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Bioinformatics: wave of the future

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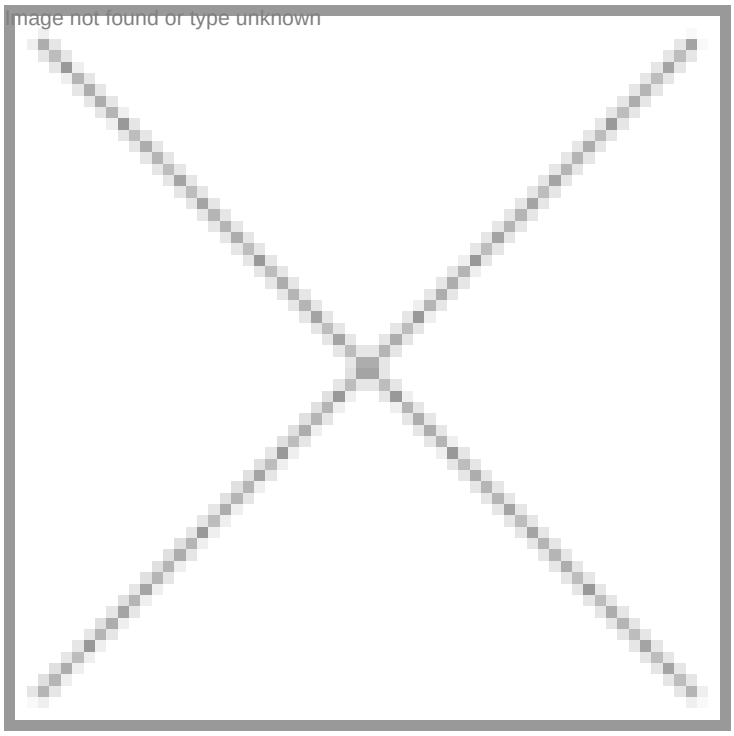


Bioinformatics: wave of the future

Everyone is now talking about bioinformatics. This is the new segment created by the merger of two hot areas: information technology and biotechnology. So this has become one of the most promising field for job hunters. What are the opportunities available in this field?

Bioinformatics is the application of computer technology to the management of biological information. It combines computer science with biology and genetics with a good-sized dollop of mathematics, statistics and other medical specialties thrown into the mix. Computers are used to gather, store, analyze and integrate biological and genetic information which can then be applied to gene-based drug discovery and development. Bioinformatics is not just a useful tool in biological research or drug development. It is an indispensable ally of researchers.

"The technology is versatile and can be applied whenever gene, protein and cell research are used for the discovery of a new drug or a new herbicide/herbicide-resistant crop combination. Drug toxicology, pharmacogenetics and clinical trial studies can also benefit from this technology which can even be used to genetically engineer crops and livestock that have enhanced nutritional qualities and the ability to produce pharmaceuticals," said Anuradha Acharya, CEO, Ocimum Biosolutions, Hyderabad.

Recent years have seen an explosive growth in biological data. It should be managed and stored for various purposes. Also the managed data should be in tune with the current times. Here comes the relevance of bioinformatics. Large sequencing

projects are producing increasing quantities of nucleotide sequences. The contents of nucleotide databases are doubling in size approximately every 14 months.

Without bioinformatics, new research in most fields of medicine and biology would come to a standstill. The explosion of publicly available genomic information resulting from the Human Genome Project has precipitated the need for bioinformatics capabilities. The enormous growth of biological data led to the development of several things. First, all these data need to be stored. The second requirement is the need for radical new methods for analyzing these huge databases. Thirdly, powerful hardware is required to carry out the task of analyzing these databases. For instance, IBM is giving away free Web services technology to help scientists to track down DNA as the company continues its push itself into the promising life sciences arena.

The latest release of GenBank (V.102) exceeded one billion base pairs. Not only the size of sequence data is rapidly increasing but also the number of characterized genes from many organisms and protein structures doubles every two years. To cope with this great quantity of data, a new scientific discipline has emerged: bioinformatics, biocomputing or computational
biology.

