

## Project Proposal Guidelines: What is a good project

Your DL project serves an important purpose: it demonstrates to us that you are now capable of conceptualizing, working out and implementing a DL solution to a problem beyond what is covered by your homeworks and assignments. In other words, it is intended to make you exercise the skills you learn during the course on newer, potentially tougher problems.

What makes a good project idea: A good project idea can belong to one of the following categories

1. A novel research problem that interests you, in any technical area.
2. A reimplementing of cutting edge research verifying results reported in recent conferences such as ICLR, NIPS or ICML from the past couple of years. The ICLR reproducibility challenge has been popular in past semesters. The reproducibility tests must go beyond reporting only the results in the paper, to comparing and contrasting it to other methods.
3. Investigation into not-yet-published work that is discussed in public fora.
4. Real-world problems, that may not necessarily be researchy, but still require significantly well-thought-out and implemented solutions.

Here are some typical topics that students from past semesters have worked on:

- a. Adversarial attacks on neural networks, defenses, etc.
- b. Healthcare – analyzing healthcare data, images, speech etc
- c. Various versions of GANs and VAEs for a variety of problems, including trying to draw police sketches from descriptions, design dresses, etc
- d. Voice applications: e.g. making health-related analyses, emotions, speaker identification, biometrics, forensics, etc.
- e. Language: story generation, parsing, question answering, generating stories from cartoon sequences, generating cartoon sequences from stories
- f. Reinforcement learning for various tasks

Several faculty and students in LTI have often supervised projects. For voice applications (forensics, biometrics, etc), Rita Singh is a great resource. For speech recognition related problems Alex Rudnicky is a good resource. Scott Fahlman is always happy to supervise a project on cascade correlation models (an architecture he pioneered, and has tremendous, but as yet untapped potential), and several faculty outside LTI (the list varies year to year). This year, Mike Tarr may be a great person to reach out to for projects. Students have also worked with industry partners.

I have my own pet projects:

- a. For several years, I've been trying to convince someone, anyone to write an RL code to learn to play quantum tic-tac-toe (a version of tic-tac-toe designed by a physicist, and which sometimes leads to papers in Physics journals ☺).
- b. Using perceptual phenomena to defend against adversarial attacks on speech recognition and speech biometric systems (this is a very publishable topic)
- c. Ultra-efficient models, with the application of trying to process a million audio recordings to classify all the sounds in them (very publishable).
- d. Others.

Hopefully this gives you some idea of what we expect in terms of work.

The actual work will require several steps from you:

- a. Meet potential advisors, and talk to your mentors. Keep both involved in all steps.
- b. You must perform the necessary background literature review to find the state of the art in the problem.
- c. Scope out the specific problem you will address.
- d. Identify data sources if necessary.
- e. State your objectives – what the end goal will be.
- f. Identify or come up with NNnet models that can actually accomplish your task.
- g. Implement and test your models. Compare to baselines if any.
- h. Report the results.

For your project proposal, we will require some level of completion of b,c,d and e. We will expect you to describe the background and state of the art (if any) in your problem. We will expect you to specify your problem in sufficient detail (so that we know what you're thinking of, and can advise on the feasibility of it). Identification of data sources early will prevent late grief. Try to state where you expect to get, keeping in mind that you only have 2 months.

Try to aim for publishable work if you can. Many previous projects have led to publications.

**IMPLEMENTATION:** *We expect you to implement as much as you can. It is not acceptable to simply download someone's open-sourced code from the web and run it. That will beat the purpose of the project. Sometimes, using open-source components will be unavoidable; in those cases, check with us.*

**Some important points:**

- *At all times, keep your TA mentors in the loop. They are a valuable resource.*

- *You can find pointers to the latest literature on interesting problems, models and solutions on social media sites like reddit (in the DL and ML subreddits). Please look into them.*
- *Look for blogs and other resources on the web.*
- *This is your chance to expand your knowledge beyond what we cover in the course. Use it.*