Careers in Research

Getting Started and Future Prospects

A Little About Me

1. B. Tech Civil Engineering, 4th Year
2. Research Interests: Data-driven Computing based solutions for Healthcare and Transportation
3. Personal Website: https://kkguliani.netlify.app/

What is Research?

What is NOT Research?

- Academic/Scholarly ❌

- Boring ❌

- Super tough ❌

- Contains lofty truths and concepts ❌

Myths about pursuing research

- I need a high GPA
- I have studied enough, I can't commit for 5 more years
- What will I do? Be a professor?

Mythbusters

- *A high GPA is a plus, but there are ways to outweigh a low one*
- *Research is not just coursework and examinations*
- *There are PhDs working in the industries as well*

What is Research?

"It's basically a learning process in which you use your existing knowledge of the subject to formulate original problems and develop their solutions"

Explore	→	Identify	→	Gather	→	Create	→	Share

Examples of Research?

- Research on God's particle in physics or Coronavirus in Biology (*Fundamental*)

- Research on ways to improve learning outcomes in classrooms (*Applied*)

- Research to find out consumer opinions about a product (*Qualitative*)

What do I need to get started?

➔ Definitely need a subject you'd like to learn about

➔ Need a medium where you can explore and learn the basics of the subject

➔ After getting hold of the subject, you need a problem statement to work upon

➔ And finally, develop a solution to that problem

"Aap Chronology Samjhiye"

Why Research

Motivation

Why would you do Research?

- Want to become a Doctor (*Naam ke aage 'Dr.' lagana hai bina MBBS ke*): Respect ++

- Problem-Solving gives you a kick

- You like to appreciate the process as much as/more than the result

- Desire to create impact through your work!

Research at IITR

Wondering how to get started with Research at IITR?

Yes!
Make sure you have a broad field in mind.

Nope!

Cool Cool 🙂

Approach a Prof. on campus for a research project

Interact with relevant student communities
Eg: VLG, QCG

Get practical experience via an internship

But... How do I know my interest?

Explore Your Core

(Search for some exciting and state-of-the art research going on in that area)

Random YouTube Videos

(Follow some good youtube channels that post about recent technological advancements)

Talk to your Seniors

(You can always ask your senior about his/her area of interest and can explore that)

Latest Buzz in the Campus

(It's always better to look for the fields that most of the people are pursuing in the campus than sitting idle)

How do I learn the basics of the Subject?

➜ Books

➜ Research Papers
- ◆ arXiv
- ◆ Google Scholar
- ◆ IEEE Xplore Site
- ◆ Research Gate

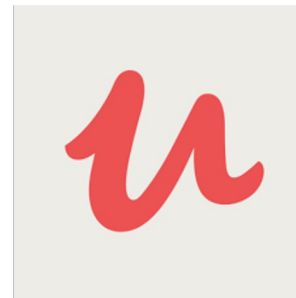➜ Online Courses
- ◆ Coursera, Udemy

➜ Blogs

How to get a problem statement?

Path 1: Contribute to a project where people are already working

Path 2: Take up a project from any professor from the relevant dept. and work

on it from scratch

Path 3: Formulate your own problem statement and develop its solution

Note: If you take up any project, make sure you devote sufficient time to it. At least 3-4 months. Only then will you be able to gain some understanding of the subject

What if my research interest isn't my major?

Congratulations! You're like most people at IITR 🙂

# What to do if my research interest isn't my major?

- Self-learn! Take up audit/credit courses in the field of interest
- Stay updates! Follow experts and professors in the field

Flexible course structure

- Provision of minors (No CGPA bar)
- Converting lab research work into credits
- Sister department PEC
- Interdisciplinary BTP
- NPTEL courses

Some Student Research Communities at R
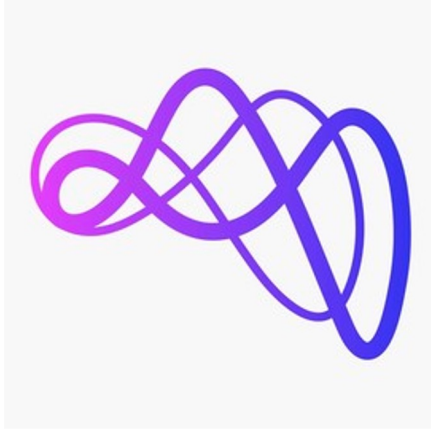
[Vision and Language Group](#) (Deep Learning)

[Quantum Computing Group](#) (QC)

[IEEE Student Chapter](#) (ECE)

Research Internships

Applying for Research Internships

Primarily two ways:

- Research Internship Programs

- Directly contacting professors

Research Internship Programs

Pretty straightforward in terms of applying:

- Detailed CV highlighting you academic credentials and past research experiences.

- Priority of projects and/or advisors that you're interested in working on.

