**Computer vision and Cognitive Systems**

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**Final Project and Exam Instructions**

**Important dates**

| **Deliverable** | **Deadline** |
| --- | --- |
| Project Proposal | At least one month before the exam |
| Final Report | One week before the exam |

**Overview**

The project is an opportunity for you to apply what you have learned in class to a problem of your interest. The instructors will provide **different tracks** consisting of applications or methodological scenarios. You should follow one of these, and eventually adjust/personalise according to your ideas.

To get a better feeling for what we expect from projects, we encourage you to take a look at the project reports from previous years (link on Moodle).

**Teams**

You have to work **in teams of 3 people**. It is mandatory. The only exception granted is for one team, which might have either 2 or 4 participants if the total number of students enrolled in the course is not divisible by three. We do expect that projects done with 4 people will have more impressive writeup and results than projects done with 2 people. To get a sense for the scope and expectations for 3-people projects, have a look at project reports from previous years.

Choose carefully your team also to have the same exam schedule: we appreciate if the final exam and the project presentation are done by all the team together.

*Team declaration*

Once you have composed your team, ask all members to enroll themselves on AImageLab Courses (link on Moodle). Then, one of the team members should go to: https://ailb-web.ing.unimore.it/courses/course/cvcs2024/project/ create a new team and add the other two members. If anyone changes his mind, you can make corrections: every member can leave the current team and/or create a new one to make adjustments, before the project proposal is submitted.

**Project Proposal**

The project proposal should be one paragraph (200-400 words). It must be done by following one of the tracks provided by the instructors, and it should describe:

* What is the problem that you will be investigating? Why is it interesting?
* What literature will you examine to have context and background?
* What data will you use? If you are collecting new data, how will you do it?
* What method or algorithm are you proposing? If there are existing implementations, will you use them and how? How do you plan to improve or modify such implementations? You don't have to have an exact answer at this point, but you should have a general sense of how you will approach the problem.
* How will you evaluate your results? What kind of results do you expect (e.g. which measures)? What kind of approaches will you compare your results against (e.g. which methods from the literature and/or which baselines)?

The pipeline of your project should contain:

* The use of classical image-processing operators (e.g., Filters, morphological operators, etc.)
* The use of at least a geometric-based algorithm or component (e.g., Perspective distortion correction, visual SLAM, etc.)
* The use of a retrieval algorithm or component.
* A Deep learning-based component, designed and trained by you. You are free to include and use any existing network, but there should be at least one component which has been originally conceived and trained by you.

You are free to include these elements anywhere in your pipeline, as long as they are clearly recognizable. You might also design a single component which accomplishes more than one requirement (e.g. a DL-based retrieval approach, designed and trained by you).

**Submission**: Please submit your proposal as a PDF on AImageLab Courses. Only one person on your team should submit.

**Deadline**: There is a strict deadline to submit your project proposal (see the “Important dates” section above).

**Evaluation**: The proposal will be reviewed by the instructors and you will receive an acceptance or rejection notification. In case the proposal is rejected, you must revise and resubmit it again in a few days, until it is accepted.

**Access to computational resources**

As a student of this course, you are eligible to obtain a student account on the AImageLab-SRV platform, which contains all the GPU-based computational resources we have at AImageLab. Usually, this includes access to 2-4 GPUs, depending on the workload the research team is facing.

To get access, there is a dedicated button on AImageLab Courses. Once you click, you will receive instructions to activate an account, and pointers to the documentation in a few days.

**Final Report**

Your final write-up is required to be between 6 - 8 pages using the provided template, structured like a paper from a computer vision conference (CVPR, ECCV, ICCV, etc.). Please use this template so we can fairly judge all student projects without worrying about altered font sizes, margins, etc.

The following is a suggested structure for your report. You don't necessarily have to organize your report using these sections in this order, but that would likely be a good starting point for most projects.

