

Research Career – Why? What? How?

Venkatesh Raman

The Institute of Mathematical Sciences
Chennai

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Research Career in Computer Science

Outline

A brief about ACM and ACM-India

Why – an academic career?

- There are a lot of jobs

- Stable and Satisfactory

What happens in a research career?

- What qualities do you need?

How?

- Preparing for an academic career – PhD and beyond

- Some general info

- Preparing for the tests and interviews

Conclusions

- ▶ Largest Professional organisation of computer scientists
- ▶ Awards Turing Award, among others
- ▶ ACM-India started 12 years back to focus on India specific activities.
- ▶ Summer/winter schools, PhD clinic, Anveshan Setu, Teaching Partnership Program, ARCS symposium, webinars, ...
- ▶ india.acm.org

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Some Facts

- ▶ India has one of the largest youth population (in age group 18-30).
- ▶ National **Gross Enrollment Ratio** (GER) (proportion of youth enrolled in College) is 27% and Government wants to increase to about 50%
(TN average was already above 50%, slight drop recently, Kerala is around 40%).

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(TN average was already above 50%, slight drop recently, Kerala is around 40%).

Corollary Nearly double the college seats required.

Government Initiatives


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news18.com/news/education-career/digital-arsity-will-scale-up-gross-enrolment-ratio-in-higher-education-dharmendra-pradhan-68962...

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National Digital University will be launched by the end of 2023 (File Photo)

Union Minister for Education, Skill Development and Entrepreneurship, Dharmendra Pradhan has said that the National Digital University which will be launched by the end of 2023 will increase the Gross Enrolment Ratio (GER) in higher education.

He said that the presence of National Digital University would scale this up from the 27 per cent enrolment.

The Minister was speaking after inaugurating the second floor of the LOGOS lecture hall at the National Institute of **Technology** (NIT), Tiruchi on Sunday.

He said that there should be a collaboration between the IITs, IIMs, and NITs for research and innovations

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Government Initiatives

South

THE HINDU

Opinion

An India chapter for foreign universities

For a long time, proponents of the internationalisation of higher education have cherished the dream of foreign universities operating in India. For nearly two decades, they have emphasised the need to provide conducive conditions and an enabling framework for such institutions. But the idea failed to come to fruition due to the concerns of the regulatory authorities and governments in India as well as the foreign higher educational institutions.

Concerns

Promoting excellence, preventing malpractices, safeguarding the interests of students and protecting national interests have been some of the major concerns. Many were wary of the cultural threat that this initiative posed. One of those who were at the front of preserving the purity of Indian culture are now a part of political dispensation. Policy makers and regulators have been particularly concerned about how to come up with a framework that gets the best of the best and not the fly-by-night kinds of institutions.

On the other hand, the



Furqan Qamar,
former Adviser for
Education in the
Planning Commission,
is a Professor of
Management at
Jamia Millia Islamia,
New Delhi. Views are
personal

their campuses in India has been so compelling that the National Education Policy (NEP) 2020 provided that "selected universities e.g., those from among the top 100 universities in the world will be facilitated to operate in India. A legislative framework facilitating such entry will be put in place, and such universities will be given special dispensation regarding regulatory, governance, and content norms on par with other autonomous institutions of India." Even though the NEP favoured a "legislative framework", the idea is being executed through a regulatory route by the University Grants Commission (UGC). There seems to be determination to get the idea going, even if it amounts to some dilution in standards.

While the policy prescribed "facilitation" and "special dispensation" for the top 100 universities of the world, the draft regulation seeks to lower the standards by extending the scope to the top 500 universities, overall or in any discipline. Further, for the "educational institutions", just being "reputed" in their home country would be a sufficient requirement. The draft regulation doesn't seem concerned about the

financial autonomy to foreign institutions but takes that away by asserting that they abide by all the conditions that the UGC and the Indian government prescribe from time to time. The provision that the foreign higher education institutions must not do anything "contrary to the sovereignty and integrity of India, the security of the State, friendly relations with foreign States, public order, decency or morality" might deter the best universities that most value their academic autonomy.

