Máster Universitario en Automática y Robótica

# Team Organization, Benchmark, Objectives, and Planning

## Deliverable 1

Computer Vision
Course 2025/2026

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# Contents

# List of Figures

# 1   Overview

- Project name: Emotion detection.

- Project duration: 11.09.2025 - 01.01.2026.

- Project goal: create a program that detects people's emotions through computer vision.

- Budget: 300 hours.

# 2   Reports Evolution

| No. | Start Date | End Date | Description | Prepared by |
|-----|------------|----------|-------------|-------------|
| 1 | 11/09/2025 | 15/10/2025 | 1st Deliverable Report | Silvia Ochando Valero<br>Raúl Chamorro Carrasco<br>José Arturo Morales Morales<br>Omar Ismel Velázquez Cazales<br>Delia Martínez Fernández<br>Álvaro Pérez-Borbujo Mohedo |

# 3   Project Objective

The objective of the project will be the detection of basic emotions from facial expressions in images. These images will be photos of different people, showing only their faces.

The emotions to be detected are: angry, disgusted, fearful, happy, neutral, sad, and surprised.

The benchmark contains a sufficient collection of images for this purpose. The dataset will be divided in order to train a model, perform tests, and validate the results. If any emotion category does not have enough images, additional samples may be generated through transformations (flipping, contrast adjustment, brightness changes, etc.) without altering the original meaning.

The final goal of the project will be to detect emotions from real photos outside the dataset. If there is enough time, it may also be possible to implement face detection in larger images — identifying a person's face and analyzing their emotion.

# 4   Team Composition

## 4.1   Team Members

- Silvia Ochando Valero

- Raúl Chamorro Carrasco

- José Arturo Morales Morales

- Omar Ismel Velázquez Cazales

- Delia Martínez Fernández

- Álvaro Pérez-Borbujo Mohedo

## 4.2 Roles & Responsabilities

| Team Member | Role | Responsabilities |
|---|---|---|
| Silvia Ochando Valero | Project Manager | -Project planning<br>-Team coordination and communication management<br>-Resources allocation management<br>-Budget management |
| Álvaro Pérez-Borbujo Mohedo | Programming | -Code management<br>-Programming environment setup<br>-Architectural Design and Interface Specification<br>-Assembly of code sections into main code<br>-Code quality and troubleshooting<br>-Documentation of programming process |
| José Arturo Morales Morales<br><br>Osmar Ismel Velázquez Cazales | Documentation | -Preparation of deliverables reports<br>-Collections of information on the different areas of the project<br>-Documentation of the whole project and final report<br>-Website creation |
| Raúl Chamorro Carrasco | Technical project manager | -Project goal determination<br>-Technological research coordination<br>-Technological progress assessment<br>-Documentation of technological tasks |
| Delia Martínez Fernández | Testing and validation | -Testing and results interpretation<br>-Assessment of results<br>-Generalization of results<br>-Documentation of tests, evaluations and results |

Attributes considered when assigning the roles of each team member:

- **Project manager:** We have selected this person because she is really good at putting out fires and has a lot of experience in managing schedules.

- **Programming:** The code manager has been chosen because he is the best one in coding and always thinks ahead.

- **Documentation:** They are great at organizing ideas, writing clearly and ensuring the final report looks polished.

- **Technical manager:** He is the best one at reading complex information and proposing innovative solutions.

- **Testing and validation:** She is the best one in making sure that our code is actually useful and reliable.

# 5 Benchmark

The main goal of the project is to use the emotion detection benchmark dataset to train a model that recognizes facial expressions and classifies them into different emotions. This program will implement computer vision techniques that all group members will improve during the Automatic and Robotics Master's Degree course in the Computer Vision subject.

As we have already mentioned, the chosen benchmark consists of detecting emotions. The aim of this benchmark is to categorize the emotions of people shown by their facial expressions into seven classes: happiness, neutral, sadness, anger, surprise, disgust, and fear.Figure 1 illustrates a simple example of how our project is expected to work.

