Research Internships

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About me

AI Researcher. My interests include deep reinforcement learning, robotics, and recommender systems.

Specifics:

- My third year intern was with Prof. Yoshua Bengio and Prof. Liam Paull at Mila, Montreal
- Yes, Yoshua Bengio did win the **Turing award** 2018
- My second year (winter) intern was with Prof. Brian Lim at NUS, Singapore
- At IIT Kanpur, I have worked with Prof. Piyush Rai and Prof. Nisheeth Srivastava
- When my ideas did not match with my advisors', I pursued independent research projects as well.
- More details on my homepage!

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Warning #1 !

All the contents of this presentation are heavily biased by my personal experiences both within and outside CSE IIT Kanpur. I do not make any attempt to conceal that this presentation is biased and do not claim that what I am presenting is general blanket advice that will work in all situations irrespective of the academic trajectories you have developed so far.

However, this is the best I can do, since we have just one life and need to infer one-sample estimates of the future; unlike computer programs, we don't get a chance to backtrack in life and sample other trajectories...

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Warning #2 !

I have been told by my professors that I tend to ramble a lot; I have still not been able to help it, so please bear with me □

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What is Research?

Think --> Theorize --> Implement --> Infer --------> PUBLISH!

*"the **systematic** investigation into and study of materials and sources in order to establish facts and reach new conclusions."*

The entire research pipeline usually starts with an idea and ends with a publication/patent.

Sometimes, in addition to publications, a working product is also the end result of research.

Exploration/Exploitation dilemma

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Why Research?

To innovate and develop solutions to existing problems

To realize something is actually a problem and needs a solution

For the thrill of it

For being the "designated geek" who does cool stuffs (albeit also gets mocked often □)

There are differences between the "whys" of academic and industrial research

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Why Research?

Research is a part of every intellectual pursuit. If there is no research, then it is not an intellectual pursuit

With the advances in AI, "mechanical jobs" will soon be taken over by robots which we (will) create

Example - advances in program synthesis/repair may render the jobs of programmers who keep coding what they are asked "without" innovating, irrelevant (I know, I am biased against software engineering profiles 😉)

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When to Research?

Now!!!

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How to Research?

Exploration/Exploitation dilemma

Most research projects start with a literature survey (exploration) followed by identification of a problem and diving deep towards a solution (exploitation)

There is also a larger dilemma regarding how much to explore different research areas before understanding which ingredients make your cup of coffee enjoyable

I will address this issue in the following slide

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How to know my cup of coffee?

The only way to realize whether a research field is suited for you, is to actually read papers/ work on some projects (may be a tiny project!) in that field. The good thing is - as a computer scientist, you will be well prepared to pursue research in a myriad of fields.

Personal experience (to be taken with a pinch of your favourite seasoning): *I dated quantum computing for a summer, had a brief fling with fuzzy logic during the following semester, got intimately involved with cognitive science/ HCI, and had an illicit affair with recommender systems and reinforcement learning, before finally marrying deep reinforcement learning for robotics last semester.*

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Timelines

For Y18 - You should use the first year summer break for exploring one (or maybe two) research fields. It is sufficient to devote around 2 months for this. For the remaining 1 month, you should go meet family/friends, pursue your hobbies, and watch at least one really addictive TV series (It was Game of Thrones for me).

For Y17 - If you have a rough idea of what to research on, you should pursue a research project with a Professor at IITK. You could go out of IITK for it too, but the benefit of doing it here will be that you can continue working in the coming semester and potentially publish (or atleast submit a paper). A paper will be seen much more favorably than the brand value of some other university while applying for third year internships

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Timelines

For both Y17 and Y18 - For the third year summer, you MUST go outside IITK for a research internship, unless you have very strong reasons for staying here. You MUST NOT stay at home for the entire duration of that summer unless there is a very strong reason to do so.

By the time you apply for third year research internships, you must have a decent idea of your research interests and some strong projects/publications to back up your interest. CPI is relatively important depending on your other achievements. However, please do try to maintain a CPI > 8, lest it raises eyebrows in your application.

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DO NOT LET YOUR CPI/GRADES DISCOURAGE YOU FROM RESEARCH

You will get tons of examples online of people who did well in academic/industrial research despite having low grades during their undergraduate education. Especially, in rapidly growing fields like AI, the importance of research projects/publications is much more than grades for getting hired in top research positions.

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Shameless Recruitment drive

One of my research projects with Prof. Nisheeth Srivastava recently got published in ACM WebSci 2019. The link to the paper is here - https://arxiv.org/pdf/1812.06525.pdf

We are looking for enthusiastic undergrads to take over the project and do some topic analysis work (using Latent Dirichlet Allocation etc.). This leg of the project will involve cool ML stuffs with an interplay of HCI research.

Feel free to shoot me or Prof. Nisheeth an email if you want to know additional details.

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Where to apply?

NEVER GO FOR NON-FUNDED RESEARCH INTERNSHIPS

Apply and go to research labs that would value your contribution and show that through remuneration.

The research lab should ideally be affiliated to a "good" university. The QS rankings of Computer Science will give you a decent idea of the "goodness" of universities.

The professor you intend to work with need not be a bigshot in the field. In fact, it may be a good idea to go and work with young professors who would be able to spend more time discussing research with you.

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How to apply

There are a ton of research internship programs/scholarships like DAAD, MITACS, Charpak, SN Bose, EPFL, Viterbi...

However, these are usually tied to sub-par universities/labs and you may need to compromise on your research interests. Also, I have heard that these programs filter mainly through CPI (because it is easy to do so) and do not care about projects/publications. I don't know this for sure as I did not apply to any of them. Haha, personal bias again! 🧢

The best route is through sending personalized emails to professors of your interest (Apping).

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How to apply

Apping requires a lot of effort, patience, and perseverance. Most professors will not reply.

You must make sure that you spend at least 20 min going through the professor's papers and research interests before writing a detailed personalized email.

It helps to look at the professor's homepage to analyze whether he/she hires undergrad interns.

I can provide more details about writing emails and searching for labs offline.

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When to apply

For programs - there are fixed deadlines.

For apping - the sooner the better. But make sure that you have sufficient research experience to back up your interests/aims/claims before applying. Ideally, I would suggest to start the process of hunting for labs early September and sending out emails early October.

Sometimes, it helps to email the professors' students/post-docs as well so that you application is noticed.

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Potential Research Areas

In Computer Science, you might be aware that research areas related to AI are trending these days. However, I would suggest you to not blindly follow the current trend (age-old advice!)

In AI - Machine Learning, Symbolic AI, Reinforcement Learning, Deep Learning, Robotics, Optimization, Information Retrieval, Computer Vision, Natural Language Processing, Explainable AI...

In HCI - System/interface design, Analysis of UIs, Ubiquitous Computing, Context-aware computing...

There are other exciting areas in Theoretical CS, Game Theory, Systems research etc. which I am not very familiar with

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Potential Research Labs in AI

- Mila, Montreal
- amii, Alberta
- Vector, Toronto (does not yet have a dedicated internship program)
- Max Planck, Germany (MPI-IS)
- INRIA, France
- Riken, Japan

Apart from these, you should email individual professors in universities across the world inquiring about summer internships.

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Good Luck!

Feel free to reach out to me. I will be glad to talk about all aspects of research.

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