CS231n Project Design

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Agenda

1. Project expectations
    a. Does my project meet expectations?
    b. FAQs
2. Picking a project idea
    a. Sources of inspiration
    b. Reading papers efficiently
3. Proposal, milestone, and final report
    a. Due dates, expectations, logistics
    b. Support

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Project expectations

The course project is a (fun) way to explore concepts taught in the course on a topic of your choice!

- Fairly open-ended, anything related to vision (**link to project page**)

Completed in groups of 1, 2, or 3 people

- Project expectations are higher for groups with more people

Generally, two tracks of work:

- **Applications:** If you have a specific background or interest (e.g. biology, engineering, physics), we'd love to see you apply ConvNets to problems related to your particular domain of interest.

- **Models:** You can build a new model (algorithm) and apply it to tackle vision tasks. This track might be more challenging, and may later lead to a piece of publishable work.

Project expectations

The final report has the following structure:

- Title, Author(s)
- Abstract
- Related Work
- Data Description
- Methods
- Experiments
- Conclusion
- Supplementary Material (optional)

For more on each of these, please also refer to the "final report" part of the **project page** (http://cs231n.stanford.edu/project.html#report)

FAQ: Does my project meet expectations?

Rule of thumb:

- How much effort are you putting into your project?

Strong projects might...

- Propose a novel variant of a technique (which takes a lot of effort)

- Adapt an existing technique to a totally new problem (which takes a lot of effort)

Weaker projects might...

- Spend several weeks collecting/cleaning data rather than testing hypotheses

- Clone an existing repo and do minimal stitching to make it work for a Kaggle competition

FAQ: Does my project meet expectations?

So, this **doesn't** mean:

- Your project has to be strictly novel to get a good grade (although, we encourage this!)
- You have to beat the state-of-the-art performance to get a good grade (you don't have to come up with the next best object detector to test an interesting hypothesis)

This **does** mean:

- You need to put a significant effort into your investigation, and you may have to try many different approaches

In your **analysis**, ask yourself:

- Are you *interpreting* and *understanding* your results, or merely stating them?
- Are you just plotting a loss curve, or are you evaluating the results of your approach from many different angles?

Project FAQs

Q: Can I apply convolutional networks to a purely NLP / audio / stock price problem?

- **A:** This is a computer vision course, so ***you must incorporate visual data in some form***.

Q: Can I change my project after the proposal, before the milestone?

- **A:** Yes - the proposal is to make sure you have a plausible project direction. If you need to change project directions, we understand.

Q: Can I change my project ***after*** the milestone?

- **A:** In general, we do not encourage this. At this point in the course, there will be little time to put together a sufficient project.

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Picking a project idea

First and foremost:

Do what is important or interesting to you, *not* what seems easiest.

- You will be far more motivated if you're invested in what you're doing
- What do you *really* care about? Healthcare? Self-driving cars? Surveillance? Sports? Ethics? You can probably find its intersection with computer vision

Practical considerations:

1. **Data:** Is there existing data for this problem? Will I need to spend weeks collecting it myself?

2. **Code & framework:** Will I have to implement this myself, or is there an existing implementation?

Picking a project idea

Conferences:

CVPR: IEEE Conference on Computer Vision and Pattern Recognition

ICCV: International Conference on Computer Vision

ECCV: European Conference on Computer Vision

NeurIPS: Neural Information Processing Systems

ICLR: International Conference on Learning Representations

ICML: International Conference on Machine Learning

*Note: Do **not** even begin to try to read through all of these papers, or even their titles. There are far too many. Use CMD+F to find papers with relevant keywords.*

Picking a project idea

Additional resources:

- Stanford Vision Lab Publications

- Awesome Deep Vision

- Papers With Code

- Kaggle

- Previous CS229 Projects

Reading papers

Do **not** read a paper linearly on your first pass

- First, read the abstract (word for word) as well as the figures & captions

- Does the paper still seem relevant? If so, read the methods as well as the results

- Finally, read the entire paper linearly (if the additional detail seems useful)

Papers are not always the most efficient way to digest an idea. Also try looking around for:

- Talks, videos, or blog posts on the topics

- Github repos, containing actual code for the idea

Reading papers

Example:

You Only Look Once:
Unified, Real-Time Object Detection

Joseph Redmon*, Santosh Divvala*†, Ross Girshick¶, Ali Farhadi*†
University of Washington*, Allen Institute for AI†, Facebook AI Research¶
http://pjreddie.com/yolo/

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Deliverables

Due dates:

- Proposal (4/24) - Monday!
- Milestone (5/13)
- Final report (6/8)
- Poster session (6/14)

Project Proposal (Due 4/24)

The proposal is a 200-400 word paragraph answering the following questions:

- **Problem**: What is the problem that you will be investigating? Why is it interesting?
- **Background**: What reading will you examine to provide context/background?
- **Data**: What data will you use?
    - If you are collecting new data, how will you do it?
- **Method**: 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?
- **Results**: How will you evaluate your results?
    - Qualitatively, what kind of results do you expect (e.g. plots or figures)?
    - Quantitatively, what kind of metrics will you use to evaluate/compare your results?

Milestone (Due 5/13)

At most 3-page progress report, more or less containing:

1. **Literature review (3+ sources)**
2. **Indication that code is up and running**
3. Data source explained correctly
4. What Github repo or other code you're basing your work off of
5. **Ran baseline model have results**
    a. Yes, points are taken off for no model running & no preliminary results
6. Data pipeline should be in place
7. Brief discussion of your preliminary results

Support: CA areas of specialty

Staff information

These are the usual staff members who will be at each session, along with their areas of expertise (which may be useful for finding project advice).

Hao Li *Robotics*	**Ziang Liu** *Robot learning, inverse rendering*	**Jeff He** *Robotics, RL, NLP*	**Haochen Shi** *Robotics*
Tiange Xiang *Computer Vision*	**Zane Durante** *CV + NLP, video understanding, hospital AI*	**Manuka Stratta** *Computer Vision, Object Detection, Object Tracking, Autonomous Vehicles, CV/AI for Climate Change*	**Bokui (William) Shen** *Computer Vision*
Samuel Clarke *Robotics, Audio, Multimodal*	**Tanmay Agarwal** *Multisensory Robotics (Tactile, Audio), Trajectory Prediction, Underwater Robotics Perception & Control, Multi-view 3D reconstruction*	**Yuan Gao** *NeRF, Diffusion, Multimodal, Simulation*	**Manasi Sharma** *CV (object detection, AVs, diffusion models), NLP*

Questions?