INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

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Regulations for MTech in Computational Biology (CB)

Preamble

The genomic revolution in biology enables one to answer many questions in medical sciences like personalized medicine, the etiology of diseases like cancer, HIV, SARS etc, etc. However, answers to these questions are impossible without the support of powerful computational and statistical tools that helps to understand and uncover the underlying systems level regulatory mechanisms (such as network design principles) responsible for diseases. With the advent of new biotechnological techniques, massive amounts of genomics data are generated at a rapid pace from the experiments and analysis of these data requires tremendous amount of domain knowledge, solid computational background and good programming skills. This has led to the development of a highly interdisciplinary field of Computational Biology and Bioinformatics which consists of a good amount of understanding of molecular biology, genomics, algorithms, programming, statistical computation, machine learning, stochastic processes, and other mathematical techniques that underlie biological design principles.

For developing skilled manpower for this field, an interdisciplinary program is needed which combine suitable aspects of biology, statistics, algorithms and mathematical models to analyze large-scale genomic and biological data in one program in a focused and strategic manner.

Currently few Institutions have strength and capability to offer interdisciplinary education in this area. IIIT-Delhi, with its strong focus on research, and with a good faculty in various CS and EE as well as Computational Biology, is well suited to offer such an interdisciplinary program of computing and biology. The proposed MTech program aims to train students in the key aspects of computing, bio informatics, and analysis of biological systems through the use of modeling and analytics.

Structure of the Program

The program will focus on strengthening key computer science capabilities needed for solving biology problems, and in developing skills in bio-informatics, techniques for modeling biological systems, analysis approaches for biological data, etc.

As this is an interdisciplinary program, it will have some modules to build the basic foundations in the two disciplines. These modules will be compulsory but will not count towards the credit requirement. Current modules are mentioned here. The PGC can modify these modules, or add/delete them.

- One intensive refresher course on Programming and Data Structures, and one refresher modules on Cell Biology and Biochemistry. (These are to be done during the summer before the start of the first semester).

Refresher module on Advanced Programming and Technical Communication, to be done during the first two semesters.

In the MTech program, the student will do 32 credits of courses (in addition to the courses mentioned above), and 16 credits for a Thesis, for a total of 48 credits. For courses, up to 12 credits can be from

CSE courses from a list of courses approved by the PG Committee. Some of them may be compulsory. Any compulsory course may be added to M.Tech. (CB) program only with the prior approval of the PGC Currently the list of approved courses is:

a. **Graduate Algorithms (or equivalent) - Compulsory**
b. **HipC**
c. **Machine learning**
d. **Bigdata analytics**
e. **Probabilistic Graph models**

The student will have to do a minimum of 20 credits of course work in Computational Biology – a few will be compulsory as defined by PG Committee, others will be electives. A sample of list of courses is given below – this list will evolve over time.

a. Foundations of Modern biology
b. Practical Bioinformatics
c. Systems and Synthetic Biology
d. Introduction to mathematical biology
e. Stochastic Simulations in Systems Biology and Biophysics
f. Molecular mechanics and Biological physics
g. Computational Neuroscience
h. Biostatistics
i. Function Genomics and Data mining

In electives, at most 4 credits of "Independent Study/Project" can be taken.

Thesis: Student will be required to do a thesis in Computational Biology – there is no scholarly paper option.

For the thesis credits, though the student has to register, he/she need not be physically present and can do the work while being outside the Institute

Note: A subset of these courses will be used for Minor in CB for BTech students.

Fee Waiver and Scholarships:

The institute will reduce the overall MTech fee by half for students in the first batch. The Institute hopes to find scholarships for students through DBT.

Change history:
July,2014 release

December,2015 release

April,2016 release

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