This will be achieved through the processing and analysis of different images, with the purpose of developing real-life applications. For example, it is useful in human-robot interaction within assistance systems or in human behavior studies. The development of this project could also be useful for implementation in other research studies.

The dataset available for this project contains 55,685 examples of 48x48 pixel grayscale images of faces, divided into training and test datasets. In addition, this benchmark is commonly known as the FER-2013 dataset, which was originally introduced in a Kaggle competition. It can be downloaded here: [1].

Another useful resource is the Kaggle notebook "Emotion Detection" by user odins0n. This notebook implements a processing and classification pipeline using the FER-2013 dataset, and can serve as a practical example of preprocessing, model design, augmentation, and evaluation strategies. It can be found here: [2]..



Figure 1: Example of the expected architecture for emotion detection.

# 6 Socio-Economic Impact

From a socioeconomic perspective, the automatic recognition of emotions through computer vision can have a significant impact mainly in two major sectors, health and work.

Psychological distress among young people represents a growing socio-economic challenge. At the Universidad Complutense de Madrid, 12.7% of students report emotional suffering due to loneliness, academic pressure, and socialization difficulties [5], while in care homes in Pais Vasco, Navarra, and Gipuzkoa, 26.5% of adolescents have attempted suicide of had suicidal thoughts [6]. These figures show how emotional problems affect health as well as educational and social performance. Artificial vision systems that detect basic emotions could help identify early signs of stress and anxiety, enabling timely interventions and promoting healthier environments.

In the work sector, an emotional analysis system could improve the work environment inside a company and work relationships by identifying moods mainly related to stress and anxiety that can affect the performance of employees, so they can receive attention and the company can make improvements for its employees. This could result in long-term economic benefits for a company by reducing work absenteeism, improving the performance and motivation of workers, and reducing the costs related to the mental health of employees.

## 6.1  Sustainable Development Goals (SDG)

This project is aligned with goal 3 of the 2030 Agenda for Sustainable Development "Good Health and Well-being" [4]. It is specially related to goal 3.4, which seeks to reduce premature deaths caused by non-communicable diseases through prevention and treatment, and promote mental and psychological health and well-being. The artificial vision system developed in this project is designed to detect basic human emotions, allowing the early identification of signs of anxiety, stress or sadness. This works as a complementary tool for emotional monitoring in educational and healthcare environments, promoting a climate of emotional well-being.

Besides, the project contributes to the early detection and preventive care of mental health, supporting the achievement of goal 3.5 [4], which focuses on improving the prevention and treatment of substance abuse, including alcohol and narcotic drugs.

About the work sector, the sustainable development goals of this project are aligned with goal 8 of the 2030 Agenda "Decent work and economic growth", which looks to promote inclusive and sustainable economic growth, employment and decent work for everyone, mainly with the goals: 8.2 that refers to reaching higher levels of economic productivity through technological modernization and innovation, and 8.5 that refers to reaching full and productive employment and decent work for all [3]. The introduction of technologies like artificial intelligence and computer vision in companies deeply promotes technological innovation. Also, with algorithms like emotion detection, it could significantly improve the performance and satisfaction of workers through psychological help programs and special attention.



Figure 2: Sustainable Development Goals

# 7  Planning

For planning purposes, the work has been divided according to the key roles within the project. Each role will function as a department, rather than as a simple task list for the individuals assigned to them.

The person assigned to each role will act as a department head, responsible for organizing the work and delegating tasks within that area.

