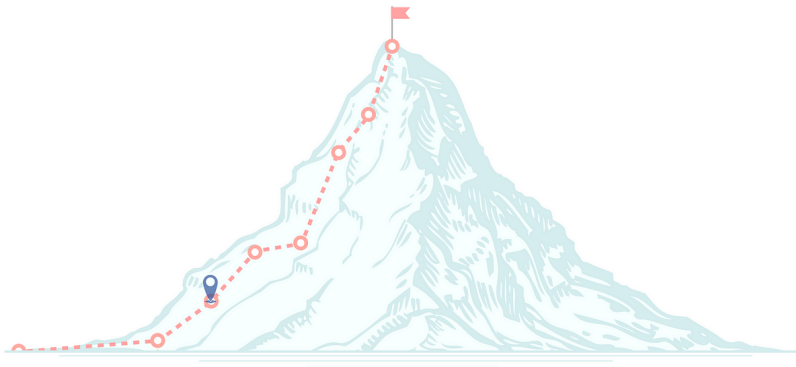


Universitat Politècnica de Catalunya

BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING

# Visual Analysis of Datasets of Mountain Tracks

*Project Proposal and Work Plan*



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## 1 Project Overview and Goals

Over the years, hiking has become increasingly popular in Catalonia, thanks to the beautiful landscapes of the Pyrenees mountains. This growth has also been helped by modern apps that allow people to share their hiking routes, making it easier for others to follow them. Today, accessing trails is more convenient than ever, as technology helps hikers explore new trails safely and efficiently.

The goal of this project is to use a large collection of hiking routes, shared by many users, to develop an interactive application that helps people explore and analyze mountain tracks. The dataset includes multiple hiking routes, each made up of a series of recorded positions with timestamps, showing how trails are used over time.

The final application will integrate these tracks with an Open Street Map background, allowing users to explore routes in a dynamic way. It will also provide useful visualizations, such as the most frequently used paths, the direction of movement, seasonal trends, and points of interest. These features will help users better understand the hiking trails and choose routes that suit their needs.

With this tool, hikers will be able to plan their walks more effectively by selecting routes based on difficulty, visiting the most popular routes, or discovering quieter trails. In addition, the application could be used for environmental studies, helping to analyze how often certain areas are visited and whether trails are being overused. This information could support efforts to protect natural areas and promote responsible hiking.

By combining hiking data with interactive maps, this application will be a valuable resource for casual hikers and experts, making outdoor adventures in Catalonia easier, safer, and more enjoyable.

## 2 The Data

The data used to create the application comes from hiking routes extracted from Wikiloc, a free platform where users can store and share outdoor routes. These routes can be recorded directly using a mobile device or specialized GPS tracking devices such as sports watches.

The dataset is organized into three folders based on different mountain areas: Canigó, Matagalls, and Vallferrera. Each folder contains a large collection of hiking routes in JSON format, including general information about each route—such as date, difficulty level, and author—as well as a detailed record of the coordinates followed by the user. These coordinates include longitude, latitude, and elevation for each point along the route.

Before being used in the application, the data will go through a processing phase to extract a clean and structured network of trails. The Fast Map Matching library will be used to align the recorded routes with official trails from Open Street Map. Additionally, a selection process will be carried out to remove inaccurate or irrelevant routes, such as those that are too short, have large gaps between recorded points, or contain errors.

This data processing ensures that the final application provides accurate and reliable trail information, helping users explore mountain routes more efficiently.