Leaving aside the issue of whether the idea would succeed, one wonders why India is so keen on foreign higher education. During a media briefing, it is stated that foreign universities in India would stop the outflow of \$28-30 billion in foreign exchange. This does not corroborate on outward remittances from studies abroad, as reported by the Reserve Bank of India (RBI). During 2021-22, foreign account of studies abroad was more than \$5.165 billion. We add to it the outflow of \$1.5 billion for education (though these do not relate to studies abroad). Education-related outflow would be \$8.973 billion. That even \$5.165 billion is a significant sum.

Government Initiatives

- ▶ Push for foreign universities
- ▶ New IITs (6 to 23 in the last 20 years)
- ▶ Increased enrollment in colleges and institutes
- ▶ New IIITs
- ▶ IISERs (Indian Institute of Science Education and Research), NISER
- ▶ New State and Central Universities (Joy University, SNU, Sai University in TN).
- ▶ Online Education (NPTEL, SWAYAM, ...)
- ▶ National Digital University

Private Initiatives

- ▶ A number of private engineering colleges/institutes (SRM, DA-ICT, VIT, SSN, Amrita, Sastra, Amity, LPU,)
- ▶ A number of new multidisciplinary universities (Azim Premji, Krea, Ashoka, Chanakya,)

Corollary Thousands of teaching jobs for the near future....

Research

- ▶ Constant push to increase research funding, as Nations have realized the potential advantages for economic development.
- ▶ Department of Science and Technology (DST), Department of Atomic Energy (DAE), Council of Scientific and Industrial Research (CSIR) pump money into research
- ▶ Google, IBM, Microsoft, TCS, Infosys have exclusive research centres.
- ▶ International collaborative funding (DST, Fulbright, ...)

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Corollary Tens of thousands of academic (teaching and research) jobs in old to new institutes to industry for a foreseeable future.

Contrast this to

The screenshot shows a Google search results page on a desktop browser. The search query is "nearly 2lakhs fired employees". The top result is from brandequity.economictimes.indiatimes.com, titled "Google job cuts: Investor tells company to fire 1.5 lakh ...". The second result is from www.thetechoutlook.com, titled "IT Employees Being Laid Off by Big Tech Giants Including ...". Both results mention Google and significant layoffs.

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Google

nearly 2lakhs fired employees

the U.S.

2 days ago

More news →

<https://brandequity.economictimes.indiatimes.com> > news

Google job cuts: Investor tells company to fire 1.5 lakh ...

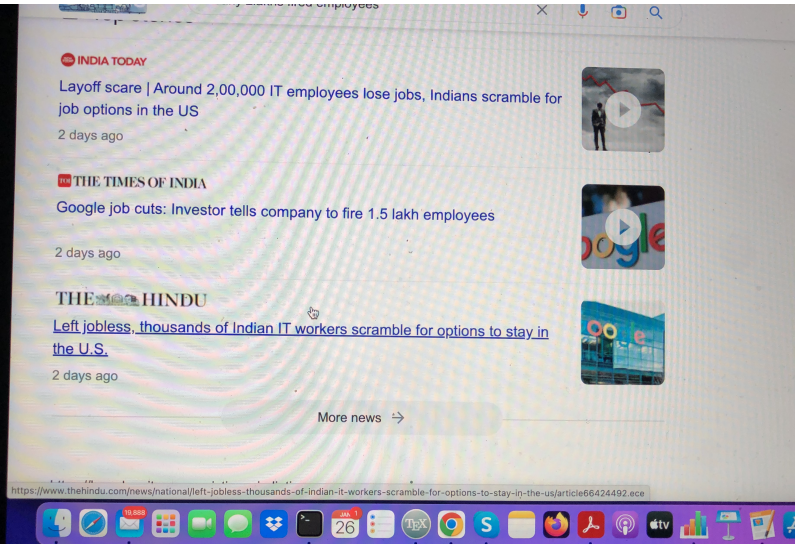
1 day ago — Apart from suggesting that Google should **fire 1.5 lakh employees**, he also said that the company should "address excessive **employee** compensation" ...

