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BACHELOR´S THESIS / ENGINEERING 2025

Inés Sallent Ysamat

Thesis title (it may be longer than one line if necessary)

[TÍTOL DEL TREBALL]

Treball Fi de Grau de

Inés Sallent Ysamat

Director: Vladimir Estivill Castro

Grau en Enginyeria en Sistemes Audiovisuals

Curs 2024-2025



*[Pàgina en blanc]*

*[Tingueu en compte:*

*(i) No s’han de deixar pàgines blanques al cos del treball (índex fins la conclusió).*

*(ii) Utilitzar interlineat senzill i tipus de lletra Times New Roman.*

*(iii) Per a aquesta secció principal (cos del treball), la restricció del límit de pàgines és de 30 pàgines + 5% o 10% de marge.*

*(iv) La pàgina del final de capítol compta com a mitja pàgina.*

*(v) Podeu afegir un annex d'informació de suport a l’apèndix per incloure totes les dades/informació que necessiteu mostrar. El apèndix no té un límit de pàgines. Si tens informació a l’apèndix, has de fer referència en el text principal a la informació continguda en l’apèndix seguint aquest exemple:*

*document principal: “La taxa de natalitat als països europeus està disminuint molt ràpidament (vegeu Apèndix-1). Això vol dir que tot i que la gent viu més temps (figura Apèndix-1), amb el temps la mida de la població disminuirà".*

*(vi) Les referències s'inclouen a la secció de Bibliografia i s'exclouen de la limitació del nombre de pàgines. ]*

Dedicatòria [opcional] [mida 12]

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**Agraïments[mida 14]**

Text dels agraïments [mida 11]

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**Resum[mida 14]**

Resum del treball en la llengua que es presenti [mida 11]

Extensió màxima recomanada: 150 paraules.

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**Resum [en una 2a llengua. Ex. Resumen][mida 14]**

Resum del treball en una llengua diferent a la utilitzada [mida 11]

Extensió màxima recomanada: 150 paraules

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**Resum [en una 3a llengua. Ex. Abstract][mida 14]**

Resum del treball en una llengua diferent a la utilitzada [mida 11]

Extensió màxima recomanada: 150 paraules

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*[Pàgina en blanc]*

**Índex[mida 14]**

*[Taula de contingut del treball, parts en què està dividida] [mida 11]*

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**Llista de figures [opcional] [mida 14]**

*[Fes la llista amb la mateixa estructura mostrada a l’índex, amb mida 11. Les figures i gràfics al cos del treball es titulen a la part d’abaix, amb mida 10]*

**Llista de taules [opcional] [mida 14]**

*[Fes la llista amb la mateixa estructura mostrada a l’índex, amb mida 11. Les taules al cos del treball es titulen a la part d’adalt, amb mida 10]*

**Capítol 1[mida 15]**

# Introducció[mida 20]

[ Text breu opcional d’introducció al capítol][mida 11]

Lorem

## 1.1 Títol de l’apartat [mida 14]

Text de l’apartat [mida 11]

**Títol de la subdivisió [mida 12]**

Text de la subdivisió [mida 11]

**Títol de la subdivisió [mida 12]**

**Chapter 2**

# Technologies used

## 2.1 Language: Python

For the implementation of the application, we have used Python 3.13.1 [a].

Python is a programming language mostly used for software development in web applications, data science and machine learning (ML). As indicate by the TIOBE Programming Community index, Python is considered the number one programming language as of March 2025 [b].

Python is known for its efficiency and ease of learning, especially when compared to other programming languages such as Java or C++, thanks to its simple syntax. It is a multi-paradigm language[[1]](#footnote-1), which makes it more flexible and more compatible than the other languages. Additionally, Python can run across multiple platforms.

One of Python's most significant advantages is its extensive ecosystem of libraries and frameworks, such as *NumPy*, *Pandas* and *Django*, which greatly enhance its capabilities in data processing and web development.

Python is an interpreted language, which means it executes code line by line. If there are any errors in the code, the execution will stop immediately, which simplifies debugging.



*Image 1: Python Logo*

## 2.2 Framework: Streamlit

After considering various available Python frameworks, we chose Streamlit to facilitate and simplify the web application's development process [c]. This decision was also influenced by our prior experience with Streamlit during the degree.

Streamlit is a free, open-source framework for building and sharing web applications, mostly machine learning and data science web applications. As a Python-based library, it allows the integration of popular Python libraries, such as *Pandas*, *Matplotlib*,and *Plotly*, enabling efficient data analysis and visualization.

Moreover, Streamlit eliminates the need for knowledge of front-end technologies like *HTML*, *CSS*, or *JavaScript*. This makes it possible to create interactive and fully functional applications using just Python, which is particularly advantageous for this case, because we want to focus on the application’s logic rather than its front-end development, especially considering that we have not worked with these front-end technologies during the degree.

Additionally, Streamlit leverages the fact that Python is an interpreted language, allowing code modifications in real-time, without the need for recompilations or redeployments of the local server. This feature significantly accelerates the development process, as changes in the code are instantly reflected in the web application, enabling quick iteration on the design and functionality of the application and facilitating error debugging.



*Image 2: Streamlit Logo*

## 2.3 Data Base: Private Google Sheet

For the project's data storage, we have used a private *Google sheet* [d], restricted to authorized users.

The first step was to create a spreadsheet with the necessary categories: *Timestamp, Last Name, Email, Age, Work Sector, Years Working, Country, Question 1, Question 2, Question 3, …, Question X, First Name, Email Address.*



*Image 3: Spreadsheet structure*

Once created, we enabled the *Google Sheets API,* a RESTful interface that provides access to data, content, algorithms, and other digital resources through web URLs. This API allows us to read and modify spreadsheet data [e, f].

