Logo, company name

Description automatically generated

Data science tools and techniques

DATDRD08

Made by: Sarwesh Balsingh, 1631859

Teacher: Mr. J. Smits

Code: DATDRD08

Hand in date: 19-12-2023

# Executive Summary

This project aims to address the challenges faced by language learners. The struggle with learning new languages is multifaceted, encompassing issues in vocabulary building, contextual understanding, grammatical and syntactic features, and sociolinguistic communicative features. To assist learners, two models were developed: Language Buddy and Language Chattie.

Language Buddy is a simple language learning tool designed to improve vocabulary skills through translation and multiple-choice exercises. It operates locally using Python, targeting any language with a user-friendly interface. The model provides personalized feedback, highlighting areas that need attention based on user performance. While competitors like Quizlet, StudyGo, and Duolingo exist, Language Buddy's simplicity and absence of practice limitations make it a valuable option for learners.

Language Chattie, on the other hand, is an advanced language practice model linked with OpenAI's GPT-3.5 Turbo model. This AI-driven approach offers translation, grammar checking, vocabulary checking, and dynamic response generation. While sophisticated, its full functionality requires a subscription plan with OpenAI, potentially limiting accessibility for some users. Evaluation against other AI tools revealed Bing Copilot as a well-rounded performer, offering accurate translation, grammar checking, and constructive feedback.

Deployment of the models involves running local scripts for Language Buddy or setting up a subscription plan with OpenAI for Language Chattie, along with hosting the web interface on platforms like Heroku. Language Buddy stands out for its simplicity and accessibility, while Language Chattie provides a more advanced AI-driven experience.

In conclusion, both models offer valuable language learning experiences, with Language Buddy excelling in simplicity and accessibility, while Language Chattie provides a more sophisticated AI-driven approach. The choice between the two models depends on individual preferences, technical proficiency, and the level of AI sophistication desired in the language learning journey.

Table of Contents

[Executive Summary 1](#_Toc153822935)

[Literature Review 3](#_Toc153822936)

[struggles with learning new Languages 3](#_Toc153822937)

[API keys 4](#_Toc153822938)

[Creating the Model 6](#_Toc153822939)

[Business Understanding 6](#_Toc153822940)

[Data Understanding 6](#_Toc153822941)

[Data Preparation 6](#_Toc153822942)

[Modelling 7](#_Toc153822943)

[Evaluation 8](#_Toc153822944)

[Deployment 10](#_Toc153822945)

[Conclusion 11](#_Toc153822946)

[Bibliography 12](#_Toc153822947)

[Appendix 13](#_Toc153822948)

[Appendix 1. Github link 13](#_Toc153822949)

[Appendix 2. interface model 1 language buddy 13](#_Toc153822950)

[appendix 3. interface model 2 language chattie 13](#_Toc153822951)

Currently, I am an International Business student with a specialization on Marketing and Sales. Within the Marketing and Sales major, a requirement is reaching level 6, equivalent to level B1, in one of the selected language courses offered at the HAN International Business School. The language options include French, Spanish, German, and Dutch (for non-Dutch speaking students). Due to being a native Dutch speaker, the choice was made to follow the French courses.

Personally, languages have always presented a challenge for me. Excelling in more analytical classes such as mathematics or statistics, my journey with French, leading up to and encompassing level 6, encountered numerous pitfalls and did not progress seamlessly. This narrative echoes among my peers engaged in various languages like German or Spanish; these students, too, grapple with the complexities of acquiring foreign languages.

Difficulty arises particularly in some language courses where classes are conducted entirely in the foreign language post-level 2, where even questions must be formulated in the foreign language. For some, this becomes a struggle as full comprehension is not always achieved. Questions might go unasked due to a lack of confidence in language proficiency.

The two models to be developed for this project aim to assist not only students but also those eager to learn new languages. These models seek to enhance language understanding, acting as tools to supplement the learning process, recognizing that they will not replace formal language education at a school or course.

# Literature Review

## struggles with learning new Languages

Learning new languages can be difficult. In 2021 some scientist did research on learning new languages and the struggles that it brings. In this research they addressed students from different background and universities in Japan to see what the implications are with learning a new language.

### Lexical and language function features

#### Vocabulary Building

Vocabulary is regarded as the primary building block of language learning. It may be difficult to understand spoken or written language if one’s vocabulary is inadequate. It is believed that acquiring a large vocabulary is essential to being proficient in a second language (Corpuz, 2021).

