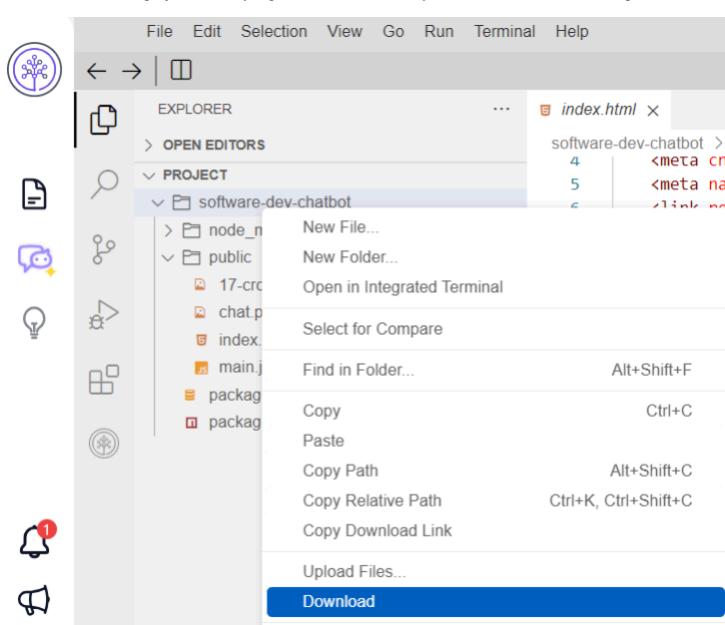
```

File Edit Selection View Go Run Terminal Help
← → | □
EXPLORER PROJECT
OPEN EDITORS
software-dev-chatbot
node_modules
public
package-lock.json
package.json
1 {
2   "name": "software-dev-chatbot",
3   "version": "1.0.0",
4   "description": "",
5   "main": "index.js",
6   "scripts": {
7     "test": "echo \"Error: no test specified\" & exit 1"
8   },
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$ mkdir public
theia@theiaopenshift-ritikaj:/home/project/software-dev-chatbot$ 

```

Please Note: It is important to understand that the lab environment is ephemeral; it only exists for a short duration and will be destroyed afterward. Therefore, it is essential to download the project directory so that it can be reopened in a new lab environment whenever needed.

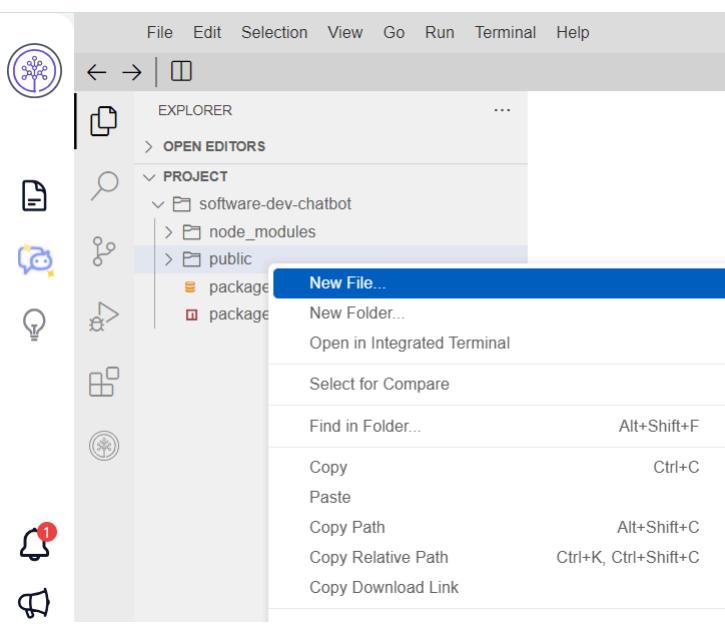
To download the project directory, right-click on the directory and choose the “Download” option, as shown in the screenshot below. This will download a zipped folder.



Additionally, please be aware that this environment is shared. Avoid storing any personal information, usernames, passwords, or access tokens in this environment for any purpose.