<https://www.thetechoutlook.com> > news > business > it-...

IT Employees Being Laid Off by Big Tech Giants Including ...

2 days ago — **Over 2 lakh IT employees** in the United States have already been **laid off** by companies like Google, Amazon, Microsoft, Meta, and others and more ...

and



Stable

- ▶ Not so much affected by recession
- ▶ Stable, long term career
- ▶ Flexible hours, not so much pressure
- ▶ Noble profession
- ▶ Well respected in the community
- ▶ Opportunity to mentor students (feel youthful always!)
- ▶ Develop skills for intellectual criticisms and debates

Salaries and Perks

- ▶ Starting salary is in the order of 150k Rs per month (after PhD and Post-Doc in top institutions)
- ▶ Good health care benefits, Research grants, housing, systems
- ▶ Opportunity to travel including abroad to attend conferences and institutions
- ▶ Opportunity for Consulting

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The Institutional Landscape – from Research to Teaching

- ▶ Industry Labs (Google, Microsoft, IBM, TCS, ...)
- ▶ Research Institutes (IMSc, CMI, TIFR, ISI, IISc, ...)
- ▶ IITs, IIITs
- ▶ Universities and Colleges

Funding, Salary, Perks, Entry requirements vary according to the above

A day in the life of a researcher

- ▶ Prepare and give lectures
- ▶ Research discussions with students and colleagues
- ▶ Attend seminars
- ▶ Write papers
- ▶ Read/Review papers, Continuously update yourself
- ▶ Attend conferences and meetings

What do you become?

- ▶ One of the top few *international experts* in an area
- ▶ Creator of new knowledge
- ▶ A problem solver
- ▶ A mentor
- ▶ Hungry for knowledge and intellectual challenges
- ▶ Become a part of the **international community** of researchers (reading, writing, reviewing, talking about research articles)

What is it NOT?

- ▶ It is not just for super intelligent nerds!
- ▶ It is not just boring lecture after lecture!
- ▶ Research is not psychologically tiring that you have to give up everything in life

Qualities needed

- ▶ Curiosity
- ▶ Commitment
- ▶ Perseverance
- ▶ Time discipline
- ▶ Problem solving skills
- ▶ ...

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











Conclusions


Where to start

- ▶ Identify your comfort level and interest in specific subjects –
Be broad
(Follow your interest, not trend)
- ▶ Start with Summer/winter schools, good videos
- ▶ Identify experts and groups in the country
- ▶ Write to people at these places (may not get prompt reply, but persist :)).
- ▶ Visit these institutes (visit library, internships,)

Exciting research happening in India and elsewhere?

By Hemangee Kalpesh Kapoor, Mausam, Venkatesh Raman
Communications of the ACM, November 2022, Vol. 65 No. 11, Pages 40-42
10.1145/3564603
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Computational sciences in the India region are going through exciting time. While India has always had significant strength in theoretical computer science (CS), in recent years it has developed substantial presence and maturity in other, more applied areas of CS such as hardware and computer architecture, data science and artificial intelligence (AI), and cyber-security. Alongside pure research, there has been a significant push toward lab-to-field projects and technology transfer and deployment, creating broad impact to the region and beyond. Significant efforts have been made on the democratization of education through online courses, enabling the vast population to learn from a relatively limited number of available experts. And these activities have continued to bolster India's already strong

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India Region Special Section 2022

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Healthcare: A Survey
of the State of the Art

