

Master of Biomedical Informatics

Capstone Project

Version Effective as of

September 8, 2021

Harvard Medical School

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The Capstone Experience

A mentored, hands-on capstone experience complements the Master of Biomedical Informatics program, tailored to each student's professional expertise and interests. Our program participants work with faculty members who are actively bringing computational methods and engineering to biomedicine.

Working in collaboration with their mentor, students will participate in Biomedical Informatics research. They will gain a practical, real-life understanding of the field by applying what they are learning in their courses as they work alongside a Biomedical Informatics leader in their area of interest. Typical capstone projects include the development of new methods and tools, creation of data resources, and analyses of biomedical data.

Any correspondence regarding capstone projects, including submission of proposals and reports, must be directed to **Rebecca Fitzhugh (rebecca_fitzhugh@hms.harvard.edu)**, MBI Program Manager.

Expectations for Capstone Students

- Students are required to submit a project proposal, progress reports, and a final manuscript by the set program deadlines.
- Students must work with their Mentor and Co-Mentors to identify a reasonable timeline to submit all project deliverables to their mentorship team for feedback and approval before the program deadlines.
- Students are expected to practice professional courtesy when making and keeping regular appointments with their Mentor and Co-Mentor(s).
- Students are expected to exhibit professional conduct when performing work related to capstone in their Mentor's lab or office space.
- Due to the fast pace and rigorous didactic course schedule of the MBI program, students are not required to submit their capstone work for publication at the time that the final report is due.
- Students are highly encouraged to submit their capstone work for future publication and must select a scientific journal on which to base the format of their final manuscript.

Compensation for Work on Capstone Project

- All MBI students receive a total of 6 academic credits towards the MBI degree for the work performed on their capstone project.
- MBI students **CANNOT** receive payment or other compensation for the work that they perform towards their capstone research.

Capstone Project Time Commitment

- Students are expected to commit around **190 total hours** towards conducting their capstone research project, including regular progress reports and writing the final project report.
- This translates to an estimated 7.5 hours of devoted work towards the capstone project per week during academic terms from the time of mentor selection to the submission of final report revisions and presentation preparation. Part-time students are expected to devote between 3.5 – 4 hours per week.

Project Formation and Execution

- Students may either work with their mentor to propose an original project idea or work on an aspect of an existing project being undertaken in their mentor's lab.
- Although students will be expected to work collaboratively with their mentor and co-mentors, **they must be the primary contributor to the work being completed for their capstone project.**

Process

Step 1. Identify Mentor

Students come up with a list of 3-5 potential mentors who have a computational or quantitative research program focused on biomedical data.

- Primary Mentors need to be Assistant Professors, Associate Professors, or Professors. Instructors may act as mentors with permission of the Program Director.
- Primary Mentors need to have an appointment at Harvard University.
- Co-mentors such as postdoctoral fellows or other suitable personnel, as well as faculty at other institutions may be proposed in addition to the Primary Mentor.

Students will be provided with lists of previous MBI capstone mentors and other appropriate faculty who have expressed previous interest in mentoring a MBI student for the capstone experience. Students can also search for other faculty they may be interested in working with by using resources such as Harvard Catalyst Profiles at <https://connects.catalyst.harvard.edu/profiles/search/people>. This database of all Harvard Medical School affiliated faculty allows users to search by research area, institution, and faculty type.

Students are expected to contact and set up meetings with prospective mentors on an individual basis. MBI Program Staff members can introduce students to potential mentors if no previous relationship exists, look over emails you plan to send to potential mentors introducing yourself, and help you think through potential mentors you may be interested in reaching out to. If you are struggling with how to connect with a potential mentor, please reach out to the Program as early as possible before your mentor selection is due.

Mentor Selection and Approval

- Submit list of potential mentors along with contact information via Canvas.
- Request introduction to potential mentors if necessary.
- Submit name and contact information of selected final mentor via Canvas.
- Have final mentor sign and return Mentor Agreement form (found in Canvas) to Program Manager.

Deadlines

- Accelerated MBI Full-time, Class of 2022
 - List of 3-5 potential mentors: **September 24th**
 - Final Mentor Selection with contact information: **October 8th**
 - Signed Mentor Agreement form due from mentor: **October 22nd**
- 48-credit MBI + Accelerated MBI Part-time, Class of 2023
 - List of 3-5 potential mentors: **February 10th**
 - Final Mentor Selection with contact information: **March 1st**
 - Signed Mentor Agreement form due from mentor: **March 15th**

Step 2. Propose project together with Mentor (*also see "Proposal Format" below*)

Students develop a project proposal with input from their mentor and co-mentors. Once the mentor has approved the proposal, students submit the proposal to Canvas for approval by the Capstone Oversight Committee. Program staff may reach out to Capstone Mentors at any time to verify that they have reviewed and approved a submitted proposal.