Task 2: Create the user interface for your chatbot using HTML and CSS

- Create an `index.html` file within the `public` directory, right-click on the `public` folder, and select the "New File" option, as shown in the screenshot below. This file will function as the user interface for your chatbot.

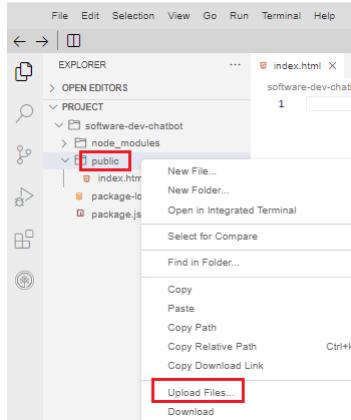


- Inside the HTML file, we are using the following elements:

- a. Text input element -> To take user input
- b. Submit button -> To submit the question from the user
- c. Text area -> where the chatbot's responses will be displayed.

- Here are the steps to set a chatbot logo of your choice:

1. Download an image from the internet for the chatbot logo and name it `chat.png`
2. Right-click on the public folder, and select the "Upload Files" option, as shown in the screenshot below.
3. Choose the downloaded image and click "OK" to upload it.



- The styling is applied through an external CSS file (`style.css`)
- The implementation of chatbot logic is done through an external JavaScript file named `main.js`
- You can type a message, and click the `Send` button, to interact with the chatbot.

Insert the provided code into the newly created HTML file.

index.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link rel="stylesheet" href="style.css">
  <title>Software Dev Chatbot</title>
</head>
<body>
  <div class="main-container">
    <div class="chat-container">
      <div class="header">
        
        <h2 class="name">Chat Window</h2>
      </div>
      <div class="chat-log" id="chat-log"></div>
      <div class="input-container">
        <input type="text" id="user-input" placeholder="Ask me anything...">
        <button onclick="sendMessage()">Send</button>
      </div>
    </div>
  </div>
  <script src="main.js"></script>
</body>
</html>
```

- Create a `style.css` file in the public directory and insert the following code into the CSS file.

style.css:

```
.chat-container {
  max-width: 600px;
  margin: 20px auto;
  border-radius: 10px;
  box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
  overflow: hidden;
  display: flex;
  flex-direction: column;
  justify-content: space-between;
  height: 80vh;
  position: relative;
  background: linear-gradient(to bottom, #1e5799, #2989d8);
}

.logo {
  width: auto;
  height: 50px;
  margin-left: 10px;
  margin-top: 10px;
  margin-bottom: 10px;
  border-radius: 50px;
}

.name {
  font-size: 20px;
  font-weight: bold;
  margin: 10px;
  color: #fff;
  margin-left: 10px;
  margin-right: 10px;
}

.chat-window {
  flex-grow: 1;
  display: flex;
  flex-direction: column;
  align-items: flex-end;
  padding: 20px;
  background-color: #fff;
  overflow-y: auto;
}

.input-container {
  display: flex;
  align-items: center;
  padding: 20px;
  background-color: #fff;
}
```

```

input[type="text"] {
  width: 100%;
  padding: 10px;
  border: none;
  border-radius: 5px;
  outline: none;
  font-size: 16px;
  box-shadow: 0 0 5px rgba(0, 0, 0, 0.1);
}

.chat-log {
  height: 400px;
  padding: 20px;
  overflow-y: auto;
  background-color: rgba(255, 255, 255, 0.8);
}

/* Added space between user prompts */
.chat-log p {
  margin: 10px 0;
}

.input-container input[type="text"] {
  flex: 1;
  height: 40px;
  padding: 5px 10px;
  border: 1px solid #ccc;
  border-radius: 5px;
  font-size: 16px;
  outline: none;
}

.input-container button {
  margin-left: 10px;
  padding: 8px 16px;
  border: none;
  border-radius: 5px;
  background-color: #4CAF50;
  color: #fff;
  font-size: 16px;
  cursor: pointer;
}