#### Contectual understanding

Learners may encounter difficulties in comprehending contextual meanings. It can be challenging to understand the intended meaning of a statement when there are even slight variations in word choice or sentence structure (Corpuz, 2021).

#### Language functions

It is thought to be essential to understand language functions. It is possible to misinterpret implications by focusing only on one word’s meaning and ignoring its context and subtleties. It takes more than just a literal translation to comprehend the distinction between, say, “How are you?” and “How old are you?” One must also grasp the intended context (Corpuz, 2021).

### Grammatical and syntactic features

#### syntax differences

Disparities in syntax between the learner’s first and second language could be problematic. Grammar mistakes in the second language might result from direct translation that follows the structure of the original language (Corpuz, 2021).

#### Complex grammatical aspects

Beyond word order, grammar encompasses intricate elements like verb conjugations, verb agreement, and other grammatical characteristics. Learners may encounter difficulties grasping these nuances, particularly if instruction is given quickly (Corpuz, 2021).

#### perceived difficulty of grammar

According to the report, students frequently think that learning grammar is hard and exhausting. Teaching strategies that emphasize specific grammar rules, for example, may have an impact on this view and demotivate language learners (Corpuz, 2021).

### Sociolinguistic communcative features

#### speaking challenges

Speaking is frequently seen as the most difficult language ability. When it comes to writing, speaking, and listening, learners could be at ease demonstrating their language skills, but they might struggle when asked to talk (Corpuz, 2021).

#### cultural factors

Individual attitudes, communication levels, and cultural influences can all have an impact on spoken language performance. It could be difficult for learners to modify their communication style to fit the second language’s sociolinguistic norms (Corpuz, 2021).

#### Native mindset

Having a “native mindset” is taking on the reasoning principles of someone who speaks the language well in order to understand others and reply correctly. Acquiring this talent is deemed crucial for proficient communication, yet it could provide a challenge for students (Corpuz, 2021).

#### Teaching strategy discrepancy

The research suggests that there may be a mismatch between language teaching strategies – like communicative language instruction – and the real demands of learners in sociolinguistic environments. The difficulties that learners encounter in real-life communication may not be sufficiently addressed by strategies that only concentrate on language aspects (Corpuz, 2021).

In summary, the struggles in learning a new language are considered to be multifaceted and include challenges in vocabulary building, contextual understanding, syntax differences, mastering complex grammatical aspects, and adapting to sociolinguistic communicative features. Addressing these challenges is deemed to require a comprehensive approach that considers both linguistic and practical aspects of language acquisition (Corpuz, 2021).

## API keys

API Keys will have an enormous importance in building Model 2. Therefore, a small literature review is done to give a better understanding of API Keys and its use (Madden, 2020).

API stands for Application Programming Interface. An API key is a unique identifier that is used to authenticate and authorize access to an API. In simpler terms, it is a code that allows you to access and interact with certain services or data provided by a particular API. Some key points about API keys and their functionality are as follows:

**Authentication**: One use for API keys is in authentication. The API key, which identifies the requester as a legitimate API user, is included in requests made to API’s. this guarantees that only authorized users can access and utilize the API (Madden, 2020).

**Authorization**: An additional use for API keys is authorization. They decide whether rights or degrees of access are given to a user in relation to the API. Different API keys may have various levels of access, depending on the settings made by the API provider, such as read-only, write, or admin access (Madden, 2020).

**Secure Access**: One factor in guaranteeing safe access to an API is the use of API keys. Providers are able to keep an eye on consumption, identify and prevent illegal or questionable attempts at access, and enforce usage limits by requiring an API key (Madden, 2020).

**Tracking Usage**: API keys make it easier to keep track of how an API is used. Analytics data can be gathered, usage trends tracked, and any limitations or usage restrictions set by the API provider can be upheld (Madden, 2020).

**Rate Limitation**: Rate limitation is a strategy that limits the number of requests a client can make to an API in a given amount of time. It can be implemented with the use of API keys. It is possible to assign specific rate restrictions to API keys in order to prevent misuse or abuse of API resources (Madden, 2020).

**Developer Identification**: By employing API keys, specific developers or apps that make use of the API can be identified. In order to give support, monitor developer usage, and uphold usage agreements or policies, this is helpful to providers (Madden, 2020).