- Statement of purpose

- Letter of recommendation/s

Generally speaking, the applications are shortlisted on the basis of GPA and then sent to advisors for project specific shortlisting.

Research Internship Programs

Pros:
- Usually funded and hence saves the hecticness of dealing with funding issues.

- Smooth in terms of paperwork. Generally speaking, no VISA issues.

Cons:
- Too much GPA bias which sometimes leads to negligence of actual research background.

A list of research internships programs can be found at this link:
[CLICK HERE][Research Intern Booklet by Watch Out!]

Directly contacting the professor

This can be broken down into four steps:

- Shortlisting advisors

- Emailing

- The Interview

- Paperwork

Shortlisting advisors

TL;DR - Choose what'll look cool on your CV, not your Facebook timeline

- Professor's relevance to your interest >>>>>> University's stature.

- Select one or two advisors from each university.

- Do some background research, read recent research work, contact PhDs & postdocs to know about the research environment.

- Don't go purely on the basis of citations, elder professors tend to be less interactive with their students, let alone interns. Always look for groups which value diversity.

- Try maintaining a priority list, useful in case you bag multiple offers.

- For students interested in CS related fields, use csrankings.org

E-mail

- Keep it short and concise

- Should comprise of 4 key things :

1. Brief introduction : name, major, degree, college, GPA (if exceptional), research interests.

2. Research Experience: Current or past research work and advisors. Definitely mention publications if any.

3. Relevance: Why are you particularly interested in working in that lab under that particular advisor. Mention relevant research work that you've read, background research about the advisor plays a major role here.

4. Specifics: Duration of availability, drive link to CV(DO NOT ATTACH).

E-mail

- Follow up after 2 weeks if no reply

- Acknowledge negative replies, request for a feedback and inquire about any future possibilities. Don't lose your morale.

- Positive Reply: Schedule the interview and ace it!

This process can get a bit testing at times, but believe it's definitely worth the effort.

E-mail

Some Don'ts

- Do not spam with generic mails. Write tailored mails to your shortlisted advisors.

- Do not CC multiple professors in one e-mail.

- Do not make grammatical mistakes. Use your G-suite ID to use grammarly premium.

- Do not use Dear sir/ma'am. Use Dear Prof's last name

- Do not talk about funding in your first email.

Interview

- Mostly dealing with past projects in your CV

- Fixing up your finances

- Talking about potential research projects.

- Students with low GPA can expect their knowledge and skill sets specific to the project to be tested thoroughly in the interview.

- Make sure to be thorough with the professor's work that you mentioned in your email.

Pros & Cons of directly contacting professors

Pros:
- More flexibility in terms of choosing the project you're going to work on.

- Research experience favored more than academic credentials.

- Interdisciplinary research is more valued.

Cons:

- Since the professor has to support you from his own research funding, so he might be a bit stringent in that case. Apply to schemes run by DORA, IITR Heritage Foundation etc.

I've got the internship, done with my paperwork and reached the lab, now what?

Actually Work!

- Research Internships are an opportunity to actually explore a field, not a 3 month holiday package.

- Try connecting with other researchers and gain an idea about future prospects.

- Go to the lab almost on a daily basis and try to be more and more involved with your mentor.

- If there are research conferences happening during your internship that you're research group will be attending, make sure to tag along.

Industrial Research and Jobs

- Internships/Jobs at Startups: For example, Rephrase.ai
- Predoctoral Fellowships: Google, Microsoft, etc
- Postdoctoral Researcher Jobs
- Research Organisations with industrial collaborations: eg: MILA Montreal, FAIR (Facebook AI Research)

Showcasing Research: Conferences and Journals
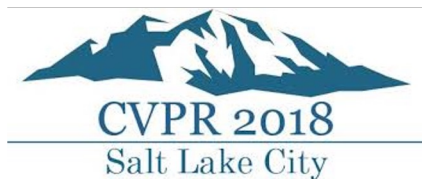
- Best sources to stay updated with cutting edge research.
- Signing up for volunteer opportunities is a good way to get started!
- Accepted papers and videos are usually made public.
- Jobs are floated too, eligibility barrier is usually high but can be helpful.
- Checkout **aideadlin.es** for upcoming conferences.

Art of reading research papers?

The Three Pass Approach

Pass 1 : 5-10 minutes
- Read the title, abstract, and introduction
- Read the section and sub-section headings, but ignore everything else
- Read the conclusion

Don't worry too much if you don't understand it completely!