.input-container button:hover {
  background-color: #45a049;
}

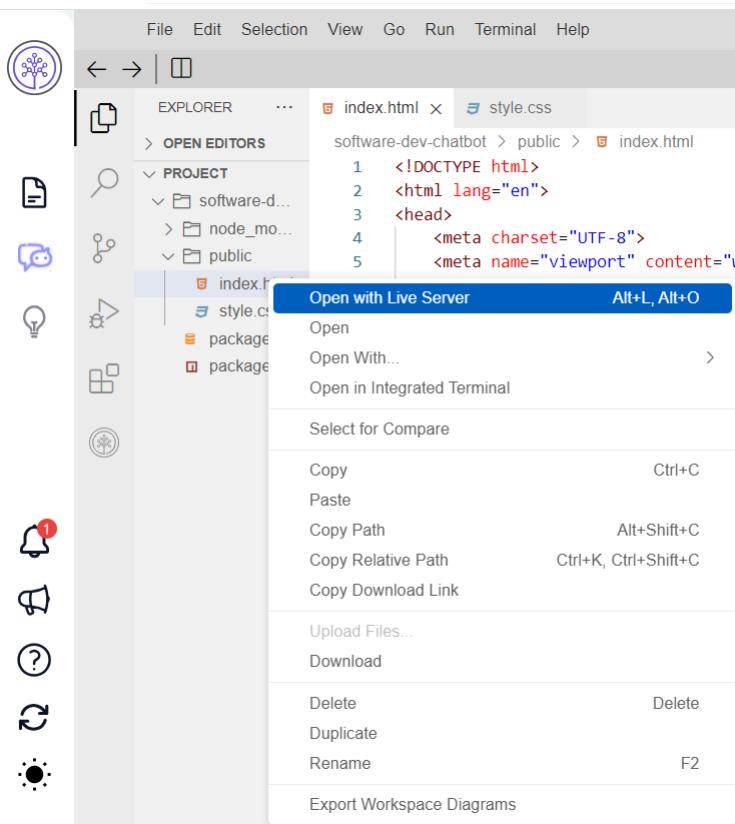
html, body {
  margin: 0;
  padding: 0;
  font-family: Arial, sans-serif;
}

```

Launch live server

You can check the user-interface of your chatbot by launching the live server.

- Please right-click on the index.html and select the "Open with Live server" option.



- Click on the "Skills Network" button on the left, which will open the "Skills Network Toolbox".
- Next, select "Launch Application" and enter the port as 5500 and launch the server. Please refer to the screenshot below.

The screenshot shows the Skills Network Toolbox interface. On the left, there's a sidebar with icons for Databases, Embeddable AI, and Other. A red box highlights the "Launch Application" button. The main area has tabs for "index.html" and "Launch Application". The "Launch Application" tab is active, displaying a form with an "Application Port" input set to "5500" and a "Your Application" button with a copy icon. Below this is a terminal window showing the command "theia@theiaopenshift-ritikaj:/home/project\$". A red box highlights the message "Server is Started at port : 5".

- Select the `software-dev-chatbot` folder and then select the `public` folder to view the HTML page as shown in the screenshots below.

The screenshot shows a terminal window with the URL "ritikaj-5500.theiaopenshiftnext-1-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai". The terminal shows the path `~ /` and the contents of the `software-dev-chatbot` folder, which includes `..`, `node_modules`, `package-lock.json`, `package.json`, and `public`. A red box highlights the `public` folder.

The screenshot shows a terminal window with the URL "ritikaj-5500.theiaopenshiftnext-1-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai/software-dev-chatbot/". The terminal shows the path `~ / software-dev-chatbot /` and the contents of the `public` folder, which includes `..`, `node_modules`, `package-lock.json`, `package.json`, and `public`. A red box highlights the `public` folder.

- You should be able to see the chat interface as below:



Task 3: Create a JavaScript file to implement the functionality of the Chatbot

- Create a `main.js` file in the public directory to implement the functionality.
- In the `main.js` file, the JavaScript code is designed to handle user input and initiate an API call to the OpenAI API.
- An event listener is attached to the submit button so that when the user clicks it, the code is executed.
- In the event listener callback function, we retrieve the user's input from the text input element and display their message in the chat log.
- Next, we make an API request to the server with the user's message using the `fetch()` function, specifying the appropriate endpoint on the server to receive this request.
- After receiving the response from the OpenAI API, we send it back to the client and display the chatbot's response in the text area of the `index.html` file.
- We then append the response to the chat log on the front end, making the conversation visible on the UI (User Interface).

Insert the following code into the newly created `main.js` file.

main.js:

```
const chatLog = document.getElementById('chat-log');
const userInput = document.getElementById('user-input');
function sendMessage() {
    const message = userInput.value;
    // Display user's message
    displayMessage('user', message);
    // Call OpenAI API to get chatbot's response
    getChatbotResponse(message);
    // Clear user input
    userInput.value = '';
}
function displayMessage(sender, message) {
    const messageElement = document.createElement('div');
    messageElement.classList.add('message', sender);
    // Wrap the message in a <p> tag
    const messageParagraph = document.createElement('p');
    messageParagraph.innerText = message;
    // Append the <p> tag to the message element
    messageElement.appendChild(messageParagraph);
    chatLog.appendChild(messageElement);
}
function getChatbotResponse(userMessage) {
    // Make a request to your server with the user's message
    fetch('/getChatbotResponse', {
        method: 'POST',
        headers: {
            'Content-Type': 'application/json',
        },
        body: JSON.stringify({ userMessage })
    })
    .then(response => response.json())
    .then(data => {
        // Display chatbot's response
        displayMessage('chatbot', data.chatbotResponse);
    })
    .catch(error => console.error('Error:', error));
}
```

Task 4: Create an Express Server and integrate OpenAI API

- Create a new file named `server.js` within your project directory (`software-dev-chatbot`)
- This file will be responsible for managing API requests and integrating with OpenAI.
- This code sets up a basic Express.js server that serves static files from a `public` directory.

- It includes a route for the root path ('/') to serve an HTML file.
- Additionally, there is a POST endpoint /getChatbotResponse that receives a user message, utilizes an OpenAI API wrapper (OpenAI API), generates a chatbot response using the OpenAI API, and sends the response back to the client.
- The server listens on a specified port 3000, and a message is logged to the console when the server is successfully running.

Insert the following code into the newly created server.js file.

server.js

```
process.env["NODE_TLS_REJECT_UNAUTHORIZED"] = 0;
const express = require('express');
const path = require('path');
const { OpenAI API } = require('./openai');
const app = express();
const port = process.env.PORT || 3000;
app.use(express.static(path.join(__dirname, 'public')));
app.use(express.json());
app.get('/', (req, res) => {
  res.sendFile(path.join(__dirname, 'public', 'index.html'));
});
app.post('/getChatbotResponse', async (req, res) => {
  const userMessage = req.body.userMessage;
  // Use OpenAI API to generate a response
  const chatbotResponse = await OpenAI API.generateResponse(userMessage);
  // Send the response back to the client
  res.json({ chatbotResponse });
});
app.listen(port, () => {
  console.log(`Server is running on port ${port}`);
});
```

Task 5: Create OpenAI API Module

- Create an openai.js file within the project directory to encapsulate the OpenAI API logic.
- This code facilitates communication with the OpenAI API, specifically the gpt-3.5-turbo Codex engine, allowing developers to generate responses based on user input through a secure configuration using an API key.

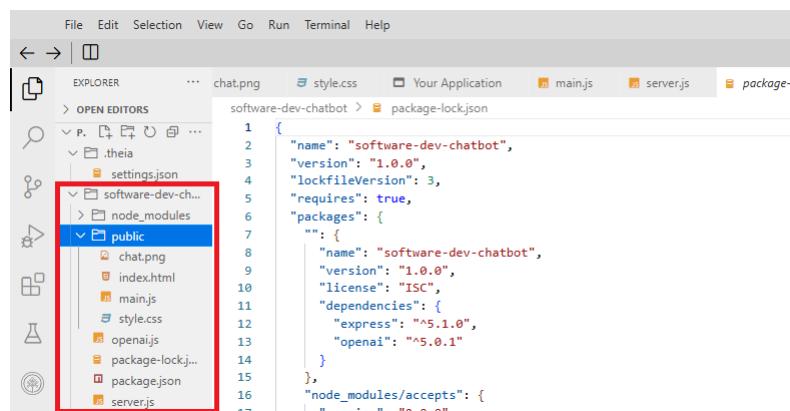
Insert the following code into the newly created openai.js file.

openai.js:

```
class OpenAI API {
  static async generateResponse(userMessage, conversationHistory = []) {
    const apiKey = process.env.OPENAI_API_KEY;
    const endpoint = "https://api.openai.com/v1/chat/completions";
    const response = await fetch(endpoint, {
      method: 'POST',
      headers: {
        'Content-Type': 'application/json',
        'Authorization': `Bearer ${apiKey}`,
      },
      body: JSON.stringify({
        model: "gpt-4o-mini",
        messages: conversationHistory.concat([{ role: 'user', content: userMessage }]),
        max_tokens: 150
      }),
    });
    const responseData = await response.json();
    // Log the entire API response for debugging
    console.log(`Response from OpenAI API: ${responseData.choices[0].message}`);
    // Check if choices array is defined and not empty
    if (responseData.choices && responseData.choices.length > 0 && responseData.choices[0].message) {
      return responseData.choices[0].message.content;
    } else {
      // Handle the case where choices array is undefined or empty
      console.error('Error: No valid response from OpenAI API');
      return 'Sorry, I couldn\'t understand that.';
    }
  }
}
module.exports = { OpenAI API };
```

Task 6: Run Your Application

- The Project folder structure should be organized as shown in the screenshot below.



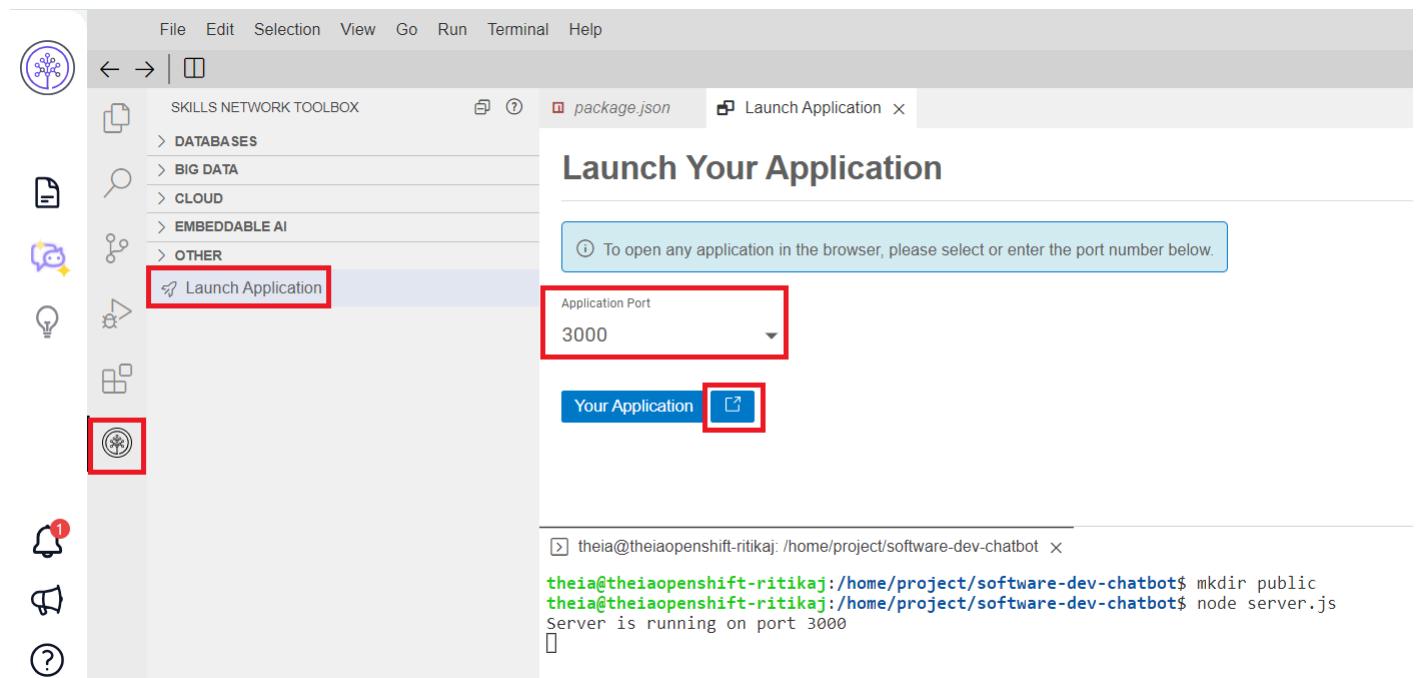
Follow the steps below to run the application

Step 1: Run your Express server by executing the below command in the Terminal

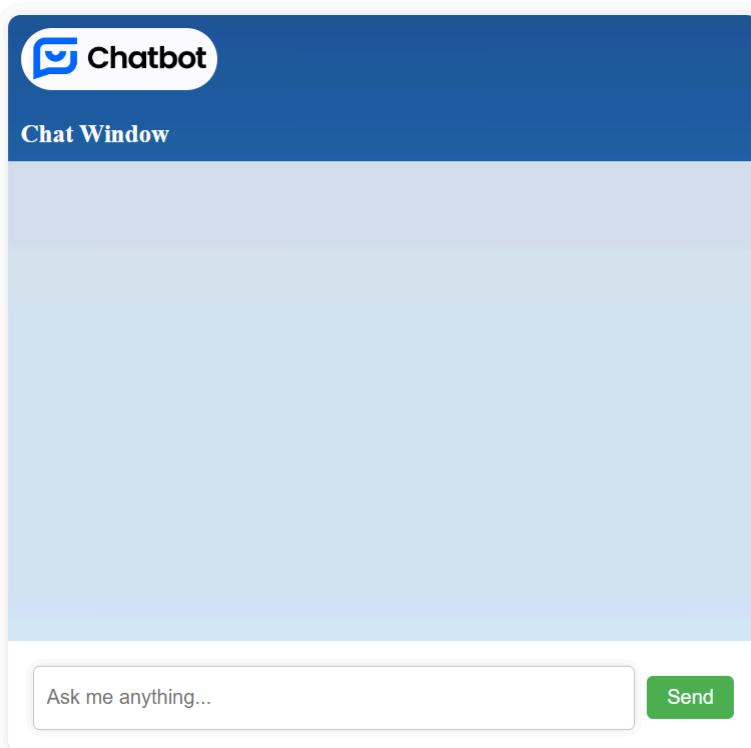
```
node server.js
```

