Bioinformatics

- MBINF
- MSc
- PhD

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Summary

The library provides **<u>strong</u>** support for the University of Guelph's Bioinformatics programs.

Recommendations

- Consider embedding information literacy instruction in BINF*6999 Bioinformatics Master's Project and BINF*6500 PhD Research Writing in Bioinformatics. In our experience, building in academic skills support at the curriculum level is most effective for students.
- Encourage Bioinformatics students to book appointments for academic writing support on their theses and dissertations.
- Encourage Bioinformatics students to seek out individual support for developing academic skills and strategies (outlined under Learning Services below).
- Encourage students to contact the library about embargoing and storing data in the institutional repository during the publication, commercialization, and/or patent process to be publicly released at a later date.
- Encourage students with large datasets to contact the library for support in the preparation of their datasets for inclusion in an external repository (e.g. GenBank, Federated Research Data Repository (FRDR)).

Part 1: Collections

E-journal, book, and index coverage is excellent. Library participation in national and provincial purchasing consortia results in better collections than would be expected at comparable, less well-connected institutions. The acquisition of e-books is rapidly replacing print, facilitating convenient remote access.

Due to the University's historic strengths in the life sciences, and the interdisciplinary nature of Bioinformatics, access to the relevant literature is strong. Additionally, major expansion of computer science related programs in recent years has been accompanied by corresponding growth and modernization of computer and data science library collections.

Journals

The library almost exclusively acquires online journals and provides access to more than 55,000 titles across all disciplines. The journal collection in disciplines relevant to Bioinformatics is strong. Students can access nearly complete journal suites, often back to the first volume, from publishers such as:

- ACM Digital Library
- American Chemical Society
- Annual Reviews
- Cambridge University Press
- Elsevier
- IEEE Xplore
- Oxford University Press
- Project Euclid
- Society for Industrial & Applied Math (SIAM)
- Springer-Nature
- Taylor & Francis
- Wiley

Where gaps exist, it is generally for publishers to which the library subscribes to select titles rather than complete 'bundles.' Notable publishers in this category include BMJ (specialty titles),

Cell Press, Karger, Mary Ann Liebert, Nature (specialty titles), Thieme, and Wolters Kluwer/OVID. The library adds new subscriptions in response to evolving demand and as budgets permit. Users can obtain non-subscribed journal articles via the interlibrary loan service.

Notable non-subscribed journals that are pertinent to Bioinformatics include:
- *Cellular & Molecular Immunology* (Springer-Nature)
- *CRISPR Journal* (Liebert)
- *Current Bioinformatics* (Bentham)
- *JAMA Oncology* (Am. Medical Association)
- *Journal of Clinical Investigation* (Am. Soc. Clinical Investigation)
- *Tissue Engineering* (Liebert)
- *Trends in Cancer* (Cell Press)

The library provides access to most of the high impact factor journals relevant to Bioinformatics, according to Clarivate's *Journal Citation Reports (JCR)* database. By subject category:

JCR Subject Category	Available at Guelph
Biochemical Research Methods	25 of 25 titles
Biochemistry & Molecular Biology	25/25
Biotechnology & Applied Microbiology	25/25
Cell Biology	43/50
Computer Science Interdisciplinary Applications	24/25
Genetics & Heredity	24/25
Immunology	24/25
Mathematical & Computational Biology	24/25
Medicine, Research & Experimental	24/25
Microbiology	50/50
Multidisciplinary Sciences	22/25
Oncology	22/25
Pharmacology & Pharmacy	25/25
Plant Sciences	25/25
Statistics & Probability	50/50

Books and E-books

The acquisition of e-books is rapidly replacing print, facilitating convenient remote access. The library offers a broad selection of Bioinformatics books from publishers such as:

- American Society for Microbiology
- CRC Press
- Elsevier
- Morgan & Claypool
- Oxford University Press
- SAGE
- Springer
- Taylor & Francis
- Wiley

With respect to Bioinformatics, e-book collections from Elsevier, Springer, and Morgan & Claypool are particularly relevant and extensive.

Search Tools to Access the Literature

Omni is the library's core academic search tool which lets users simultaneously search the University of Guelph library collections plus the library collections of most of the other university

libraries in Ontario. Omni facilitates access to full-text books, articles, streaming media, and much more by linking to library subscriptions and open access scholarly works.

The library subscribes to a variety of online indexes to the scholarly literature, including:
- ACM Digital Library
- Biological Sciences Collection (ProQuest)
- Compendex / Engineering Index
- IEEE Xplore
- Medline/PubMed
- SciFinder
- Web of Science

Research Methods & Protocols

Journals dominate the research literature. However, methods and protocols are often impossible to replicate from the brief descriptions written up in research articles. To help overcome this challenge, the library collects an increasing number of books, book series, and databases that provide comprehensive detail about experimental procedures. Notable examples include:

- Cold Spring Harbor Protocols
- Journal of Visualized Experiments (JoVE, a streaming video service)
- Methods in Enzymology (Elsevier)
- SAGE Research Methods Videos
- Springer-Nature Experiments (formerly *Springer Protocols* and *Nature Protocols*)
- Wiley Current Protocols

Streaming Media and Online Training Resources

Video resources are increasingly being integrated in the curriculum. In support of this trend, the library is actively developing a robust streaming media collection which includes documentaries, instructional videos, feature-length films, and news clips.

