

## Internet Technologies

### "Chatbot Project"

Complete **Tasks 1-2** in order to pass the PrL (Praktikumsleistung).

Note the following submission rules:

- Groups of up to 4 students can make a joint submission.
- The submission must include:
  - The names and student IDs of all group members.
  - All source code and configuration files.
  - A setup manual that documents offline installation and usage.
- The submission must not include:
  - Dependencies such as the `node_modules` directory. Instead, provide a `package.json` and `package-lock.json` in the source code.
  - Microsoft Azure account credentials.
  - Any secrets, such as API keys or access tokens.
- Submit the solution in the form of a ZIP archive via iLearn.

### Task 1 - Chatbot Implementation

Implement a chatbot, i.e., a computer program that simulates human conversation through text chats.

The following **functional** requirements shall apply:

- The bot should be able to understand and interact within conversations, conducted in Q&A<sup>1</sup> fashion, and limited to the topic assigned to you.
  - The bot should steer the conversion by asking aggressively.
  - The bot should understand the intents from a user's answer (utterance).
  - The bot should have a soft fallback if it cannot understand an user's utterance (i.e., ask the user to rephrase).
  - The bot should have a hard fallback if the bot failed to advance the conversation repeatedly (i.e., start all over again).

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<sup>1</sup>Question and answer

- The bot should accomplish certain tasks in context of the chosen topic and therefore remember the conversation history. Examples:
  - Place an order in a restaurant.
  - Compile a workout plan in a gym.
- The bot should be able to conduct a conversation that exceeds 20 Q&A turns.
- The bot should not repeat itself (except for fallback questions).
- The user interface should have a modern look & feel supporting responsive web design for mobile devices, tablets, and desktop computers..
- The user interface should display questions and answers alternating in a list-like shape.

The following **non-functional** requirements shall apply:

- The frontend should be implemented in the form of a HTML5 website.
- The frontend should have a layout realized with CSS.
- The frontend should be based on the React framework having at least 4 React components.
- The frontend should communicate with the backend using Socket.IO and the Websocket protocol.
- The backend should be based on Node.js<sup>2</sup> and use Express.js to serve the application's user interface.
- The backend should identify the intents of a user based on keyword-spotting<sup>3</sup>.
- The backend should be extensible in a sense that adding new topics / intents / answers does not require changing the source code.

The following rules for **code reuse** shall apply:

- It is allowed to reuse existing layouts, e.g., from *bootsnip*<sup>4</sup> or from *onaircode*<sup>5</sup>, except the chat layout by Pavel Komiagin<sup>6</sup>.
- It is allowed to reuse the code examples from the lecture, uploaded to iLearn, except the chat layout by Pavel Komiagin.
- It is **not** allowed to reuse code from any other sources (incl. ChatGPT).

*Hints:*

- In order to make the user interface modern looking and responsive, use a framework such as Bootstrap 5.
- Note the quality of your code will be evaluated as well → write clean code.

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<sup>2</sup>Version 18.14.2 LTS

<sup>3</sup>The identification of keywords in text and/or utterances

<sup>4</sup><https://bootsnipp.com/tags/chat>

<sup>5</sup><https://onaircode.com/html-css-chat-box-examples>

<sup>6</sup><https://bootsnipp.com/snippets/Z1kBn>

## Task 2 - Chatbot Deployment

Deploy the chatbot implementation to the Microsoft Azure<sup>7</sup> cloud.

The following **functional** requirements shall apply:

- The chatbot should be available via a publicly available URL.
- All communication should be encrypted via SSL/TLS.

The following **non-functional** requirements shall apply:

- Enroll for a "Azure for Students"<sup>8</sup> subscription to get 100\$ of credits.
- To host the chatbot, use one of the following Azure services:
  - Azure App Services (preferred)
  - Azure Virtual Machines

## Task 3 - Chatbot Engine (optional)

Improve your chatbot by replacing the keyword-spotting approach by an implementation based on the Microsoft Azure's *Language Understanding* (LUIS<sup>9</sup>) service or the APIs provided by OpenAI<sup>10</sup> to detect the intent from a user's utterance. The same functional and non-functional requirements apply as for Task 1, except for keyword spotting.

Submit a fully operational solution in addition to (not 'instead of') the solution of Task 1 to iLearn. However, for Task 2, deploy the solution of Task 3 instead of (not 'in addition to') Task 1.

*Note:* Successful completion of this task carries a 10% bonus for the exam.

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<sup>7</sup><https://azure.com>

<sup>8</sup><https://azure.microsoft.com/en-us/free/students/>

<sup>9</sup><https://luis.ai>

<sup>10</sup><https://platform.openai.com/>