How to become a bioinformatics expert?

Bioinformatics combines the tools and techniques of mathematics, computer science and biology in order to understand the biological significance of a variety of data. So if you like to get into this new scientific field you should be fond of these 'classic' disciplines. Because the field is so new, almost everyone in it did something else before. Some biologist went into bioinformatics by picking up programming but others entered via the reverse route.

Eligibility: B.Sc/M.Sc (Microbiology/Biochem/biotechnology/Agriculture/Horticulture/Seri/Food Technology/Organic Chemistry/botany/zoology/statistics/bio science & other divisions of life sciences, BE/B.Tech/B.VSc/M.VSc/B.Pharma, MBBS/BDS. ·

As a biologist, what skills do I need to make the transition?

In addition the extensive knowledge of the run-of-the mill molecular biology packages (GCG, BLAST etc.), you will need to learn web and programming skills including HTML, Perl, JAVA and C++ and be familiar with a variety of operating systems (especially UNIX). Relational database skills are very much sought after. So knowledge of SQL and a major database application such as Sybase or Oracle will be highly advantageous. One area of bioinformatics that is set to expand is the determination of relationships between structures and sequence. If you wish to enter this field, you will need to learn all you can about structural biology and modeling, mathematical optimization, computer graphics theory and linear algebra.

Is it easier to move from biology to computers or the reverse?

The answer depends on whether you are talking to a computer scientist who 'does' biology or a molecular biologist who 'does' computing. Most of what you will read in the popular press is that the importance of interdisciplinary scientists cannot be over-stressed and that the young people getting the top jobs in the next few years will be those graduating from truly interdisciplinary programs.

However, there are many types of bioinformatics jobs available, so no one background is ideal for all of them. The fact is that many of the jobs available currently involve the design and implementation of programs and systems for the storage, management and analysis of vast amounts of DNA sequence data. Such positions require in-depth programming and relational database skills which very few biologists possess and so it is largely the computational specialists who are filling these roles.

This is not to say the computer-savvy biologist doesn't play an important role. As the bioinformatics field matures there will be a huge demand for outreach to the biological community as well as the need for individuals with the in-depth biological background necessary to sift through gigabases of genomic sequence in search of novel targets. It will be in these areas that biologists with the necessary computational skills will find their niche.

National biotech institutes

Chandigarh
The Institute of Microbial Technology, Chandigarh

The National Institute of Immunology, New Delhi
New Delhi
IGIB, New Delhi

The Center for Cellular and Molecular Biology, Hyderabad
Hyderabad
Centre for DNA Fingerprinting Technology, Hyderabad

The National Center for Biological Sciences, Bangalore
Bangalore
The Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore

Companies which are into Bioinformatics

The Scope

As geneticists, microbiologists and other researchers continue to gather huge amounts of new information about the human genome and biological molecules, there is a growing need for sophisticated, computerized approaches for compiling and analyzing that data. The process by which that is done is called bioinformatics. Every major university in the world is trying to get its share in this field.

There is a great scope for Bioinformatics in India. Companies have to work hard to gain respect and credibility. Bioinformatics hasn't and cannot create a million jobs like IT as it is only a subset of IT. The numbers will increase but in small percentages.

"I wouldn't advice everyone to jump into this field as it would only dilute the market with excess supply of professionals. On the other hand, it might be good for companies as it would give us enough people to choose from", said Ocimum's Anuradha.

Another observation was that for a bioinformatics company which hires 100 people, about 70 percent are people with core knowledge with some understanding of bioinformatics. The number of people with bioinformatics resumes have increased rapidly but the quality of these "professionals" hasn't.

"Companies like us are always looking for good people but it takes us, on an average, 100 shortlisted resumes to finally pick one qualified person," she added.