The university subscribes to LinkedIn Learning, a platform offering thousands of applied technology courses delivered via streaming video. For programming skills development and supplemental learning, it is a valuable resource for Bioinformatics students.

Curriculum Resources

The E-Learning & Reserves unit makes resources readily available to students with integrated links in the course management platform, CourseLink, and with access points in Omni. Where possible, course reserves resources are made available online.

Part 2: Academic and Professional Skills

Research and Information Literacy (IL) Skills

Information Literacy (IL) librarians support students by providing:
- Individual appointments
- In-class guest lectures

- Co-curricular workshops such as Dissertation Boot Camp and Brain Food for thesis management.
- Customized digital learning objects, such as online course guides

The IL team takes a broad view of research skills and provides instruction and support on:
- developing a research question.
- doing preliminary research or researching around a topic.
- search and retrieval of scholarly and non-scholarly sources.
- knowledge synthesis projects, such as literature, systematic or scoping reviews.
- evaluating information for bias, authority, reliability, and other indicators of suitability.

The IL team prioritizes support to large required and core courses that have research skills or digital media literacy assignments. IL librarians aim to scaffold information literacy instruction throughout the curriculum to provide students with the opportunity to build on their skills year over year.

IL librarians are supporting individual graduate students via individual appointments but are not currently involved in any of the courses in the Bioinformatics programs.

Writing Services

Writing specialists support students by providing:
- Individual writing appointments.
- In-class guest lectures.
- Curricular support and resources for instructors and graduate student supervisors.
- Co-curricular programming such as Dissertation Boot Camp, Brain Food for thesis management, Writing Tune-Up for grammar, and Academic Writing Style.
- Academic integrity support through Academic Integrity at the University of Guelph www.academicintegrity.uoguelph.ca and by helping students understand and prevent academic misconduct.

Individual writing appointments

Year	# Bioinformatics students
2017-2018	7
2018-2019	5
2019-2020	1
2020-2021	7

Since Winter 2018, Writing Services and Learning Services have collaborated to present to MBINF students on library support, audience mapping, writing project proposals, project management, presenting findings, and writing for end users.

Joint Writing Services & Learning Services workshops for MBINF students

Year	# Sessions	# Students
Winter 2018	2	25 (total)
Fall 2018	2	60 (total)
Fall 2019	2	60 (total)
Fall 2020	1	15

English as an Additional Language (EAL)

English language programming supports students to develop skills in English communication, pronunciation, presentation, reading, and writing skills. Support is offered through:
- Individual appointments.
- Co-curricular workshops and short courses such as EAL Graduate Writing Camp, Pronunciation Groups, Talk like an Academic, and Write like an Academic.
- Curricular support and resources for instructors and graduate student supervisors.

Learning Services

Learning Services supports students in the development of academic skills and strategies. Learning Specialists provide individual appointments, workshops, programs, and resources to graduate students on topics such as:

- goal setting and time planning during the thesis process.
- productivity and procrastination.
- presentation skills.
- preparing for qualifying exams and comprehensive exams.
- reading strategically.

Scholarship and Data Services

The Research & Scholarship (R&S) team provides support for students' data and research activities through:

- Individual appointments.
- In-class guest lectures.
- Co-curricular programming such the Data Skills Workshop Series, the Scholarly Communications Workshop Series, workshops on acquiring, analyzing, and visualizing data, using research software, cleaning, coding, depositing data into Dataverse, and data management plans.
- Customized digital learning objects such as instruction sheets, videos, and tutorials.
- The library's Data Resource Centre which provides access to statistical data resources and software and specialist support for the use of GIS data, statistical software, and survey software.
- The library has installed ArcGIS, Excel, R, SPSS, SAS, and Matlab on all library workstations.
- Administration of the University's institutional repositories:
  - The Atrium for institutional open access research.
  - Dataverse for research data from all disciplines created by researchers at the University of Guelph.
  - The Agri-Environmental Research Data Repository to preserve and provide access to agricultural and environmental data produced during University of Guelph research projects.

Although we do not collect program level data on our workshop attendees, graduate students from the sciences comprise most of our participants. Although we do not collect program level data on our individual appointments, the majority of our participants are graduate students from the sciences with a large proportion of those students seeing statistical support.

Electronic Theses and Dissertations (ETD)

University of Guelph Institutional Repository, the Atrium, houses University of Guelph student theses and dissertations.

Bioinformatics theses and dissertations added to the Atrium (2019-2020):
5 Masters theses