Next, we set up the authentication to allow our script to interact with the *Google Sheet*. First, we created a *Service Account* in *Google Cloud* and generated a *key file*, which is a JSON[[2]](#footnote-2) file containing authentication credentials. Then, we granted the *Service Account* access to the previously created spreadsheet, by sharing the document with its associated email address, ensuring it has the necessary permissions, in this case, viewer access. Finally, we stored the *key file* securely by adding its content to the *.streamlit/secrets.toml.* file in our project.

With the authentication in place, our questionnaire script, *TFG.py*, could now access the Google Sheet and retrieve the necessary information.

Finally, we modified our main script, TFG.py, so it could access and store user responses from the questionnaire. To achieve this, we created a new function called *save\_response\_to\_gsheets* and add the following import:  *from streamlit\_gsheets import GSheetsConnection.*

**Capítol 3**

# Development

## 3.1 Títol de l’apartat

## 3.2 Project Estructure

Below is a diagram that illustrates the project structure, which has been designed with the goal of maintaining a logic and coherent organization. This structure facilitates easy navigation through the code and other files, ensuring a clear understanding of its functionality. At the same time, it adheres to the organizational requirements necessary for Streamlit to function correctly.

.

└── TFG/

    ├── .devcontainer/

    │   └── devcontainer

    ├── .streamlit/

    │   └── secrets

    ├── idiomas/

    │   ├── \_\_pycache\_\_

    │   ├── castellano.py

    │   ├── catala.py

    │   └── english.py

    ├── Media/

    │   ├── Logos/

    │   │   └── logo

    │   └── Videos\_Questionarios/

    │       └── videos

    ├── app.py

    ├── TFG.py

    ├── README.md

    ├── requirements.txt

    └── .gitignore

Inside the folder *TFG*, we have the following folder and files:

* “.devcontainer/”, which contains
* “.streamlit/”, that as explained previously it contains the authentication credentials for accessing the spreadsheet with all the data information of the questionnaire.
* “idiomas/”, this folder is composed of three important files*: castellano.py*, *catala.py* and *english.py*. Each of these files is a Python dictionary containing all the translated words and phrases used in the interface or system for each respective language.
* “Media/”. Media folder contains all the additional interface assets or resources used in the project, such as logos, extra images, icons, and other graphical elements. These media files are used to enhance the visual design of the application or website.

In addition to images and icons, the “Media/” folder also holds the videos used in several questions.

* “app.py”. This file has been used as the testing file for the project. Before making any changes to the official documents, the changes were first modified and tested in this file. Once the changes were confirmed to work properly, they were then transferred to the official project file.
* “TFG.py”: Official project file, the one that has been deployed to the internet. Is the final version of the project.
* “README.md”, contains a general description of the web application.
* “requirements.txt”, contains all the necessary requirements the project file need to run properly.

# Conclusions i treball futur

[Es pot separar conclusions i treball futur en capítols diferents, sense sobrepassar les 30 pàgines del cos de treball.]

[ Text conclusió i treball futur. El text és pot separar en apartats.][mida 11]

Lorem

**Bibliografia**

*Cal documentar les fonts bibliogràfiques utilitzades amb format APA.*

[*https://guiesbibtic.upf.edu/models-citacio/APA*](https://guiesbibtic.upf.edu/models-citacio/APA)

*La Biblioteca de la UPF ofereix el gestor de bibliografies Mendeley, que us permet crear la vostra base de dades personal de referències bibliogràfiques en línia, importar referències automàticament des de diferents recursos d'informació, extreure llistes i generar bibliografies en diferents estils de citació, i incorporar les citacions i llistes de bibliografia als vostres documents de text*

[*Gestor de bibliografies Mendeley*](http://guiesbibtic.upf.edu/mendeley)

*Exemples de cita bibliogràfica [mida 11]*

Pons, E. i Vernet, J. (2009). La llengua de l’ensenyament a les CCAA amb llengua pròpia. *Revista d’Estudis Autonòmics i Federals* (REAF), (8), 144-191.

American Psychological Association (2021). *Apa Style*. Recuperat 7 de juny del 2022, des de<https://apastyle.apa.org/>

[a] *Streamlit • Streamlit*. (n.d.). <https://streamlit.io/>

[b] Jansen, P. (2022, 3 junio). *TIOBE Index - TIOBE*. TIOBE. <https://www.tiobe.com/tiobe-index/>

[c] Workspace, G. (n.d.). *Google Sheets: Online Spreadsheets & Templates | Google Workspace*. Google Workspace. <https://workspace.google.com/products/sheets/>

[d] *Google Sheets API Overview. (n.d.). Google for Developers.* [*https://developers.google.com/workspace/sheets/api/guides/concepts*](https://developers.google.com/workspace/sheets/api/guides/concepts)

[e] *About RESTful APIs*. (n.d.-b). Google for Developers. <https://developers.google.com/photos/overview/about-restful-apis>

[f] *Service accounts overview*. (s. f.). Google Cloud. <https://cloud.google.com/iam/docs/service-account-overview>

**Apèndix [opcional][mida 14]**

[Seguiu una estructura lògica que coincideixi amb la secció del cos principal. No hi ha límit de pàgines.

• Llista de continguts

• 1a secció

• 2a secció

• Referències (només d’informació contiguda a l’apèndix)]

1. Ability to use different programming styles, such as procedural or object-oriented programming. [↑](#footnote-ref-1)
2. JSON (JavaScript Object Notation) is a text-based format for storing and exchanging data in a way that’s both human-readable and machine-parsable. [↑](#footnote-ref-2)