Wojskowa Akademia Techniczna
im. Jarosława Dąbrowskiego

Wydział Cybernetyki, kierunek informatyka - inżynieria systemów

Sprawozdanie z laboratorium z przedmiotu:

Standarty w projektowaniu systemów dialogowych

Temat laboratoriów:

Projektowanie ChatBota przy pomocy biblioteki Pythona „Flask”

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Wstęp

Zadaniem jest stworzenie chatbota, który oferuje pomoc z w zakresie zagadnień sportowych i około tego.

Tworzenie warstwy wizualnej chatbota

Strona html

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Chatbot</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='style.css') }}"/>
</head>
<body>
<div id="chat-container">
    <div id="chat-header">ChatBot</div>
    <div id="chat-box">
        <div id="chat-output">
            <!-- User and bot messages will be added here -->
        </div>
    </div>
    <div id="chat-input">
        <input type="text" id="user-input" placeholder="Type a message..."/>
        <button id="send-button">Send</button>
    </div>
</div>
<script src="https://code.jquery.com/jquery-3.6.0.min.js"></script>
<script>
    function scrollToBottom() {
        var chatOutput = document.getElementById("chat-output");
        chatOutput.scrollTop = chatOutput.scrollHeight;
    }

    $(document).ready(function () {
        $("#send-button").on("click", sendMessage);
        $("#user-input").on("keydown", function (event) {
            if (event.which == 13) {
                event.preventDefault();
                sendMessage();
            }
        });

        function sendMessage() {
            var user_msg = $("#user-input").val();
            $("#chat-output").append("<p>You: " + user_msg + "</p>");
            $("#user-input").val('');
            $.ajax({
                url: "/get_response",
                type: "POST",
                data: {user_msg: user_msg},
                success: function (response) {
                    var bot_response = response.response;
                    $("#chat-output").append("<p>Bot: " + bot_response + "</p>");
                    scrollToBottom();
```

```
                }
            });
        }
    });
</script>
</body>
</html>
```

Styl css

```
body {
    font-family: 'Poppins', sans-serif;
    background: linear-gradient(135deg, #9b59b6, #8e44ad);
    color: #eee;
    margin: 0;
    padding: 0;
    display: flex;
    justify-content: center;
    align-items: center;
    min-height: 100vh;
}

#chat-container {
    align-items: center;
    border-radius: 20px;
    background: linear-gradient(145deg, #8e44ad, #9b59b6);
    box-shadow: 0 0 20px rgba(0, 0, 0, 0.5);
    color: white;
    overflow: hidden;
    border: 2px solid #fff;
    display: flex;
    flex-direction: column;
    height: 95vh;
    width: 95%;
    border-top: 5px solid #4a235a;
    animation: chatEntry 0.5s ease;
}

#chat-header {
    padding: 20px;
    text-align: center;
    font-size: 2.5em;
    font-weight: bold;
    color: #ecf0f1;
    animation: headerEntry 1s ease;
    background: linear-gradient(145deg, #8e44ad, #9b59b6);
    width: 100%;
}

#chat-header h1 {
    margin: 0;
    font-size: 1.5em;
    font-weight: bold;
    background-color: transparent;
}

#chat-box {
    background: #f8f9f9;
    color: #2c3e50;
    padding: 20px;
    text-align: left;
    font-size: 1.2em;
    overflow-y: auto;
    flex-grow: 1;
    border-radius: 20px;
```

```
    margin: 20px;
    width: 60%;
    box-shadow: 0 4px 8px rgba(0, 0, 0, 0.2);
    animation: boxEntry 1s ease;
}

#chat-output {
    padding: 10px;
    word-wrap: break-word;
    background-color: transparent;
    font-family: 'Poppins', sans-serif;
}