According to Rajendran, Sr. Executive - Business Development, BrainWave Bioinformatics Ltd, a lot of universities and institutes are into bioinformatics. Almost every university in Andhra Pradesh and Karnataka offer a diploma in Bioinformatics. The prominent ones are the University of Hyderabad, Osmania University, IICT, IIIT.

Many private institutions which started during the hype have shut down. There are very good universities like the University of Pune, Madurai Kamaraj, Bose Institute and Jawaharlal Nehru University. The IIT's at Kharagpur and Delhi also have a very good biotechnology department.

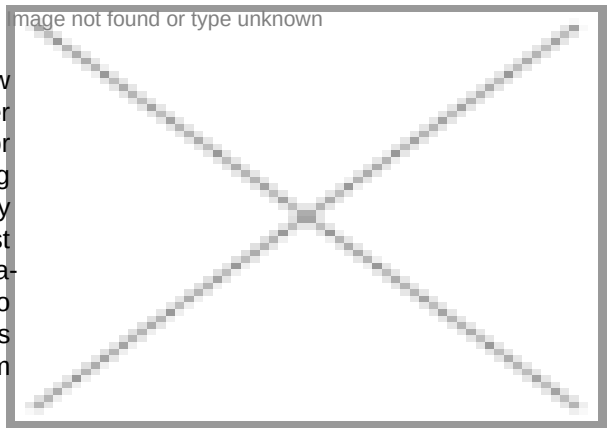
A lot of IT companies like TCS and Infosys have ventured in to this area but most of them do not have very large teams. Many large companies and research institutions are hiring hundreds of bioinformatics professionals.

GVK BioSciences Pvt. Ltd	Hyderabad
Strand Genomics	Bangalore
AstraZeneca	Bangalore
Dr Reddy's Laboratories	Hyderabad
Innovigen (division of Labs)	Hyderabad
Jubilant Biosys (subsidiary from Jubilant Organosys)	Noida, UP
Landsky Solutions	Secunderabad
Molecular Connections	Bangalore
Ocimum Biosolutions	Hyderabad
PrayogNET Computing	Chennai
Questar Bioinformatics	Hyderabad
Satyam Computers	Hyderabad
Spectramind Services	New Delhi
Total Consultancy Services	Hyderabad

"Bioinformatics as a career is very lucrative and has a great future. Requirement from an individual is the ability to contribute either in life sciences or in IT when working in a team comprising of professionals from both fields. Typical qualifications would be Masters and Ph.D. The salaries are benchmarked against industry standards and would be comparable with any other industry including IT. The sector is growing at an impressive rate and companies which understand the 'real issues' of the industry will only survive in the long run. Working with such companies will result in overall development for professionals in this sector," says Sowmya Narayan of Strand Genomics.

According to Dr GPS Raghava, Scientist & Co-ordinator of Bioinformatics Centre, Institute of Microbial Technology, Chandigarh, there is a big gap between the demand and expertise available. The gap is not only in India but in the US also. Despite the hype and the presence of large number of bioinformatics training centers in India our contribution is too limited.

Other useful areas



Bioinformatics is today seen as primarily applied to speeding up new drug discovery. But the other area that assumes increasingly higher significance is the application of IT to the entire life sciences sector- for the same purpose it is done in other industrial sectors- improving efficiency, reducing costs, wider access, etc. For example bio-diversity data management is an area that requires application of the best database design techniques and planning for data warehousing and data-mining. Knowledge management as applied to corporations will also become relevant in the scientific context to ensure that Indian scientists get relevant and timely information related to their research to help them network and collaborate to create new intellectual property.

"There may be around 200-300 employed in this sector every year. There are a lot of private institutions getting into the foray, but then quality is indeterminate," said Rajiv Vasudevan, who is an expert both in IT and biotechnology.

Bioinformatics in India is at an early stage of development. But at 4 to 5 centers in the country, one sees mature understanding of the needs of this sector and world class development of tools and applications. These centers will ensure

that India's traditional strengths in IT are leveraged to place us on par with the developed countries.

Roby Ajith