Project Proposal

For the course project, you will explore a topic in-depth of your own choosing. This can be an implementation (implement an existing algorithm), an application (apply existing computer vision techniques for a specific application), or research (trying to invent something new). You are expected to work in groups 1-4 students for each project (although I strongly suggest having at least 2 students in a group).

Project expectation

1) You should explore a problem that's challenging
2) You are encouraged to use existing libraries and open-source codes available (as long as you properly document/acknowledge this), but the use of such library/code should not make the project trivial
3) The projects should be more open ended than homeworks
4) You should get some experience with doing a project end-to-end, from designing the solution to a problem, to evaluation and writing it up

What to submit

The proposal is due on March 7 at 3pm Montreal time. You only need to submit one project proposal per group (students in each group should coordinate and arrange one group member to submit the proposal).

Your proposal should be a 1-page PDF (no specific format required) containing the following:

1) Project title
2) Names and Concordia IDs of students in the group
3) Problem statement: describe what problem you are going to solve
4) Techniques: what approaches you are going to try or develop to solve this problem? It is OK if you do not have all the details figured out yet, but at least you should have a rough plan of how to proceed
5) Datasets: What datasets are you planning to use? A common roadblock for many projects is the lack of suitable datasets. Since the course project has a very tight timeline, it is unrealistic to collect any new datasets or rely on other people to provide the data, so you should already have access to the datasets (e.g. benchmark datasets that are openly available)
6) Computational resources: What computational resources will you use for the project? Be aware that if you are going to train deep learning models for this project, you might need to have access to enough GPUs resources. Make sure your project is not too ambitious that you do not have enough computational resource for it.
7) Evaluation: How will you evaluate whether your project is successful? What metric will you use? Is there some simple baseline that you plan to compare with?
8) (Only if it is applicable) You are encouraged to combine this project with course project with other courses (of course, assuming the instructors of the courses are aware and are OK with this). You are also encouraged to leverage your existing research with this project. If you choose to do so, please provide relevant information.

Project ideas

You are encouraged to come up with your own, creative ideas for the projects.

1) **Application of computer vision**. Apply computer vision techniques to solve a task that is important to you. I highly recommend this option since this is often the most fun option, and you will be working on a problem that you really care about. Often these projects will involve applying a few computer vision techniques to a task and analyze the results. For example, in previous editions of this course, students have applied computer vision methods to automatically sort trash (according to whether it is recyclable), to enable gesture control of TV, to automatically solve jigsaw puzzles, etc.
2) **Implementation**. Try to implement one or more computer vision algorithms (e.g. for object detection) and try to analyze/understand when one works better than the other. You can look at recent papers at computer vision conferences (e.g. CVPR, ICCV, ECCV) for inspirations.
3) **Research**. If you are already doing research related to computer vision and/or machine learning, I highly recommend this option to explore some new methods to your research.

In addition to standard computer vision tasks (e.g. recognizing/detecting objects, tracking, …), if you would like to explore something more challenging (especially if you are choosing option 3: research), here are some possible topics to consider.

- Domain shift: if the test data (e.g. snowy day images) are very different from training data (e.g. sunny day images), computer vision models usually do not work well. This is called domain shift. Try to explore some techniques (e.g. domain adaptation) that overcome this domain shift issue.
- Algorithmic fairness: if the training data are biased (e.g. most images are male images), the computer vision models tend to learn that bias (i.e. the models will not work well on female images). Try to develop some methods to overcome this bias
- Data efficiency: most current computer vision models require large amount of labeled training data to train the models. Explore some data efficiency strategy (e.g. self-supervised learning, transfer learning) in some computer vision tasks.