### 3 Work Plan

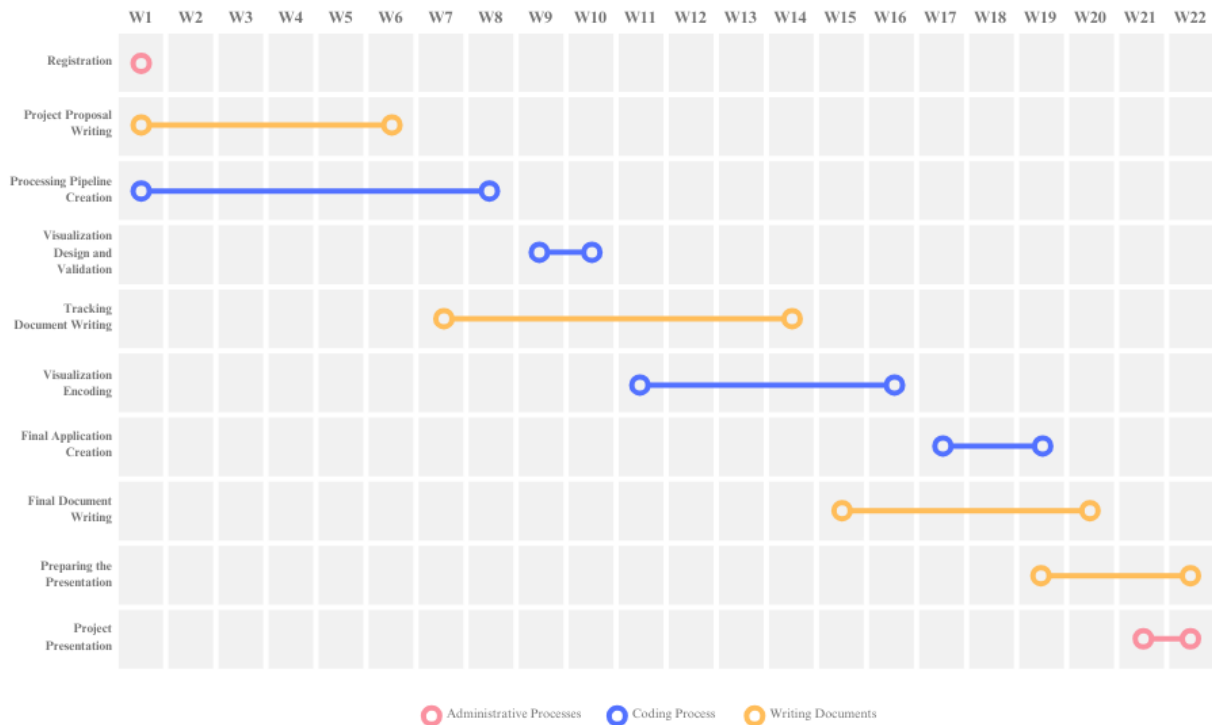
#### 3.1 Tasks and Milestones. Gantt Diagram

The project consists of two main tasks. The first is data processing, where the initial hiking routes will be converted into a standardized format aligned with the Open Street Map network. This step ensures that the paths are properly structured and formatted for generating accurate visualizations. The second key task is the design and creation of visualizations, which must effectively convey the maximum amount of relevant information without unnecessary elements.

These tasks will be executed sequentially. First, a data processing pipeline will be developed to structure the hiking route data correctly. Once this step is completed, the processed data will be used to generate the required visualizations. However, it is important to note that there may be a need to revisit the data processing phase if issues arise during visualization development.

After completing the visualizations, the student will proceed with implementing the final application, which will allow users to explore the visual representations and gain additional insights. Throughout the project, the student will meet regularly with project advisors to receive feedback and make necessary improvements. Additionally, the student will progressively work on documenting the project findings and methodology.

The following provisional Gantt diagram outlines the different phases and tasks of the project:



### 3.2 Meeting and Communication Plan

The communication plan for this project is based on a structured and efficient exchange of information using a Discord chat. This platform facilitates communication between the student, the main advisor, the co-advisor, and another student working on the same project. Through this chat, students can share information, discuss progress, and ask questions, while advisors can provide guidance, feedback, and support in real time. This ensures a continuous flow of communication and allows quick resolution of doubts or issues.

In addition to online communication, a face-to-face meeting is held approximately every two weeks between the student and the advisors. During these meetings, the student presents the progress made, discusses any challenges encountered, and receives detailed feedback and suggestions to improve the work. This combination of chat and in-person communication ensures effective project development, promoting both collaboration and independent problem-solving.

## 4 Generic Skills

Throughout the course of the project, a range of generic skills will be promoted and assessed. These skills are essential for the successful development of the project and the student's personal and professional growth. The following skills will be focused on:

Generic Skill	Assessed
GS1 Innovation and entrepreneurship	
GS2 Societal and environmental context	X
GS3 Oral and written communication	X
GS4 Teamwork	
GS5 Survey of information resources	X
GS6 Autonomous learning	X
GS7 Communication in a foreign language	X
GS8 Gender perspective	

These skills are key to ensuring the development of the project aligns with academic and professional standards. Skills such as oral and written communication will be essential as the project involves frequent communication with advisors and the writing of the final report in English. Societal and environmental context will also be an important aspect, ensuring that the project takes into account the social impact of hiking, as well as environmental sustainability. Other skills, such as autonomous learning, survey of information resources, and communication in a foreign language, will be crucial as the student conducts independent research and interacts with global resources.