What Can I Do with a Computational Biology Major?

A computational biology degree combines biology, computer science, and math to help scientists understand living things using computer models and data analysis. Students learn how to study DNA, diseases, and how cells work by using computer programs instead of only working in a lab. This helps researchers find new medicines, understand genetics, and solve biological problems faster.

With a computational biology degree, graduates can work in healthcare, biotechnology, and research. They may help doctors study genetic diseases, assist scientists in creating new drugs, or work with environmental researchers to study how animals and plants evolve. The degree includes courses in biology, programming (like Python and R), and statistics, teaching students how to analyze large sets of biological data. [1]

Computational Biology and Bioinformatics are concerned with solving biological and biomedical problems using mathematical and computational methods. It is a growing field not only in academia, but also in industry. Major players in computation and medicine have invested heavily in computational biology, including Google, Microsoft, Life Technologies, Lockheed Martin, Roche and Merck. [3]

Careers Pathways [1, 2]:

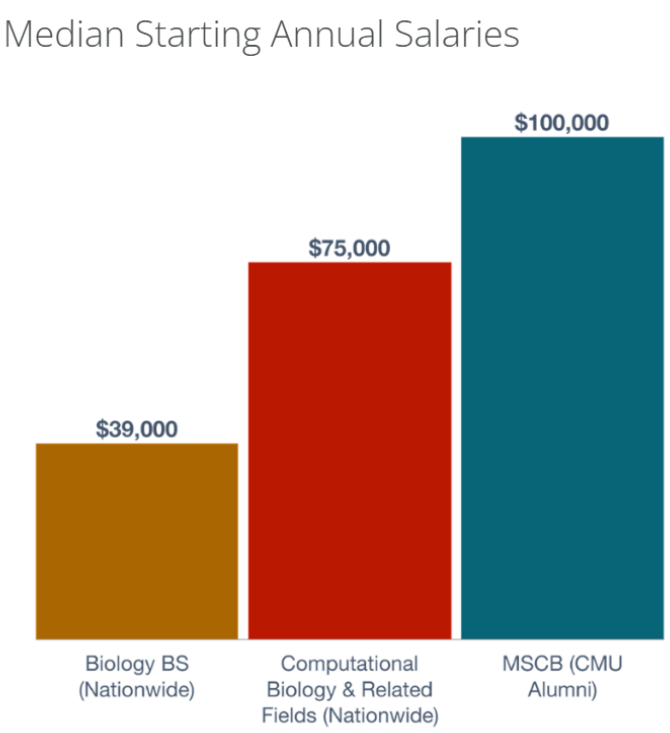
1. ***Bioinformatics scientist (may require further education – graduate degree)***
   Bioinformatics scientists analyze and interpret large biological datasets. They use technology and computer science to answer questions related to areas including biotechnology, biology, pharmaceuticals and medicine. As part of their job duties, they may design databases and develop algorithms for processing information.
2. ***Clinical Bioinformatics Specialist***
   Works in hospitals or medical centers to analyze patient genetic data, supporting personalized medicine and disease diagnosis. They help guide treatment decisions based on genetic information.
3. ***Machine learning engineer (may require further education – graduate degree)***
   Machine learning engineers develop algorithms and models to interpret complex data. Machine learning can be applied to many processes. In health care, machine learning systems lead to breakthroughs in areas like disease diagnosis and drug discovery.
4. ***Software Developer***

Develops software tools and databases used by researchers to store, manage, and analyze biological data. They work in biotech firms or as independent software developers.

5. ***Computational biologist (may require further education – graduate degree)***
   Computational biologists use computer algorithms for the research of biological topics. They bridge the gap between biology and technology to turn data into meaningful information. A computational biologist may work in biotech, pharmaceuticals or academia.
6. ***Genomics Technician***
   Assists in the analysis of genetic data, often involved in tasks like genome sequencing or research in personalized medicine. They typically work in labs or healthcare settings.
7. ***AI specialist (may require further education – graduate degree)***
   AI specialists are at the forefront of AI research. They develop groundbreaking algorithms and models to solve complex problems. In health care, AI specialists develop and implement artificial intelligence to improve patient outcomes and optimize hospital operations.
8. ***Data scientist (may require further education – graduate degree)***
   Data scientists use analytical tools and techniques to understand large amounts of data. In the pharmaceutical and biotech sectors, these scientists uncover trends and patterns that accelerate drug development and streamline manufacturing processes.
9. ***Biotech software engineer (may require further education – graduate degree)***
   Biotech software engineers design and develop software tools for analyzing biological data, managing laboratory workflows and simulating biological systems. They create paths to automation and efficient management of resources to improve the medical field.

Consider an Advanced Degree in Computational Biology:

Both Master's Degrees and PhDs in Computational Biology/Bioinformatics can open doors for many Computational Biology career opportunities! The info-graphic below is from Carnegie Mellon University's statistics from their M.S. in Computational Biology (MSCB) Alumni:



PhDs in Computational Biology also open doors to a wide range of impactful careers at the intersection of biology, data science, and technology. Graduates are equipped to lead cutting-edge research, analyze complex biological data, and drive innovation in genomics, precision medicine, and drug development. Career paths include roles in academia as faculty or research scientists, industry positions such as computational biologist, data scientist, and bioinformatics analyst, and opportunities in clinical research, government agencies, and science policy. Whether contributing to cancer research, developing new therapeutics, or building AI tools for biomedical discovery, PhDs in computational biology are solving some of today's most critical health and science challenges. Check out the Pitt and Carnegie Mellon University Joint PhD program in Computational Biology to learn more.

If you are interested in a PhD in Computational Biology, consider adding in some of the below common program pre-requisite coursework:

- Applied Mathematics (Probability & Statistics)
- Analysis (Calculus & Numerical)
- Algebra (Linear & Multilinear)
- More information on recommended Undergraduate Coursework: https://www.compbio.cmu.edu/prospective-students/recommended-undergraduate-courses.html

Resources (endnotes):

1. https://www.careerexplorer.com/degrees/computational-biology-degree/#What-Can-You-Do-with-a-Computational-Biology-Degree
2. https://www.csb.pitt.edu/2025/01/29/six-high-paying-jobs-for-computational-biomedicine-and-biotechnology-ms-degree-graduates/
3. https://www.cmu.edu/ms-compbio/prospective-students/career.html