**Management of API Providers**: API keys enable providers to oversee and regulate user access to their services. They provide flexibility and security in controlling user access by having the ability to issue, revoke, or regenerate API keys as needed (Madden, 2020).

It is crucial to remember that in order to avoid unwanted API access, API keys must be kept sage. They ought to be handled similarly to passwords, not disclosed to the general public or included in client-side code (Madden, 2020).

To summarize, API keys are essential for granting authorised and sage access to APIs, which enables developers to utilise the features and information the API provides in their system or applications (Madden, 2020).

# Creating the Model

## Business Understanding

The goal is to create multiple models to help people learn ,foreign, languages. The key stakeholders for this project are students, but also people in general who are eager to learn new languages. Learning new languages can be a struggle for most students with a lot of pitfalls. Especially if it is a new language which the individual has never practiced before.

For this project two models will be created. Model 1 will be an application that will practice phrases with you. This Model is called “Language Buddy.” The Language Buddy is a simple language learning tool designed to aid users in improving their vocabulary skills through translation and multiple-choice exercises. Developed using Python, the application leverages the ‘tkinter’ library for creating a graphical user interface (GUI) and utilizes ‘pandas’ for efficient data manipulation with an Excel-based wordlist.

Model 2 is an advanced language practice model linked with OpenAI. The goal for this model is to have genuine chats with the AI Bot and practice any language of preference. This Model is called “Language Chattie.” The chats can be about anything, and it will help the individual practice its skills in any language. The AI Bot will also give recommendations on how to say certain things better and explain about the culture of the language. Because culture understanding is volatile in speaking a language.

## Data Understanding

### Model 1 Language buddy

The dataset used is a list with French phrases. These phrases are study material from the French 6 classes. Because there are a lot of phrases in French 6, only 50% was used in the dataset. The dataset itself contains 56 different phrases in French and with the correct English translation. The data is texted based and also contains letters with special characters (e.g. â, ç, á, etc.).

### Model 2 Language Chattie

Because Model 2 is an AI linked with OpenAI using an API key and the GPT-3.5 model, the data being used is from the OpenAI database sources. This makes it a very sophisticated model with a lot of knowledge. The model contains various functionalities which are important for understanding the data used in the model.

* The model translates text using the Google Translate API
* It checks grammar using the LanguageTool API
* Checks vocabulary by comparing words against the NLTK word corpus
* Finally, the model will generate a response using OpenAI’s GPT-3.5 Turbo model.

## Data Preparation

### Model 1 Language buddy

The data preparation was simple. All the phrases were extracted from the pdf file to an excel file. This was done manually by copying each phrase to the excel file. The dataframe is an excel file as input, the reason that this is the case is that it is easier to read into Python using the Pandas package.

In the dataframe there are two columns: ‘Native’ and ‘Foreign.’ In this case the English translation was put in to the ‘Native’ column and the French translation was put in to the ‘Foreign’ column. The reason this is the case is that the model can work on every language. Not just French and English. It is important that the user put their data in the right order. The column ‘Foreign’ will be the practiced language and the column ‘Native’ will be the language that the user already speaks fluently. By implementing this change the user only has to prepare the excel file in the right way.

### Model 2 Language Chattie

Because Model 2 has a function where you can insert a wordlist to practice with the AI bot, preparing this list was the only data preparation. This is because pre-existing data is used and connected with the model using API Keys. The wordlist is the exact same wordlist used in Model 1.

## Modelling

### Model 1 Language buddy

The application uses a simple model for language learning exercises, including translating words, selecting correct translations from multiple choices, a phrase that disappears after 5 seconds and that phrase has to be typed again. The model randomly selects words from the dataset for each exercise.

#### Libraries

By importing the correct libraries, it makes it possible to run the code and make it work smoothly. The libraries that are used in the code for Model 1 are:

* ‘tkinter’: GUI toolkit for desktop applications.
* ‘Messagebox’, ‘ttk’: Components of tkinter for dialog boxes and themed widgets.
* ‘Random’: Used for generating random numbers.
* ‘Pandas’: Enables efficient data manipulation and analysis.

#### GUI Elements and Functionality

The elements for creating the graphical user interface and it is functionality are important to recognize and mention in the model. This highlights how the application’s interface works for the user.