* Title, Author(s)
* Abstract: Briefly describe your problem, approach, and key results. Should be no more than 300 words.
* Introduction: Describe the problem you are working on, why it's important, and an overview of your results
* Related Work: Discuss published work that relates to your project. How is your approach similar or different from others?
* Data: Describe the data you are working with for your project. What type of data is it? Where did it come from? How much data are you working with? Did you have to do any preprocessing, filtering, or other special treatment to use this data in your project?
* Methods: Discuss your approach for solving the problems that you set up in the introduction. Why is your approach the right thing to do? Did you consider alternative approaches? It may be helpful to include figures, diagrams, or tables to describe your method or compare it with other methods.
* Experiments: Discuss the experiments that you performed to demonstrate that your approach solves the problem. The exact experiments will vary depending on the project, but you might compare with previously published methods, perform an ablation study to determine the impact of various components of your system, experiment with different hyperparameters or architectural choices, use visualisation techniques to gain insight into how your model works, discuss common failure modes of your model, etc. You should include graphs, tables, or other figures to illustrate your experimental results.
* Conclusion: summarize your key results. Suggest ideas for future extensions or new applications of your ideas.

**Submission**: You will submit your final report as a PDF. You will also be required to upload your complete source code, together with trained models checkpoints in a single ZIP file. There will be a size limit for upload (around 50MB). If you need more space, use Google Drive/OneDrive links. You can update your submission before the deadline.

Your report PDF should list all authors who have contributed to your work. Any code that was used as a base for projects must be referenced and cited in the body of the paper. This includes open-source, or Github implementations. You can use a footnote or full reference/bibliography entry.

**Deadline**: There is no fixed deadline for submitting the final report, but it must be submitted at least one week before the team takes the exam (see the “Important dates” section above). Once a member of the team successfully passes an exam, the project will be locked and no updates will be allowed, also for the other members of the team.

**Evaluation of Final Reports**

For the Final Report, we will evaluate according to:

* Technical soundness and correctness: Is the approach technically sound? Is it in line with existing literature on the topic? Is it computationally feasible?
* Originality of the approach: How does your proposal advance the field/the application you are focusing on? Does it contain novel ideas or insights?
* Experimental evaluation: Is the evaluation convincing? Is there a quantitative evaluation? Are there comparisons with the state of the art or with carefully-designed baselines?
* Quality of the presentation: Is the report well written and easy to understand? Is the presentation of the approach convincing? Does the report clearly convey the ideas behind the approach? Can we easily reproduce the approach reading the report?

**Presentation during the exam**

During the exam, you will be likely asked to shortly present your project. You might use a PowerPoint presentation, and showcase a demo video or qualitative results in addition to presenting your methodology and experimental results. Your presentation should be tailored for a 5 minute talk, and should focus on the novelty of the work you have done, also with respect to other teams.

**Taking the final exam**

In addition to presenting your project, you will be asked a series of theory questions. By the day of the exam, you should also have completed at least 70% of the laboratory exercises on AImageLab courses. If you like, you can replace one of the theory questions by presenting a paper from one of the major CV venues (CVPR, ECCV, ICCV, TPAMI) provided it has not been discussed during the lectures.

We will regularly add and advertise exam sessions on ESSE3. Enrollment on ESSE3 closes at the beginning of the day before the exam; i.e., if an exam is scheduled for June 2nd at 9:00, registration will close on June 1st 00:00 (24+9 hours before the exam session).

If you don’t book your exam on ESSE3, you will not be allowed to take the exam. After the exam, you will receive an email with your grade. You can accept or refuse it and take the exam again.

**Getting support**

To avoid getting stuck in the project, do not hesitate to reach out and ask for support. In case it is needed, we can also give you a tutor (either a PhD student or a research grant).

Still, students should try to be autonomous and independent. Do not ask for support for simple issues that you can solve on your own, or for something that has already been covered in previous courses. Contact the instructor/tutor when it is really needed, or when you need advice from an expert.

**Other rules**

You may consult any papers, books, online references, or publicly available implementations for ideas and code that you may want to incorporate into your strategy or algorithm, as long as you clearly cite your sources in your code and your writeup. However, under no circumstances may you look at another team’s code or incorporate their code into your project.