Proposal Format

The student must prepare a capstone proposal that is reviewed and approved by their mentor. The student must submit the mentor-approved capstone proposal to Canvas for approval by the Program Director. The proposal should be 3 to 5 pages in length and include the following sections:

- Objectives of the research
- State of the art and significance of the project
- Approach and methods
- References
- Timeline
- Plans for submitting an IRB proposal, if relevant. Please include the institute where it was submitted and any policies and dates that may need attention.

Creation and Submission of Project Proposal

- Discuss project idea, identify data sources, and techniques with mentor.
- Discuss how to obtain IRB and other approvals required for proposed project.
- Write project proposal and receive approval from capstone mentor.
- Submit project proposal as a .pdf or .doc document to Canvas site.
- Obtain approval for proposed project from Capstone Oversight Committee.
- Declare project start date if submitted before deadline listed below.

Deadlines

- Accelerated MBI Full-time, Class of 2022: **October 22nd**
- 48-credit MBI + Accelerated MBI Part-time, Class of 2023: **March 25th**

Step 3. Conduct Research under Guidance of Mentor

Students conduct research under the guidance of their mentor and co-mentors. Students and mentors meet regularly to discuss the project. Students submit regular progress reports for review by their Capstone Oversight Mentor.

Conducting Project and Submitting Progress Reports

- Meet with primary mentor at least once a month to discuss progress, challenges arising in the project, and to address feedback on progress reports.
- Submit progress reports approximately every 8 weeks by the deadlines (see below) for review and approval by the Capstone Oversight Committee
- Agree on a journal that is appropriate for the capstone research.

Progress Report Deadlines

- Accelerated MBI Full-time, Class of 2022: **December 10th** and **February 10th**
- 48-credit MBI, Class of 2023: **May 6th** and **September 30th**
- Accelerated MBI, Part-time, Class of 2023: **May 6th**, **September 30th**, **December 10th**, and **February 10th**

Progress Report Format

The student must prepare a capstone progress report approximately every 8 weeks that is reviewed and approved by their mentor. The student must submit the mentor-approved capstone progress report to Canvas.

The progress report must outline what has been accomplished so far and detail issues that have been encountered in data collection, analysis, writing, and IRB approval. The report must describe the next steps and explain possible changes to the plan resulting from issues encountered during the project.

The *final* progress report must indicate which journal the student and mentor have selected for the project and a link to the "Instructions for Authors" must be included.

Step 4. Submit Report

Students submit a capstone report in the form of a full-length journal article manuscript for their targeted journal. The Capstone Oversight Committee may request revisions.

Submission of Final Report

- Draft a final report and receive approval from your mentor.
- Submit report as *.pdf* or *.doc* to Canvas and Turnitin
- Receive feedback from Capstone Oversight Committee that needs to be incorporated into the final report.

Deadlines

- Accelerated MBI, Full-time, Class of 2022: **April 8th**
- 48-credit MBI, Class of 2023: **November 14th**
- Accelerated MBI, Part-time, Class of 2023: **April 10th**

Report Format

The completed capstone paper should be consistent with the requirements of the specific journal to which it could be submitted and will generally include the following sections:

- Introduction
- Methods
- Results
- Discussion
- References
- Acknowledgments

The *mentor must approve the completed written manuscript* in advance of submission. Mentors may be contacted at any time to verify that they have reviewed and approved a submitted report. It is strongly encouraged that students submit their manuscript to the selected journal.

Students also have the option to submit their final report to DASH –**Digital Access to Scholarship at Harvard** – which is a central, open-access repository of research by members of the Harvard community. Students must have permission of their project mentor to deposit to DASH. Learn more at dash.harvard.edu.

Step 5. Defend Capstone Research

Students present and defend their final and approved report at a “Capstone Research Day” that is open to the public and held once per semester. Presentations are 10 minutes plus 5 minutes for questions.

Dates

- Accelerated MBI, Full-time, Class of 2022: **May 12-13, 2022**
- 48-credit MBI: **December 15-16, 2022**
- Accelerated MBI part-time: approximately **May 10th, 2023. Date TBD**

Changes to Project and/or Mentor

If a student needs to significantly change their project or select a new mentor after already submitting a project proposal, they and their original mentor need to submit the request in writing to the MBI Program Manager for consideration by the Capstone Oversight Committee. The request must include the reason for the request and an explanation for why the original project and/or collaboration did not succeed. Requests to change mentors **must be sent by the due date of the first progress report (second progress report for part-time students)**. If the change is approved, a new project proposal will need to be submitted for approval. Changing mentors or projects may negatively impact the progress made towards the capstone project.

Grading and Evaluation

The capstone courses BMI 751 and BMI 752 are graded as 'Satisfactory' or 'Unsatisfactory'. A 'Satisfactory' grade is defined as a minimum of 80 out of 100 points, or the equivalent of a B minus or higher. The purpose of the capstone project is to give students the opportunity to engage in a professional research project, with the understanding that not all research projects go according to plan. The MBI Capstone Oversight Committee and Program Team are committed to counseling students throughout their capstone projects on ways to work through any challenges they may encounter. Evaluation of the capstone project is therefore based primarily upon the student's effort and ability to meet the expectations of carrying out a professional project as opposed to evaluating the project based on only the final results.