In the following sections, each task will be detailed. A Gantt chart is provided to illustrate how tasks are scheduled over time, and a PERT chart is included to show the relationships and dependencies between them.
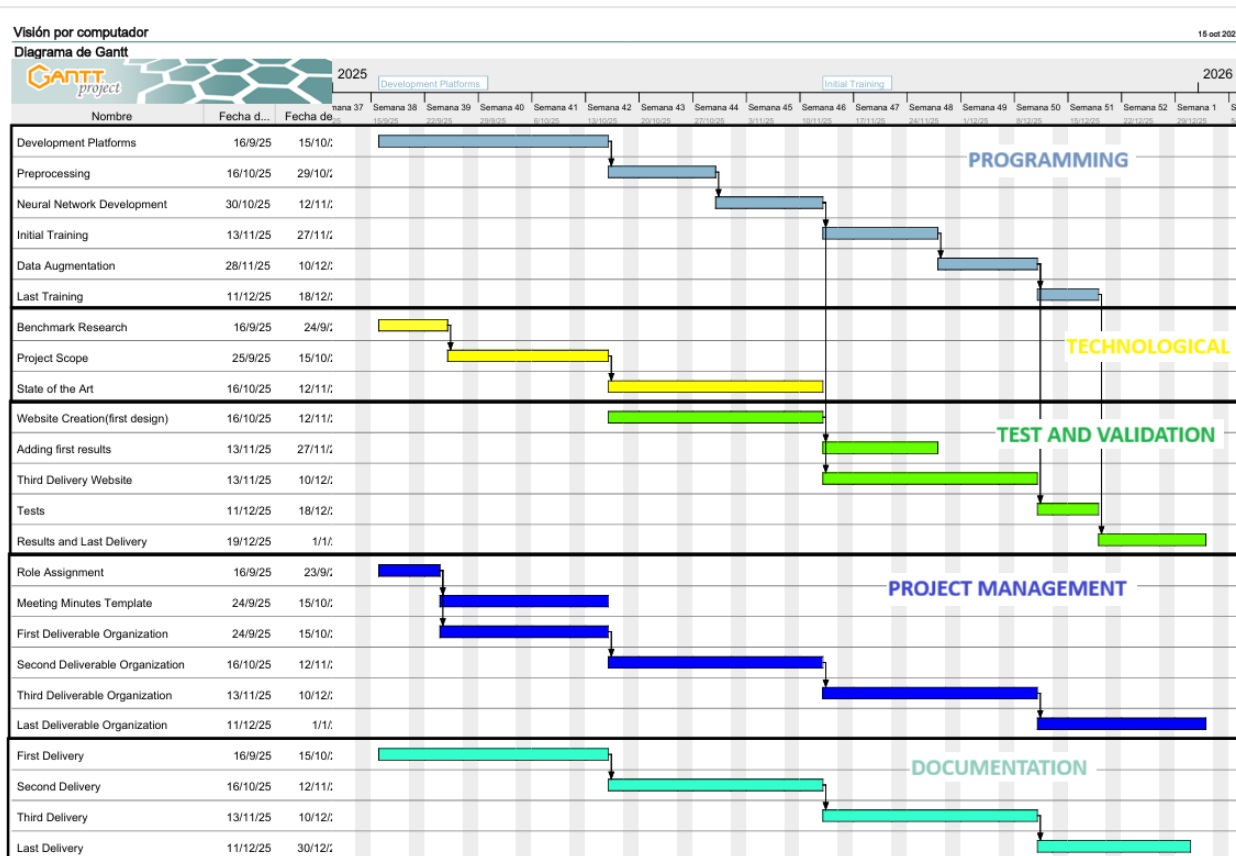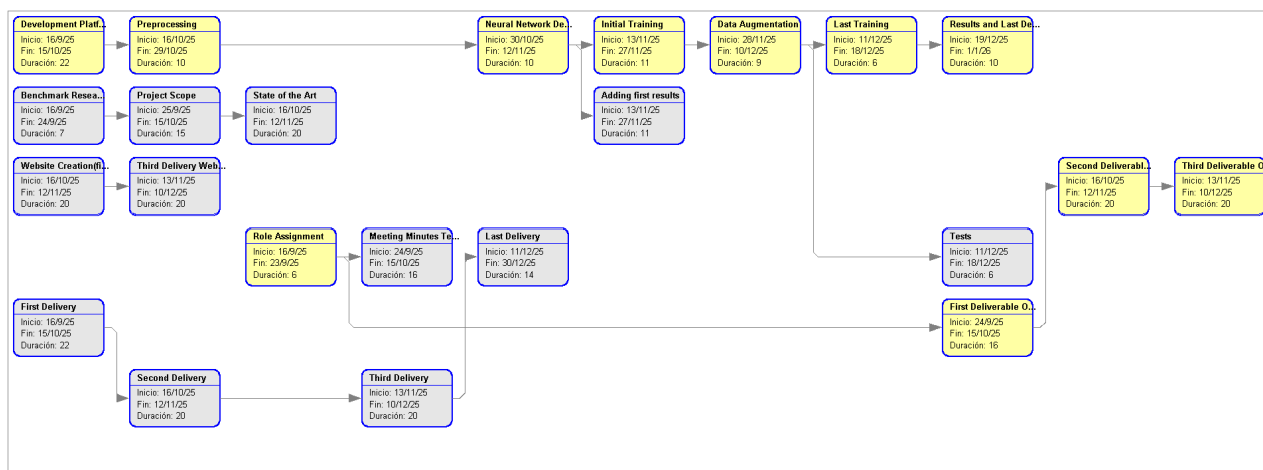
Figure 3: Gantt Chart



