Final project

Objective

The **final project** is the summarizing assignment where students apply all their knowledge of computer vision to solve a practical or research problem. The project is carried out in a team.

Students can choose one of two formats:

1️⃣ **Practical Project** → Development of a complete solution that can be used in real-world conditions. Examples include an image classifier, an object recognition system, or an image processing service. This format includes deployment, API, or user interface implementation.

2️⃣ **Research Project** → Conducting an analytical study where a new model or approach is tested. Examples include comparing different neural network architectures or investigating the impact of data augmentation on model performance. This format includes metrics and analysis.

📌 **Team collaboration**

Since this project is completed as a team, the presentation should include a separate slide with a table showing the task distribution among team members

Name + Surname	Tasks completed
Participant 1	• — • — • —
Participant 2	• — • — • —
Participant 3	• — • — • —
Participant 4	• — • — • —

Structure of practical project

1. **Introduction**
   - Description of the problem being solved.
   - Why this is needed (potential users, application cases).

- Problem definition (what data will be used, what methods).
- Technology stack.
- Project stages.

2. **Review of Existing Solutions**
   - What approaches and algorithms are already used to solve this problem?
   - Why were the proposed methods chosen?
3. **Data Preparation**
   - Description of the selected dataset: source, quantity, format.
   - Data preprocessing: normalization, cleaning, augmentation, anomaly detection.
   - Visualization of key data aspects.
4. **Model Development**
   - Which algorithm/neural network architecture was used?
   - Why was this method chosen?
   - Hyperparameters, training strategy.
5. **Implementation and Training**
   - Code and environment description (frameworks, libraries).
   - Training process:
     - Number of epochs
     - Loss function
     - Optimizer
     - Performance metrics
     - Training graphs (errors, accuracy, etc.).
6. **Model Evaluation**
   - Metrics (accuracy, precision, recall, F1-score, IoU, etc.).
   - Confusion matrix and error interpretation.
   - Testing on new data.
7. **Deployment and Demonstration**
   - How can the model be used in production?
   - Development of an API/web interface/mobile application.
   - Demo video or interactive prototype.
8. **Conclusions and Future Perspectives**
   - Key project results.
   - What problems remain unsolved?
   - Ways to improve the model.

Final Products:

- **Report in PDF format** (using Jupyter Notebook for combining code and explanations is recommended).
- **Project presentation** for the final defense.
- **Repository with code (GitHub).**
- **Demo version (if possible).**

Evaluation criteria

Points	Criteria
0-4	**Functionality and Deployment:** • **4 points:** The project is fully functional, correctly performs the stated functions, and includes a demonstration (API, web interface, or video). • **3 points:** The project works but has minor issues or partial implementation. • **2 points:** The project's core functions do not work, or a demonstration is missing. • **1 point:** The code contains serious errors, and the project does not fulfill its intended purpose. • **0 points:** The project is not implemented or does not run.
0-2	**Code Quality and Technical Implementation:** • **2 points:** Well-structured, and documented code with logical architectural decisions. • **1 point:** The code works but has inconsistencies, suboptimal solutions, or lacks comments. • **0 points:** The code does not work or is missing.
0-2	**Depth of Analysis and Model Quality:** • **2 points:** Model choice is justified, with relevant metrics, error analysis, and comparison with alternative approaches. • **1 point:** Some analysis is provided, but it is superficial or has deficiencies. • **0 points:** No analysis is conducted.
0-2	**Report Formatting Quality:** • **2 points:** The report is logically structured, includes all required sections (problem definition, implementation, testing, conclusions). The presentation is clear, and answers to questions are well-reasoned. • **1 point:** The report is present but missing explanations, visualizations, or analysis. The presentation is logical, but some answers are incomplete. • **0 points:** The report is absent or extremely weak.

Опоздание при сдаче работы **штрафуется**. Опоздание в пределах

- от 1 дня до недели - **минус 1 балл**
- более одной недели - **минус 2 балла**

Плагиат: Работы, содержащие плагиат, оцениваются в 0 баллов.

Late Submission Penalties

- from 1 day to 1 week late → **-1 point**
- More than 1 week late → **-2 points**

Plagiarism Policy: Submissions containing plagiarism will receive 0 points.

Structure of the Research Project

1. **Introduction and Hypothesis Statement**
   - What research problem is being addressed?
   - Hypothesis: How does the experimental model differ from the baseline?
   - Expected results.

2. **Data Analysis**
   - Which dataset is used and why?
   - Data visualization and pattern detection.
   - Data processing specifics (cleaning, augmentation, etc.).

3. **Methodology**
   - What algorithm or model is being studied?
   - What modifications are made compared to existing approaches?
   - How will testing be conducted?

4. **Experiments**
   - Definition of control and test models.
   - Conducting multiple experimental runs.
   - Training graphs, error analysis, and metric evaluation.

5. **Results Analysis**
   - Comparison of different models/approaches.
   - Which hypotheses were confirmed/rejected?
   - Interpretation of metrics and findings.

6. **Conclusions and Future Directions**
   - Final research results.
   - Future research prospects.
   - Potential further experiments.

Final Products:

- Report in PDF format (using Jupyter Notebook for explanations and code is recommended).
- Project presentation for the final defense.
- Repository with code (GitHub).
- Graphs, metrics, and comparative analysis.

Evaluation criteria

Points	Criteria
0-4	**Depth of Literature and Approaches Review:** • **4 points:** Multiple approaches (more than 2) are reviewed, with references to research and comparisons.

	• **3 points:** 1-2 approaches are described but without in-depth analysis. • **2 points:** A brief review is present but lacks comparison. • **1 point:** Only one method is mentioned, with no critical analysis. • **0 points:** No literature review.
0-2	**Methodology and Hypothesis Statement:** • **2 points:** Clearly defined hypothesis, justified methodology, and logically described experiments. • **1 point:** The methodology is described but weakly justified or has gaps. • **0 points:** No clear hypothesis or experimental plan.
0-2	**Depth of Analysis and Interpretation of Results:** • **2 points:** Comparative analysis of models, with meaningful conclusions. • **1 point:** Some analysis is provided but lacks depth or justification. • **0 points:** No analysis.
0-2	**Report Formatting Quality:** • **2 points**: Well-structured report with graphs, metrics, and explanations. The presentation is clear, and answers to questions are correct. • **1 point:** The report contains all key elements but has shortcomings. The presentation is logical, but some answers are incomplete. • **0 points:** The report is absent or extremely weak.

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