#chat-input {
    display: flex;
    align-items: center;
    background-color: #f8f9f9;
    padding: 20px;
    border-radius: 20px;
    margin: 20px;
    width: 60%;
    box-shadow: 0 4px 8px rgba(0, 0, 0, 0.2);
    animation: inputEntry 1s ease;
}

input[type="text"] {
    flex: 1;
    padding: 15px;
    border: none;
    border-radius: 25px;
    margin-right: 10px;
    outline: none;
    font-size: 20px;
    font-family: 'Poppins', sans-serif;
    background: #ecf0f1;
    color: #2c3e50;
}

#send-button {
    background-color: #e74c3c;
    color: white;
    border: none;
    border-radius: 25px;
    padding: 15px 30px;
    cursor: pointer;
    outline: none;
    transition: background 0.3s ease;
}

#send-button:hover {
    background-color: #c0392b;
}

@keyframes chatEntry {
    from {
        transform: translateY(-100%);
        opacity: 0;
    }
    to {
        transform: translateY(0);
        opacity: 1;
    }
}

@keyframes headerEntry {
    from {
```

```
        transform: translateY(-100%);
        opacity: 0;
    }
    to {
        transform: translateY(0);
        opacity: 1;
    }
}

@keyframes boxEntry {
    from {
        transform: scale(0.8);
        opacity: 0;
    }
    to {
        transform: scale(1);
        opacity: 1;
    }
}

@keyframes inputEntry {
    from {
        transform: translateY(100%);
        opacity: 0;
    }
    to {
        transform: translateY(0);
        opacity: 1;
    }
}
```

Tworzenie aplikacji dla chatbota

```
 import json
import random
import torch
from flask import Flask, render_template, request, jsonify

from model import NeuralNet
from utils.nltk_utils import bag_of_words, tokenize

app = Flask(__name__)

# Load intents and the chatbot model
with open('source/intents.json', 'r') as json_data:
    intents = json.load(json_data)

FILE = "source/data.pth"
data = torch.load(FILE)

input_size = data["input_size"]
hidden_size = data["hidden_size"]
output_size = data["output_size"]
all_words = data["all_words"]
tags = data["tags"]
model_state = data["model_state"]

model = NeuralNet(input_size, hidden_size, output_size)
model.load_state_dict(model_state)
model.eval()


# Function to get chatbot responses
```

```
def get_response(msg):
    sentence = tokenize(msg)
    X = bag_of_words(sentence, all_words)
    X = X.reshape(1, X.shape[0])
    X = torch.from_numpy(X)
    output = model(X)
    _, predicted = torch.max(output, dim=1)

    tag = tags[predicted.item()]

    probs = torch.softmax(output, dim=1)
    prob = probs[0][predicted.item()]

    if prob.item() > 0.75:
        for intent in intents['intents']:
            if tag == intent["tag"]:
                return random.choice(intent['responses'])

    return "I do not understand..."


# Define the home page route
@app.route('/')
def home():
    return render_template('index.html')


# Define a route for handling chat interactions
@app.route('/get_response', methods=['POST'])
def chat():
    user_msg = request.form['user_msg']
    bot_response = get_response(user_msg)
    return jsonify({'response': bot_response})


if __name__ == "__main__":
    app.run(debug=True)
```

Tworzenie skryptu trenującego

```
import json

import torch
import torch.nn as nn
from torch.utils.data import Dataset, DataLoader

from model import NeuralNet
from utils.nltk_utils import tokenize, stem, bag_of_words

with open('source/intents.json', 'r') as f:
    intents = json.load(f)

all_words = []
tags = []
xy = []

for intent in intents['intents']:
    tag = intent['tag']
    tags.append(tag)
    for pattern in intent['patterns']:
        w = tokenize(pattern)
        all_words.extend(w)
```

```
        xy.append((w, tag))

ignore_words = ['?', '!', '.', ',']
all_words = [stem(w) for w in all_words if w not in ignore_words]
all_words = sorted(set(all_words))
tags = sorted(set(tags))

X_train = []
y_train = []

for (pattern_sentence, tag) in xy:
    bag = bag_of_words(pattern_sentence, all_words)
    X_train.append(bag)

    label = tags.index(tag)
    y_train.append(label)