Figure 4: PERT Chart

## 7.1 Programming Department

This department is responsible for the technical development and implementation of the project's core features.

### 7.1.1 Task List

- **Development Platforms:** Setting up the necessary coding environments and frameworks.

- **Preprocessing:** Preparing and cleaning the initial data for model training.

- **Neural Network:** Develop and train the neural network models that form the core of the identification system.

- **First Training:** Running the initial training cycle for the machine learning model.

- **Data Augmentation:** Artificially increasing the size of the dataset to improve model accuracy.

- **Second Training:** Conducting a second training cycle with the augmented data.

## 7.2 Technical Project Manager Department

This department oversees the project's technical strategy, research, and alignment with industry standards.

### 7.2.1 Task List

- **Benchmark Research:** Investigating existing solutions and technologies relevant to the project.

- **Project Utilities / Scope:** Defining the technical requirements and boundaries of the project.

- **State of the Art:** Analyzing the current state of technology and study different solutions.

## 7.3 Testing and Validation Department

This department ensures the quality and functionality of the final product through rigorous testing.

### 7.3.1 Task List

- **Website Creation:** Developing a web platform to showcase the final results of the project.

- **Adding first results:** Upload the initial test results and corresponding images to the project website.

- **Third Delivery Website:** Finalize the website's content and functionality for the third project delivery.

- **Testing and Validation:** Evaluating the Neural Network model's performance to confirm it is well-trained.

- **Results:** Documenting the outcomes of the validation phase and reporting key metrics.

## 7.4 Documentation Department

This department is in charge of creating and managing all written materials and project deliverables.

### 7.4.1 Task List

- **Project Deliverable I:** Preparing the submission for Deliverable I.
- **Project Deliverable II:** Preparing the submission for Deliverable II.
- **Project Deliverable III:** Preparing the submission for Deliverable III.
- **Final Project Submission:** Creating the final comprehensive report for project completion.

## 7.5 Project Manager Department

This department handles the overall organization, team coordination, and administrative tasks of the project.

### 7.5.1 Task List

- **Role Assignment:** Distributing responsibilities and roles among team members.
- **Meeting Minutes Template:** Creating a standardized format for meeting minutes.
- **Deliverable I Coordination:** Coordinating the team's efforts for the first submission.
- **Deliverable II Coordination:** Coordinating the team's efforts for the second submission.
- **Deliverable III Coordination:** Coordinating the team's efforts for the second submission.
- **Final Delivery Coordination:** Overseeing the final submission and administrative closure of the project.