* The GUI includes labels, entry widgets, and buttons for user interaction.
* Exercises involve translating words, selecting correct translations from multiple choices, a phrase that disappears after 5 seconds and that phrase has to be typed again, and viewing the entire wordlist.
* The application maintains a score, updates it after each exercise, and concludes the session after a set number of exercises (in this case twenty, but can be set to whatever the user wants) .

#### interface

In APPENDIX 2. INTERFACE MODEL 1 LANGUAGE BUDDY is a picture of the interface. As you can see the interface design is quite simple, and after answering a question the application will show whether this is wrong or right.

### Model 2 Language Chattie

Model 2 is a language learning AI model with a simple web interface. Users can enter messages and receive responses based on the model’s logic. The model is built using a Flask web application that utilizes various language processing techniques and APIs to create a language learning AI model. In this model users can interact with the AI to practice their preferred language. The model provide translation, grammar checking, vocabulary checking, and response generation.

For the model to work an html index is created, this ensures that the web interface is functional. The html index can be modified and complex as the user want. Because my experience in coding is new, the html index is set up quite standard as a baseline.

#### Libraries and APi key

The libraries used in the code are crucial, the libraries used are:

* Flask, used for creating a local web application.
* NLTK, used for checking vocabulary by comparing words against the NLTK word corpus.
* Googletrans, used to learn the model understand the languages contained in the Google Translate database.
* OpenAI, used for the model to generate responses based on the database from OpenAI.
* Language-tool-python, used to learn the model how to grammar check using LanguageTool database.

#### Java

The Python-Language-Tool library, provides access to the LanguageTool grammar checking functionality, requires a Java Runtime Environment (JRE) to be installed. LanguageTool is an open-source grammar checking and language quality improvement tool. It is written in Java and is designed to be used as a standalone application or integrated into other applications or libraries. Python does not have a native implementation of LanguageTool. Therefore, to use LanguageTool’s functionality in Python, a bridge or wrapper is needed to connect the Python code with the Java-based LanguageTool application (*Language-tool-python*, 2022).

The python-language-tool library utilizes a py4k, a Python-to-Java communication library, to establish a bridge between Python and LanguageTool. Python and Java are two different programming languages that run on separate runtime environments. Py4j helps facilitate communication and method invocation between Python and Java (*About Py4J — Py4J*, n.d.).

To run Java-based applications or libraries like LanguageTool, a Java Runtime Environment (JRE) must be installed on the machine running the Python code. the JRE provides the necessary infrastructure and libraries for executing Java-based programs. The python-language-tool library relies on the JRE to execute the Java code and interact with LanguageTool (*JDK 21 Documentation - Home*, 2023).

In summary, the python-language-tool library requires Java to be installed because it acts as a bridge between the Python code and the Java-based LanguageTool application. The Java Runtime Environment (JRE) provides the necessary infrastructure for executing the Java code and enabling communication between Python and LanguageTool.

#### interface

In APPENDIX 3. INTERFACE MODEL 2 LANGUAGE CHATTIE is a picture of how the interface looks like. As you see this is a remarkably simple interface. The user can type in its message and choose the ‘target language,’ meaning the language that the user wants to learn, and the ‘user language,’ meaning the language that the user already speaks fluently.

## Evaluation

### Model 1 Language buddy

While an amazingly simple model, it can be beneficial for every user during the learning journey. The application is sensitive to grammar mistakes and operates on a one-on-one basis with the Excel file. Thus, if an extra space or an additional comma is present, the model will consider it correct. Therefore, it is crucial for the user to approach this task carefully and precisely.

The exercises are random, consisting of either three exercises; translating phrases, multiple choice, and typing over a phrase that disappears after 5 seconds, and the phrases are also randomly generated. This randomness adds comfort and increases engagement during the exercises. Upon completing an exercise, the application will indicate whether it is correct by stating "Well Done!" or incorrect by saying "Incorrect," along with the correct translation. After completing all exercises, the application will display the user's score percentage based on correct translations. Additionally, it will present a list of sentences where the user made mistakes, highlighting areas that need extra attention and practice.

While some genuinely nice features are present in this simple model, it is essential to acknowledge the existence of other applications and websites for practicing foreign languages. Some popular examples include Quizlet, StudyGo (formerly WRTS), and Duolingo.