```
theia@theiaopenshift-ritikaj: /home/project/software-dev-chatbot $ mkdir public  
theia@theiaopenshift-ritikaj: /home/project/software-dev-chatbot $ node server.js  
Server is running on port 3000
```

Step 2: Click on the "Skills Network" button on the left, which will open the "Skills Network Toolbox". Next, select "Launch Application" and enter the port as 3000 and launch the server. Please refer the screenshot below.

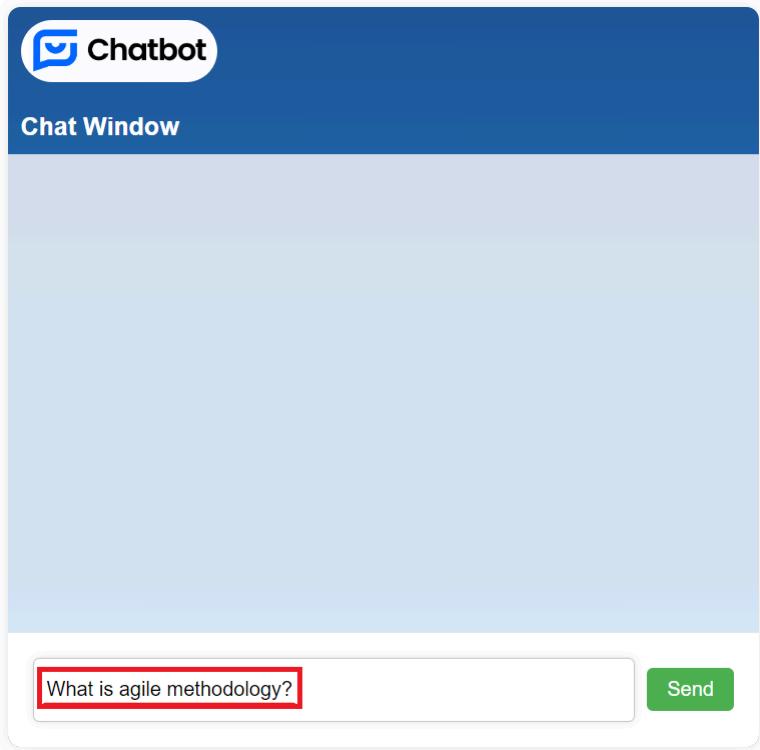


You should be able to see the chat interface as below:



Step 3: When you enter a question and click **Send** the chatbot will respond to your question using the OpenAI API.

Please refer to the screenshot below, where the question "What is agile methodology?" is posed, and the chatbot has provided an appropriate response.



A screenshot of the same chat interface. The user input field now contains the question "what is agile methodology?". Below the input field, the chatbot has responded with a detailed explanation: "Agile methodology is a type of project management that focuses on iterative and incremental development, where requirements and solutions evolve through collaboration between self-organizing, cross-functional teams. Agile methodology focuses on responsiveness to customer needs, delivering working software in short timelines, and allowing for continual improvement and adaptive planning." At the bottom of the screen, there is another input field with the placeholder text "Ask me anything..." and a green "Send" button.

Step 4: You can submit the following software development-related questions one at a time to the chatbot by entering them in the **Ask me anything** text box.

Click **Send** to receive a response from the chatbot.

Q1. What is the difference between a compiler and an interpreter?

Your output may be similar to the responses shown below:



Chat Window

What is the difference between a compiler and an interpreter?

A compiler is a program that translates code written in a high-level programming language into a low-level language. Compiled code can then be executed quickly and easily at runtime. An interpreter is a program that executes instructions written in a high-level language one line at a time. It does not create a compiled version of the code, so it takes longer to execute.

Ask me anything...

Send

Q2. What is the difference between a stack and a queue?

Your output may be similar to the responses shown below:



Chat Window

What is the difference between a stack and a queue?

A stack is a data structure that follows the Last-In-First-Out (LIFO) principle, meaning that the last item added to the stack is the first item that will be removed. A queue is a data structure that follows the First-In-First-Out (FIFO) principle, meaning that the first item added to the queue is the first item that will be removed.

Ask me anything...

Send

Q3. What is the difference between a linked list and an array?

Your output may be similar to the responses shown below:



Chat Window

What is the difference between a linked list and an array?

A linked list is a data structure where individual elements are connected to each other. It does not require any particular order, so elements can be added or removed from the beginning, middle, or end of a linked list without needing to move elements around. In contrast, an array is an ordered collection of elements, and elements must be removed or added in a specific order in order for the array to remain ordered. Additionally, a linked list can easily be expanded to store an unknown number of elements, while arrays have a fixed size determined when they are first created.

Ask me anything...

Send

Note: In case you want to use your own API Key instead of the lab environment's free access then you need to make a few changes to the configuration and openai.js file. Also, to run the code outside of Skills network labs you will need to add your own API key.

► Click here to see the configuration changes:

Summary:

This hands-on lab is designed to assist in the creation of a basic chatbot proficient in responding to queries related to software development. The project uses the free Skills Network-provided OpenAI APIs, along with Node.js and the Express.js framework.

Congratulations! You have completed the lab on Building a Basic Chatbot using ChatGPT.

Author(s)

Rajashree Patil
Ritika Joshi

© IBM Corporation. All rights reserved.