# References

[1] *Emotion detection datasheet- FER-2013:*. Available at: `https://www.kaggle.com/datasets/ananthu017/emotion-detection-fer/data`

[2] *Emotion detection notebook:*. Available at: `https://www.kaggle.com/code/odins0n/emotion-detection/notebook`

[3] *Martin. (2025, September 10). Goal 8: Economic Growth - United Nations Sustainable Development. United Nations Sustainable Development.*. Available at: `https://www.un.org/sustainabledevelopment/economic-growth/`

[4] *Martin. (2025, September 10). Health - United Nations Sustainable Development. United Nations Sustainable Development.*. Available at: `https://www.un.org/sustainabledevelopment/health/`

[5] *Raffo, F. (2025, May 14). El malestar emocional de los adolescentes se sitúa en el 38,5% y afecta más a las chicas. El País.*. Available at: `https://elpais.com/sociedad/2025-05-14/el-malestar-emocional-de-los-adolescentes-se-situa-en-el-385-y-afecta-mas-a-las-chicas.html`

[6] *the. (2024, March 13). Study finds suicidal behavior is common among adolescents in residential care. Medicalxpress.com; Medical Xpress.*. Available at: `https://medicalxpress.com/news/2024-03-suicidal-behavior-common-adolescents-residential.html`

## Project Information

| Customer | UPM | Name | Work Computer Vision |
|----------|-----|------|----------------------|

## ASSISTANTS

| Name | Project Position |
|------|------------------|
| Silvia Ochando Valero | Management |
| Raúl Chamorro Carrasco | Technological |
| Omar Ismael Velázquez Cazales | Documentation |
| José Arturo Morales Morales | Documentation |
| Álvaro Pérez-Borbujo Mohedo | Programming |
| Delia Martínez Fernández | Testing and validation |

## INFORMACION MEETING

| Date | 09/10/2025 | Start-End | 14:00-15:15 | Type | In-person |
|------|-----------|-----------|-------------|------|-----------|
| Objectives | Assigning the tasks of the deliverable 0 | | | | |

## ITEMS TO BE DISCUSSED

Task Assignment

Next Meeting Scheduling

## TOPICS DISCUSSED

Task Assignment

The programming language to use will be python

We will work with Word but the final project will be made with Latex

Next Meeting Scheduling

## COMMITMENTS AND AGREEMENTS ADOPTED

| No. | Description | Date of Application | Responsible | Expiration Date |
|-----|-------------|---------------------|-------------|-----------------|
| 0 | Drafting and Completion of Assigned Section | 09/10/2025 | Each Member | 13/10/2025 |
| 1 | Elaboration of a Latex template | 09/10/2025 | Silvia and Álvaro | 13/10/2025 |

| NEXT MEETING AGENDA: | YES | Date | 13/10/2025 |
|----------------------|-----|------|------------|

| REMARKS | None relevant |
|---------|---------------|

| PREPARED BY: | Silvia |
|--------------|--------|

| Project Information | |
|---|---|
| Customer | UPM | Name | Work Computer Vision |

## ASSISTANTS

| Name | Project Position |
|---|---|
| Silvia Ochando Valero | Management |
| Raúl Chamorro Carrasco | Technological |
| Omar Ismael Velázquez Cazales | Documentation |
| José Arturo Morales Morales | Documentation |
| Álvaro Pérez-Borbujo Mohedo | Programming |
| Delia Martínez Fernández | Testing and validation |

## INFORMACION MEETING

| Date | 13/10/2025 | Start-End | 20:30-21:00 | Type | Online |
|---|---|---|---|---|---|
| Objectives | Reviewing the completed work | | | | |

## ITEMS TO BE DISCUSSED

Review and Verification of Completed Sections

## TOPICS DISCUSSED

All the parts are finished

Migration of the final draft to LaTeX

## COMMITMENTS AND AGREEMENTS ADOPTED

| No. | Description | Date of Application | Responsible | Expiration Date |
|---|---|---|---|---|
| 0 | Finalization of the project in LaTeX | 13/10/2025 | Silvia and Álvaro | 15/10/2025 |

| NEXT MEETING AGENDA: | NO | | Date | - |
|---|---|---|---|---|

| REMARKS | None relevant |
|---|---|

| PREPARED BY: | Silvia |
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