X_train = torch.tensor(X_train, dtype=torch.float32)
y_train = torch.tensor(y_train, dtype=torch.int64)


class ChatDataset(Dataset):
    def __len__(self):
        return len(X_train)

    def __getitem__(self, index):
        return X_train[index], y_train[index]


dataset = ChatDataset()
batch_size = 8
dataloader = DataLoader(dataset=dataset, batch_size=batch_size, shuffle=True)

input_size = len(X_train[0])
hidden_size = 8
output_size = len(tags)
learning_rate = 0.001
num_epochs = 1000

model = NeuralNet(input_size, hidden_size, output_size)

criterion = nn.CrossEntropyLoss()
optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)

loss = None


for epoch in range(num_epochs):
    for (words, labels) in dataloader:
        outputs = model(words)
        loss = criterion(outputs, labels)

        optimizer.zero_grad()
        loss.backward()
        optimizer.step()

print(f'Final loss: {loss.item():.4f}')

data = {
    "model_state": model.state_dict(),
    "input_size": input_size,
    "hidden_size": hidden_size,
    "output_size": output_size,
    "all_words": all_words,
    "tags": tags
}
```

```
FILE = "source/data.pth"
torch.save(data, FILE)

print(f'Training complete. File saved to {FILE}')
```

Tworzenie narzędzi pomocniczych dla aplikacji i skryptu trenującego

```
import nltk
import numpy as np
from nltk.stem.porter import PorterStemmer

stemmer = PorterStemmer()


def tokenize(sentence):
    return nltk.word_tokenize(sentence)


def stem(word):
    return stemmer.stem(word.lower())


def bag_of_words(tokenized_sentence, all_words):
    tokenized_sentence = [stem(w) for w in tokenized_sentence]
    bag = np.zeros(len(all_words), dtype=np.float32)
    for idx, w in enumerate(all_words):
        if w in tokenized_sentence:
            bag[idx] = 1.0
    return bag
```

Przygotowanie danych

```
{
  "intents": [
    {
      "tag": "greeting",
      "patterns": [
        "Hello",
        "Hi there",
        "Good day",
        "Hey",
        "Hi",
        "Good morning",
        "Good evening",
        "Greetings",
        "Howdy",
        "Hi everyone",
        "Hey there"
      ],
      "responses": [
        "Hello, welcome to the Sports Advisory Forum!",
        "Hi there! How can we help you with your sports-related questions today?",
        "Good day! Need advice on sports training or equipment?",
        "Hey! How can we assist you with your sports needs today?",
        "Greetings! What sports issues can we help you with?"
      ]
```

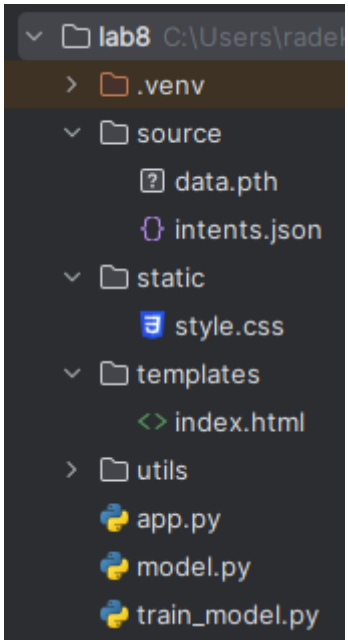
```
    },
    {
      "tag": "goodbye",
      "patterns": [
        "Bye",
        "Goodbye",
        "See you later",
        "Thanks for the help",
        "Catch you later",
        "Take care",
        "See you next time",
        "I'm off",
        "Farewell"
      ],
      "responses": [
        "Goodbye! Stay active and healthy!",
        "See you next time, enjoy your sports activities!",
        "Thank you for visiting the Sports Advisory Forum!",
        "Bye! Stay fit and have fun!",
        "Catch you later! Have a great day!"
      ]
    },
    {
      "tag": "thanks",
      "patterns": [
        "Thanks",
        "Thank you",
        "Much appreciated",
        "Thanks for your assistance",
        "Thanks a lot",
        "I appreciate it",
        "Thanks so much",
        "Many thanks",
        "Thank you very much"
      ],
      "responses": [
        "You're welcome! Happy to help!",
        "Any time! We're here for all your sports needs.",
        "Glad to assist! Enjoy your training!",
        "No problem! We're always here to help.",
        "You're welcome! Stay active and take care!"
      ]
    },
    {
      "tag": "training_advice",
      "patterns": [
        "How do I improve my running speed?",
        "What exercises help build muscle?",
        "Tips for increasing endurance?",
        "How can I get better at soccer?",
        "What training is best for basketball?"
      ],
      "responses": [
        "To improve running speed, focus on interval training and strength exercises
for your legs.",
        "Building muscle requires a combination of strength training exercises like
weightlifting and a protein-rich diet.",
        "For endurance, incorporate long-distance running or cycling and mix in
interval training.",
        "Improving at soccer involves practicing ball control, shooting drills, and
playing regularly with others.",
        "Basketball training should include dribbling drills, shooting practice, and
agility exercises."
      ]
    },
    {
```

