



Master track

Theoretical Biology & Bioinformatics

Universiteit Utrecht

Modeling and bioinformatics is an important ‘growth area’ in modern biology, pervading almost all disciplines in biology. Modern high throughput experiments deliver massive amounts of biological data, and reveal more-and-more complex interaction schemes. Proper understanding of the functioning of such highly complex biological systems calls for mathematical and computational approaches that are nowadays called ‘systems biology’. Our MSc track Theoretical Biology & Bioinformatics provides courses introducing you to the basic concepts of modeling and bioinformatics, and offers research projects in which you will study how complex biological systems function and evolve, using modern computational systems biology approaches.

This master track is part of the Molecular and Cellular Life Sciences program of the Utrecht Graduate School of Life Sciences. Most of the students in our track have a bachelor in biology from Utrecht University, and have acquired skills in modeling and bioinformatics during our bachelor courses: Systems Biology (level 1), Theoretical Ecology (level 2), Immunobiology (level 3), and Computational Biology (level 3). Students from outside also need to have a sufficient background in modeling and/or bioinformatics. They can attend (part of) these courses during their master. Our two MSc courses “Computational Biology” and “Bioinformatics and Evolutionary Genomics” are mandatory for all students attending the full track.

The master track prepares students for PhD positions in Computational Systems Biology. Currently there is a high demand for talented modelers and bioinformaticians in various research institutes all over the world. Due to its interdisciplinary approach to complex biological systems the program is exciting and challenging, and involves expertise in biology, mathematics and computer programming. Typical research questions involve:

- How are the genomes of species structured during evolution, and how does this influence their evolution?
- How can we get insight into behavioral and ecological patterns from the evolution of interacting individuals in spatio-temporal systems?
- How is a virus like HIV or HCV escaping from the immune system of their hosts, and how does that shape the evolution of hosts and pathogens?
- How can we understand pattern formation during development from the underlying genetic networks and cellular interactions?
- How do we predict protein function and evolution by comparative genomics?
- How can we model and describe the migration of cells in tissues?

The track is organized by the Theoretical Biology & Bioinformatics group of the department of Biology. During the master you can choose to be supervised by one of its staff members, who each have their own research lines in biology. Together we cover morphogenesis, genetic regulation, immunology, and comparative genomics, and we all have a strong emphasis on evolution. Projects typically have an emphasis on either modeling or on bioinformatics. More information is available on the website theory.bio.uu.nl/master.html, via the coordinator of the track Prof.dr. Rob J. de Boer (r.j.deboer@uu.nl), and via the coordinator of the MCLS master program Dr. Anje de Graaf (h.a.degraaf@uu.nl).