Pass 2 : <= 1 hour, start jotting down
- Look carefully at the figures, diagrams and other illustrations in the paper
- You should now be able to summarize the main thrust of the paper, with supporting evidence, to someone else.
- To fully understand a paper, proceed to the third pass.
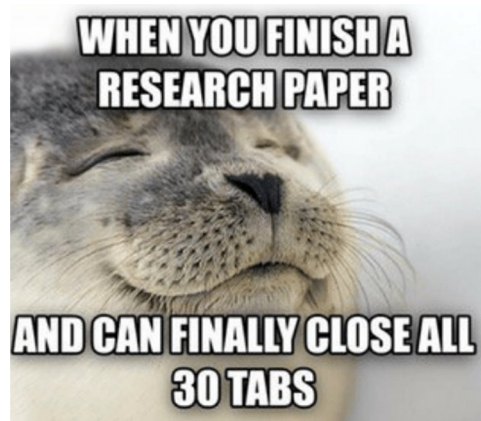
The Final Pass

Read Creatively and critically

- What are the good ideas in this paper?
- Are the assumptions the authors make reasonable?

Make Notes as you read the paper

- **I**f you have questions or criticisms, write them down
- Underline key points the authors make

Reading Groups

University of Waterloo / Borealis AI Machine Learning and Finance Reading Group

Organizer: Peter Forsyth Jr.

Mailing List

Presentations (Winter 2022)

Topic: The Retail investor

Date	Presenter	Topic	Location (May change)	Slides (Optional)
25 January 2022		Organization	Webex	
8 February 2022	Peter	Defined Contribution Pension Plans	Webex	Slides
22 February 2022	Francis	Neural Portfolio Optimization	Webex	Slides
8 March 2022	Muhammed	Tontines	Webex	Slides
22 March 2022	Alexey	Annuties	Webex	Slides
5 April 2022	Dan	Goal-based Weatlh Management	Webex	Slides
19 April 2022	Graham		Webex	

Possible Papers:

Finance

- https://www.tandfonline.com/doi/abs/10.1080/1351847X.2016.1151805
- https://www.nber.org/papers/w9116
- https://pure.hw.ac.uk/ws/files/42550851/STAR_decumulation.pdf

A Final Word: Don't be a sheep

"COLLECTIVE FEAR STIMULATES HERD INSTINCT, AND TENDS TO PRODUCE FEROCITY TOWARD THOSE WHO ARE NOT REGARDED AS MEMBERS OF THE HERD."

. BERTRAND RUSSELL .

ILOVEHUMANITY.COM
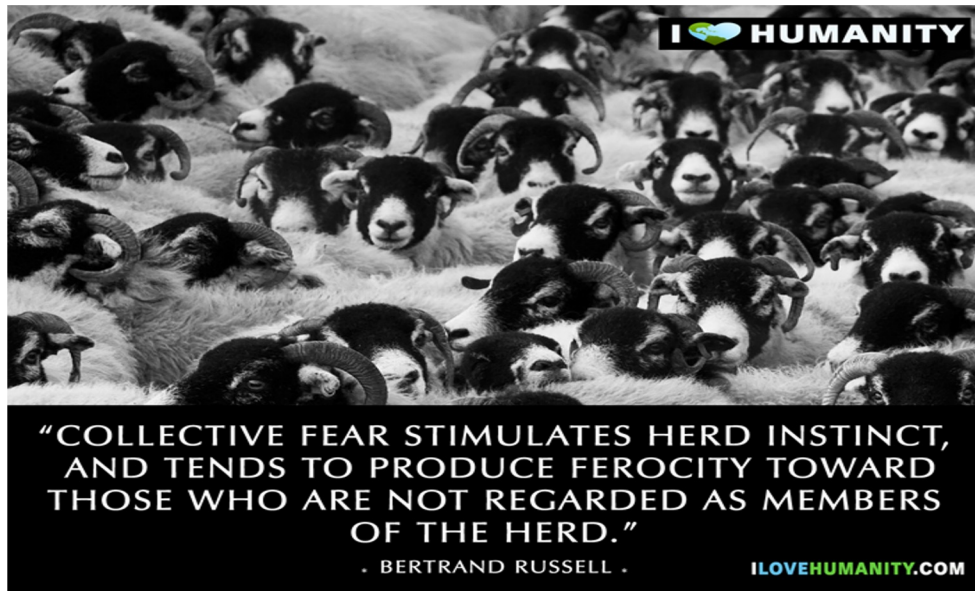
- Don't let the insecurity of having an extra #andhimachai on your timeline overpower your passion.
- Internships are an opportunity to explore your interest and not going by what the 'herd' says is best.

Thank You.
Questions?

Reach Out: **Keerat Kaur Guliani**
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Twitter: @GulianiKaur

Appendix

For the audience's reference

Academic CV 101

General Guidelines

- Get a good template

- No funky-guy@gmail.com

- LaTeX

- No images please

- Short and precise < 2 pages

- Consistency is key

- Never fake anything

- Double check spelling + grammar
- Don't be modest but don't go overboard

What to include?

Name, Contact Details, Research Interests

Education, Grades, Relevant Courses

Conferences attended and Publications

Experience: Internships, Projects

Awards and Achievements

Technical and Professional Skills

Extra - Curriculars