```
      "tag": "nutrition",
      "patterns": [
        "What should I eat before a workout?",
        "Best foods for muscle recovery?",
        "How to stay hydrated during exercise?",
        "What diet is best for athletes?",
        "Post-workout meal suggestions?"
      ],
      "responses": [
        "Before a workout, eat a balanced meal with carbohydrates and protein about
2-3 hours prior.",
        "For muscle recovery, consume foods rich in protein like chicken, fish, and
legumes, along with carbohydrates.",
        "Stay hydrated during exercise by drinking water regularly, and consider
sports drinks for long-duration activities.",
        "Athletes benefit from a diet rich in lean proteins, whole grains, fruits,
and vegetables.",
        "A good post-workout meal includes protein and carbohydrates, such as a
smoothie with protein powder and fruits."
      ]
    },
    {
      "tag": "equipment_advice",
      "patterns": [
        "Best running shoes?",
        "What type of bike is good for beginners?",
        "How to choose a tennis racket?",
        "What equipment do I need for home workouts?",
        "Recommended brands for sports gear?"
      ],
      "responses": [
        "The best running shoes depend on your foot type and running style; visit a
specialty store for a fitting.",
        "For beginners, a hybrid bike is a good choice as it combines features of
road and mountain bikes.",
        "When choosing a tennis racket, consider your skill level and playing style;
consult with a specialist for advice.",
        "For home workouts, basic equipment includes dumbbells, resistance bands, a
yoga mat, and a stability ball.",
        "Popular and reliable brands for sports gear include Nike, Adidas, Under
Armour, and Reebok."
      ]
    },
    {
      "tag": "injury_prevention",
      "patterns": [
        "How to prevent running injuries?",
        "Tips for avoiding sports injuries?",
        "What are the best stretches before a workout?",
        "How to avoid overtraining?",
        "Preventing muscle strains?"
      ],
      "responses": [
        "To prevent running injuries, ensure proper warm-up, use the right shoes, and
gradually increase mileage.",
        "Avoid sports injuries by warming up properly, using appropriate gear, and
following proper techniques.",
        "Effective pre-workout stretches include dynamic stretches like leg swings,
arm circles, and walking lunges.",
        "Avoid overtraining by allowing adequate rest, listening to your body, and
varying your training routine.",
        "Prevent muscle strains by warming up, incorporating flexibility exercises,
and not overexerting yourself."
      ]
    },
    {
```

