Virtual Undergraduate Town Hall FAQ
Speeding up Deep Reinforcement Learning via Transfer and Multitask Learning &
How to Choose a Research Direction as an Undergraduate.
Speaker: Yunshu Du, Host: Gail Murphy
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Deep Reinforcement Learning via Transfer and Multitask Learning

What classes should I take if I want to learn more about Deep Reinforcement learning or Multi-task learning?

➤ I would recommend the Stanford course on Convolutional Neural Networking for Visual Recognition. There are also tons of online resources. For example, Udacity has an introduction to machine learning, introduction to reinforcement learning, and a course on deep learning. Another option is YouTube, where you can get access to many lectures on deep reinforcement learning. My personal favorites are David Silver's RL lectures.

How do you think AI will impact future jobs and what key areas do you think AI will be used for breakthrough ideas?

➤ AI has certainly been helpful in our daily lives. For now, I think simple jobs involving repetitive tasks, or high-risk jobs will be replaced by AI. For example, warehouses use robot arms to stock their goods, instead of human labor. Or in rescue situations we can send a robot to the dangerous zone instead of sending a human.

What do you think about AI safety?

➤ AI Security is a big discussion, people think it shouldn't be trusted for deep learning because we don't really know what is going on in the neural network, and we don't know where the AI get its results. So I think, in life and death situations, deep learning AI should not be considered an altogether reliable source, but in terms of less serious situations we should definitely give it a try.

➤ The main concern with AI security comes from the public perception of AI as a super intelligent entity that is going to destroy our lives. From that point of view, I can tell you there is nothing to worry about. AI at this point is still very rudimentary, they're not going to take over the world.

Where do you think Deep RL will be used in the future, in our day to day lives, community, and in the classroom?

➤ DEEP RL can be applied anywhere. Right now, you can find a number of blogs about people attempting to apply DRL to a wide range of problems. People are currently looking into using DRL for traffic control, weather forecasting, and predicting how crowded a place will be.

➤ Deep RL is applicable to many daily circumstances. If you can find a problem, frame it around an environment, set a goal, and use these factors to design a rewards signal, then DEEP RL can be used.

In what situations should Reinforcement Learning be used over Multitask Learning? What was the motivation behind using Reinforcement Learning in AlphaGo?

➤ Reinforcement Learning is a branch of Multitask Learning, so using RL is using ML. If you are talking about using RL over supervised versus unsupervised learning, RL is suitable when you don't have much labeled training data and your environment is uncertain (e.g., state changes over time; think of the example of playing breakout where the images keep changing depends on what action the agent took).

➤ RL was used in AlphaGo because in the game of Go, state spaces are huge and every movement can lead to a very different result. It is not feasible to collect train-test data pairs for all situations. Therefore, we can use RL to explore the environment and learn interactions.

It seems like Breakout performed better starting off with the learning from Pong, instead of the other way around. Why is this and can certain domains have more basic actions?

➢ Your observation is correct. Unfortunately, at this time we do not know why. Understanding the behavior inside a neural network is a very popular area of study right now. One of the simplest domains in RL is the grid world, where an agent can take actions of going up, down, left, and right.

I am doing research in Deep RL. Do you recommend Tensorflow as a good resource?

➢ I have used both Torch and Tensorflow as my research tool. Torch does programming with LUA, and Tensorflow is using Python, so it depends on which language you are more familiar with. I have found both tools easy to use.

How to Choose a Research Direction as an Undergraduate?

How do I choose at topic and how do I start my research?

➢ If you have an area of interest take some time to google researchers or academics in that field who are currently at your university or even outside your university, and reach out to them. Graduate students and professors are usually very supportive, so don't be afraid to ask around. Participating in events can also help.

I am not sure if I should participate in summer or academic year long research. Do you have any insight into what differences I should consider?

➢ I would recommend you consider summer research first, because you will be more focused and have better progress. It can be difficult to do both class work and research at the same time during an academic semester.

➢ CRA-W has programs for summer and academic year REUs, DREU and CREU. Read the program requirements and blogs from past year participants for additional insight into expectations and time commitment.

In my CS department, the machine learning research is very competitive. Professors strictly looking at GPA and past experience. What is a good way to distinguish myself other than trying to take challenging classes and self-studying on the topic?

➢ Investigate summer research at other schools like CRA-W's DREU program.

➢ Ask the professor if you can go to the lab as a "visitor" and then get in touch with grad students in the lab.

➢ Some self-study will be needed to build up your skills.

Have you or your colleagues done academic year research? How hard it is to balance schoolwork and research?

➢ As a grad student, I've been doing research during academic years, and honestly it's not easy to maintain both coursework and research.

How many hours can we expect to put in for getting involved in research over the school year?

➢ For undergraduate research, 20 hr/week is typical, but it depends on who you are working with or the program requirement.

➢ CRA-W runs a REU during the academic year that requires 10-15 hours of work per week. You can find out more about our CREU program by visiting: http://cra.org/cra-w/creu/