04:28

Read CACM November 2022 special issue of India section

The screenshot shows a web browser window with a purple header bar containing navigation links: History, Bookmarks, Profiles, Tab, Window, and Help. Below the header, there's a search bar and a list of open tabs including 'All Cal', 'Mail', '2023', 'CSE R', 'Home', 'CMVR', 'Chenn', 'primer', and 'dbi'. The main content area displays three articles from the 'gazines/2022/11#india-region-special-section-big-trends' section. Each article has a title, a brief description, the author's name, and the page range. The first article is 'Theory Research in India: 2019–2022' by C. Aiswarya, V. Arvind, and Saket Saurabh, spanning pages 88-93. The second is 'AI and Data Science Centers in Top Indian Academic Institutions' by B. Ravindran, Sunita Sarawagi, and Aditi Jain, spanning pages 94-97. The third is 'Cybersecurity in India' by Debdeep Mukhopadhyay, spanning pages 98-102. At the bottom of the browser window, there's a taskbar with several open files: 'cacm_1.jpeg', 'cacm_2.jpeg', 'Opportunities fo...png', and 'foreign_univ_ne...jpeg'.

History Bookmarks Profiles Tab Window Help

gazines/2022/11#india-region-special-section-big-trends

Theory Research in India: 2019–2022

We explore some of the results of exciting new research in the field of algorithms in India.

C. Aiswarya, V. Arvind, Saket Saurabh

Pages 88-93

AI and Data Science Centers in Top Indian Academic Institutions

A look at the activities of artificial intelligence and data science centers located at seven top Indian institutes.

B. Ravindran, Sunita Sarawagi, Aditi Jain

Pages 94-97

Cybersecurity in India

A look at some of the major research accomplishments resulting from the efforts of several academic institutes to secure cyberspace.

Debdeep Mukhopadhyay

Pages 98-102

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Attend
the talks
today

Tests and Scholarships

- ▶ Different institutes have different entry procedures
 - ▶ JEST for IMSc (March 11th, Feb 25 Application deadline)
 - ▶ CMI, ISI have their own tests
 - ▶ IITs, IIITs (Apr/Oct deadlines), IISc (23 Mar 2023), GATE
- ▶ Several PhD seats and research grants go vacant even in good places
- ▶ You get stipend (30000+ Rs per month) during PhD Plus HRA, travel to conferences, book grants.
- ▶ There are also Prime Minister Fellowships (about 70000+ per month), Visweswara Scholarship, industry fellowships, Ramanujan Fellowship, INSPIRE fellowships
- ▶ In some institutes, one can go for integrated PhD direct after BTech
- ▶ Most institutes offer internships (summer or otherwise)

How to Prepare

- ▶ Get the fundamentals right, if necessary go back and read basic books
- ▶ Concepts and high level understandings are more important than details: Some examples:
 - ▶ JAVA vs C++ differences – more than specific syntax of either languages
 - ▶ Linux vs Windows differences
 - ▶ The advantages and disadvantages (say array vs linked list)
 - ▶ Knowledge versus aptitude
 - ▶ Problem solving skills
- ▶ Ask 'Why' for every concept; Explore answers!

What happens in a PhD

- ▶ You identify a broad area of your interest Then, with the help of a guide
 - ▶ Read advanced books and papers to understand state of the art
 - ▶ Learn them critically
 - ▶ Create new ideas, new theories, verify by experiments (and proofs).
- ▶ Proper information (through guide or otherwise) on state of the art, unsolved problems/directions is important.

What after PhD?

- ▶ Teaching
- ▶ Post-doctoral research
- ▶ Research (even in Industry)
 - ▶ Jobs in industry from the 90s have changed to become real interesting development jobs that need higher learning.

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- ▶ Academic career is challenging, satisfying and attractive
- ▶ For the next few years, this is going to witness even faster growth.
- ▶ Hopefully, some of you will think about it and contribute to our nation's creation of knowledge and the knowledge seekers!

Finally ...

Turing award winner, author of TAOCP series, Knuth says ...



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'When my books came out, they were not copies of any other books. They always were something that had not been fashionable to do, but they corresponded to my own perception of what ought to be done.

Finally ...

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Thank You