#### Quizlet

Quizlet is a free-to-use service application with a paid subscription, priced at €2.66 per month, where users can sign up and practice wordlists. Due to its premium version, the free version has limitations. Quizlet offers various exercises for learning phrases and functions similarly to Model 1. However, the premium version imposes a maximum practice limit per day, unlike Model 1, which has no such limitations.

#### StudyGo

Similar to Quizlet, StudyGo is a free-to-use service application with a paid subscription, featuring three tiers: Plus (€5.99 per month), Premium (€9.99 per month), and Pro (€15.99 per month). Each tier has its own benefits. While StudyGo's exercises are akin to Quizlet, it allows linking to classrooms. This feature enables teachers to insert lists, and students can learn, and complete exercises related to those lists. StudyGo is more advanced than Model 1, but for users above 18 years old, a subscription is mandatory, posing affordability challenges for some.

#### Duolingo

Duolingo stands as the world's most popular language app, aiding in language learning with various levels of difficulty. It starts easy and progresses to advanced levels. Although more of an educational app, Duolingo lacks the capability to input custom wordlists, limiting its use for specific exam preparations. While free, Duolingo has a premium version priced at €7.33 per month. In contrast to Model 1, Duolingo is more advanced but lacks the feature of practicing a user-selected set of phrases. It offers diverse exercises, including reading activities, and introduces leaderboards for users to compete in earning XP, enhancing engagement.

#### conclusion

Overall, Model 1 Language Buddy offers a straightforward and effective one-on-one language learning experience, emphasizing precision in grammar through sensitivity to mistakes. The randomization of exercises and phrases enhances engagement, distinguishing it in its simplicity. However, in the broader landscape, competitors like Quizlet, StudyGo, and Duolingo present varying strengths. Quizlet's free-to-use model aligns with Model 1 but imposes practice limitations in its premium version. StudyGo, with an advanced system, links exercises to classrooms but mandates subscriptions for users over 18. Duolingo, as the most popular app, provides comprehensive learning but lacks customization for specific exam preparations. Model 1's simplicity, absence of practice restrictions, and personalized feedback make it stand out, yet the choice depends on individual preferences and learning objectives.

### Model 2 language chattie

As explained in the literature review making use of the OpenAI API Key, is not free. For this to work it is mandatory to have a premium account on OpenAI or start a billing plan. Unfortunately, at this moment I do not possess such subscription plan. Therefore, it is difficult to test the actual model itself. Because it is based on OpenAI’s sources, the evaluation will be conducted based on Chat GPT 3.5. For evaluating the model, a dialogue will be written and applied to different AI tools. The dialogue will be exactly the same and to see how the different AI tools respond to this. The dialogue will include some grammar errors and will be fully written in French. In the GitHub will be folder with ‘Datasets’ and here will the dialogue be stored in a word file. The answers by each model will be evaluated in this section.

#### Chat gpt 3.5

To evaluate how Model 2 will perform, Chat GPT 3.5 will be used, as explained in the paragraph before this. During the evaluation process, some notable things surfaced. GPT gives a very extensive response to my input. It is important to keep giving input because it will not manually talk about a topic. It does give suggestions on what topics could be talked about and how to continue the conversation. It is nice that GPT gives the correct translation and when asked on how to say certain things in French the AI responds perfectly accurate. One problem is that it does not grammar check the prompts that were given as input (e.g. footbal in French is le football). This is unfortunate, but overall, the chatting experience feels like a bot and that is not something bad. The grammar and the vocab and the tips given are a good structure and will help with improving language skills.

#### BARD ai

Well, the Bard AI gave very extensive answers but without putting the English translation with the answers, which was asked for in the first prompt. Without the translation it is difficult to understand all of it. Bard does give a list of things on how to practice and improve my French speaking. This is not asked for but nice to have. The grammar in Bard’s French is exceptionally good and accurate like Chat GPT’s. It is only unfortunate that Bard cannot give the right English translation.

#### Bing Copilot

The evaluation for Bing Copilot was very surprising. My expectations were surpassed by Bing’s performance. The AI not only replied short with straightforward answers but also had the right translation and even grammar checked my input. This is something that Bard and Chat GPT did not do. The structure stays the same that Bing is an AI, and no real conversations are possible, but it is an incredibly good framework to start practicing languages. After giving corrections it even gave my compliments on how good it already is. This was very surprising, but overall Bing has a great AI for practicing languages.