```
      "tag": "recovery",
      "patterns": [
        "How to recover after a marathon?",
        "Best recovery methods for sore muscles?",
        "Tips for post-workout recovery?",
        "How to reduce muscle soreness?",
        "Effective ways to recover from a workout?"
      ],
      "responses": [
        "After a marathon, focus on hydration, gentle stretching, and rest to allow
your body to recover.",
        "For sore muscles, try foam rolling, gentle stretching, and applying ice or
heat as needed.",
        "Post-workout recovery tips include rehydrating, consuming a balanced meal
with protein and carbs, and resting.",
        "Reduce muscle soreness by staying hydrated, incorporating light activities
like walking, and using a foam roller.",
        "Effective recovery methods include proper hydration, nutrition, stretching,
and getting adequate sleep."
      ]
    },
    {
      "tag": "sports_psychology",
      "patterns": [
        "How to stay motivated in sports?",
        "Tips for overcoming performance anxiety?",
        "How to set effective sports goals?",
        "Dealing with pressure in competitions?",
        "Improving mental toughness?"
      ],
      "responses": [
        "Stay motivated by setting achievable goals, tracking your progress, and
finding a workout buddy or coach.",
        "Overcome performance anxiety by practicing relaxation techniques,
visualization, and positive self-talk.",
        "Set effective sports goals by making them specific, measurable, attainable,
relevant, and time-bound (SMART).",
        "Deal with competition pressure by focusing on your own performance,
practicing mindfulness, and staying positive.",
        "Improve mental toughness by challenging yourself regularly, staying focused
on your goals, and building resilience."
      ]
    },
    {
      "tag": "sports_rules",
      "patterns": [
        "What are the basic rules of soccer?",
        "How is basketball scored?",
        "What are the rules of tennis?",
        "How do you play volleyball?",
        "Explain the offside rule in soccer."
      ],
      "responses": [
        "The basic rules of soccer involve scoring by getting the ball into the
opponent's goal and preventing the opposition from scoring.",
        "Basketball is scored with two points for regular field goals, three points
for shots beyond the arc, and one point for free throws.",
        "Tennis rules include serving diagonally, scoring points through rallies, and
winning sets by reaching six games with at least a two-game lead.",
        "Volleyball is played by hitting a ball over a net with the aim to land it in
the opponent's court, and teams can hit the ball up to three times before returning
it.",
        "The offside rule in soccer states that a player is offside if they are
nearer to the opponent's goal line than both the ball and the second last opponent
when the ball is played to them."
      ]
```

```
        }
    ]
}
```

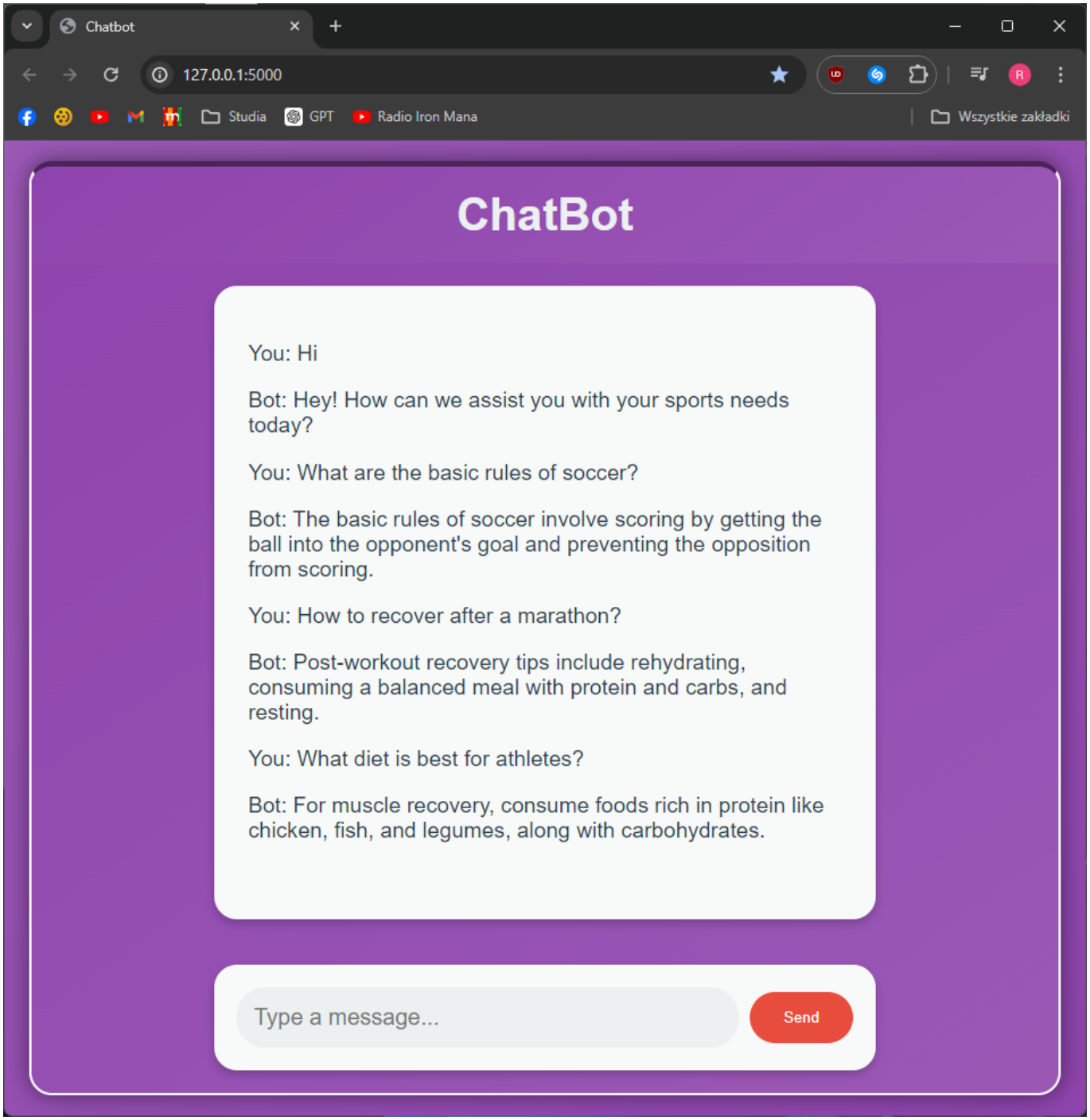
Struktura projektu



Trenowanie chatbota