Two critical expectations for completing a professional research project are (1) meeting project milestone deadlines and (2) actively incorporating feedback from your mentor(s) and the Capstone Oversight Committee. These two criteria are reflected in the grading scheme detailed below. To receive a grade of 'Satisfactory' for BMI 751 and BMI 752, you must earn at least 160 out of 200 possible points:

| Assignment | Content | On Time |
|------------------------------------|---------|------------|
| Mentor Selection | N/A | 10 |
| Proposal | 25 | 15 |
| Progress Report 1 | 15 | 10 |
| Progress Report 2 | 15 | 10 |
| Final Report | 50 | 30 |
| Final Presentation | 20 | N/A |
| | | |
| Area Total | 110 | 90 |
| Grand Total Possible Points | | 200 |
| Points needed for 'S' grade | | 160 |

***For Part-Time Accelerated MBI students, each of the 4 progress reports will be worth 7.5 content points and 5 on-time points, respectively.**

Content Points

Capstone Oversight Mentor Feedback

When the proposal, progress reports, and final report are submitted, students should expect comments from their Capstone Oversight Mentor within one to two weeks of the submission date. **As soon as the Capstone Oversight Mentor posts feedback on the assignment submission, students are expected to address all comments or concerns within one week.** This includes any requests for revisions to address the feedback of the Capstone Oversight Mentor. Acknowledging feedback and submitting a first revision within the one-week timeframe will award the student the full content points available for the assignment. **Subsequent progress reports cannot receive full credit if the previous progress report's feedback remains unaddressed.**

Additional Revisions

At the discretion of the Capstone Oversight Mentor, a second revision may then be required. If the second revision is required because of new concerns or issues that are unique from the content of the first revision, content points will not be affected. **If the second revision is required because the student did not adequately address the feedback on the assignment submission in the first revision, half of possible content points will be deducted.** The same policy will hold true for any subsequent revisions on the same assignment.

On Time Points

Assignment Due Dates and Extensions

Students are expected to submit their capstone project assignments by the due date. If a student knows that they will not be able to submit their assignment by the due date, they must notify the Program Manager **24 hours before** the assignment due date to be given an extension (typically 3 business days for progress reports, five business days for mentor selection, project proposal, and final report). **Any assignment that is submitted late without permission for an extension OR is submitted past the extension deadline will receive 0 on-time points.**

In situations where extenuating circumstances (illness, family emergency, etc.) exist that prevent the student from submitting their capstone assignments on time, the Program Administration will work with the individual student to determine an appropriate alternate timeline.

Students who do not submit their final capstone report by the due date or by an agreed upon extension date will not be permitted to present at that semester's capstone presentation session and will lose all on-time points for the final report (30) and all points for the presentation (20). These students will be subject to academic disciplinary action.

Not Meeting Expectations

When a student has lost a total of 20 points, they must meet with the Program Director to discuss their progress and a plan for remediation. If the student loses a total of 30 points, they will be considered as not making [Satisfactory Academic Progress](#) and their case will be reviewed by the HMS Master's Programs' Academic Progress and Review Board (APRB). At the discretion of the APRB, the student will be issued a Formal Notice indicating that they must extend their time to degree to finish the capstone project should they lose more than 40 total points.

Students who lose 40 or more points before or while enrolled in **BMI 751 – Capstone Research I** will receive a grade of 'UNSAT' for BMI 751 and will not be permitted to enroll in BMI 752 in the next semester. Students who go on to lose more than 40 points after completing BMI 751 will not be permitted to complete their capstone and present their final presentation in the semester in which they are enrolled. Students in this situation will not qualify for graduation and will not be issued the MBI degree in their expected graduation term. The student will receive an 'Incomplete' grade for **BMI 752 – Capstone Research II**, be required to finish their project in the next academic term and will have to pay an extension to degree fee of \$3,000. This extension fee only provides for a student to finish and receive credit for the capstone project and does not allow the student to enroll in any additional Harvard University or MIT classes. If the student fails to complete

their capstone in the next semester, they will need to then retake **BMI 752** and pay the part-time MBI tuition rate to continue with their capstone project to graduate from the program.

Academic Dishonesty and Plagiarism

All submitted work for the Capstone Project is expected to be the student's own work and must include proper citations. Students must follow the guidelines found in [Section 3.09 of the HMS Master's Student Handbook on Academic Dishonesty and Plagiarism](#).

All project proposals and final reports will be analyzed using the plagiarism detection software, Turnitin. Students will be given access to run their project proposals and final reports through Turnitin for similarity analysis ahead of the assignment due date.

Information on citing correctly and scientific integrity is available here:

- <https://usingsources.fas.harvard.edu/>
- <https://guides.library.harvard.edu/gsd/write/integrity>

Plagiarism, fabrication and/or falsification of research results ordinarily will result in the student's requirement to withdraw, dismissal or expulsion.