#### conclusion

While each model has its strengths and weaknesses, Bing Copilot stands out for its well-rounded performance, combining accuracy in translation, grammar checking, and constructive feedback. The three models are similar to each other, but Bing Copilot is better because it ticks all the boxes. Because Chat GPT is similar to Model 2 and uses the same database, Model 2 has a slight upper edge because it also has a program installed that makes corrections. Based on the evaluation it is not a standard thing that the AI corrects automatically. So, a real competitor for Model 2 would be Bing Copilot.

## Deployment

### Model 1 Language buddy

Because the application is currently written as a local host, the user has to download Python and run the script to make use of this model. It is also important that the user puts the wordlist in excel and have the columns ‘Native’ and ‘Foreign.’ The code is written that it can run any language, but it is important to specify these two columns. Further, no coding skill is needed to run this model. It is a matter of copying and pasting it.

What would make this model more advanced is to run a server or a webhost where users could give the excel file with phrases as an input and then practice on the webhost. But for now, that is too complicated.

### Model 2 language chattie

Model 2 is more advanced than Model 1 and has a more complicated way of deployment compared to model 1. For Model 2 to be fully functional for everyone who wants to use it, it start by getting a subscription plan with GPT. After setting up a subscription plan, the back end of the model is setup. For the front-end of the model (the web interface) a Heroku account can be set up and Heroku will host the website and makes it accessible for other users via online. Currently in the code it opens a local webhost using Flask. This means that if other users want to make use of this AI, they have to run the complete code and download the html index. Furthermore, the Model is ready to go. Knowing that Copilot is better optimized than GPT for learning languages, Model 2 will be similar to Copilot. It will not look as pretty as Copilot, but the functionality will be the same.

# Conclusion

In conclusion, the presented language learning models, Language Buddy, and Language Chattie, offer distinct approaches to aiding users in acquiring new language skills.

Language Buddy, the first model, takes a simple yet effective one-on-one approach, focusing on vocabulary improvement through translation and multiple-choice exercises. The model’s interface, developed using Pythong and tkinter, provides a user-friendly experience for practicing phrases in any language. While its simplicity and lack of practice restrictions make it accessible, it competes with other language learning platforms like Quizlet, StudyGo, and Duolingo, each with its own strengths and limitations. Language Buddy stands out for its personalized feedback and absence of practice limitations, offering a valuable option for users seeking a straightforward learning experience.

Language Chattie, the second model, introduces a more advanced language learning AI experience linked with OpenAI’s GPT-3.5 Turbo model. the model’s capabilities include translation, grammar checking, vocabulary checking, and dynamic response generation. Deployed as a web application using Flaks, users can interact with the Ai to practice their preferred language. However, the model’s full functionality requires a subscription plan with OpenAI, presenting a potential barrier for some users. In the evaluation, Chattie was compared with other AI tools like Chat GPT 3.5, Bard AI, and Bing Copilot. While all models demonstrated strengths, Bing Copilot stood out for its well-rounded performance, encompassing accurate translation, grammar checking, and constructive feedback.

In summary, both models offer valuable language learning experiences, with Language Buddy excelling in simplicity and accessibility, while Language Chattie provides a more sophisticated AI-driven approach. The choice between the two models depends on individual preferences, technical proficiency, and the level of AI sophistication desired in the language learning journey.

# Bibliography

*About Py4J — Py4J*. (n.d.). <https://www.py4j.org/about.html>

Corpuz, A. D. (2021). Struggles and Successes of High School Students Studying Second Language: A Narratology Study. OSAKA JALT, 10.

*JDK 21 Documentation - Home*. (2023, September 19). Oracle Help Center. https://docs.oracle.com/en/java/javase/21/

*language-tool-python*. (2022, April 18). PyPI. https://pypi.org/project/language-tool-python/

Madden, N. (2020). *API Security in action*. Simon and Schuster.

# Appendix

## Appendix 1. Github link

[SRRBalsingh/Data\_Science\_and\_Tools: For the minor 'Data Driven Decision Making' at HAN ISB in the Netherlands an Individual Project is required. This Project is about creating a Language Learning Tool. (github.com)](https://github.com/SRRBalsingh/Data_Science_and_Tools/tree/main)

## Appendix 2. interface model 1 language buddy

A screenshot of a computer

Description automatically generated

## appendix 3. interface model 2 language chattie

A screenshot of a computer

Description automatically generated