```
PS C:\Users\radek\OneDrive - Wojskowa Akademia Techniczna\magister\sem1\SWP - Standardy w Projektowaniu Systemów Dialogowych\lab56\lab8> python .\train_model.py
C:\Users\radek\OneDrive - Wojskowa Akademia Techniczna\magister\sem1\SWP - Standardy w Projektowaniu Systemów Dialogowych\lab56\lab8\train_model.py:40: UserWarning: Creating a ten
sor from a list of numpy.ndarrays is extremely slow. Please consider converting the list to a single numpy.ndarray with numpy.array() before converting to a tensor. (Triggered int
ernally at ..\torch\csrc\utils\tensor_new.cpp:277.)
  X_train = torch.tensor(X_train, dtype=torch.float32)
Final loss: 0.0001
Training complete. File saved to source/data.pth
PS C:\Users\radek\OneDrive - Wojskowa Akademia Techniczna\magister\sem1\SWP - Standardy w Projektowaniu Systemów Dialogowych\lab56\lab8> python app.py
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 990-015-363
127.0.0.1 - - [11/Jun/2024 02:48:17] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [11/Jun/2024 02:48:17] "GET /static/style.css HTTP/1.1" 304 -
127.0.0.1 - - [11/Jun/2024 02:48:22] "POST /get_response HTTP/1.1" 200 -
127.0.0.1 - - [11/Jun/2024 02:48:32] "POST /get_response HTTP/1.1" 200 -
127.0.0.1 - - [11/Jun/2024 02:48:39] "POST /get_response HTTP/1.1" 200 -
127.0.0.1 - - [11/Jun/2024 02:48:47] "POST /get_response HTTP/1.1" 200 -
```

Uruchomienie chatbota



Podsumowanie:

W ramach ćwiczeniu udało się stworzyć chatbota doradzającego w zakresie sportu, dającego wskazówki jak się przygotować i jak radzić sobie z kwestiami okołosportowymi.

Chat został wytrenowany przy pomocy bibliotek torch, nltk oraz numpy. Aplikacja została postawiona jako lokalny serwer http przy pomocy frameworka Flask.