

# Master of Biomedical Informatics Capstone

## Project BMI 750

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Harvard Medical School

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Capstone Oversight Mentors: Shira Fischer, MD, PhD, MMSc, Arjun Manrai, PhD*

### 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 match 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 <b>Rebecca Fitzhugh (<a href="mailto:rebecca_fitzhugh@hms.harvard.edu">rebecca_fitzhugh@hms.harvard.edu</a>)</b> , MBI Program Manager.
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### 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 6 academic credits towards the MBI degree upon completion of the capstone project in their final semester in the program.
- 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 189 total hours towards conducting their capstone research project, including the submission of 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.

## 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 up to 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.
- 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 are able to introduce students to potential mentors if no previous relationship exists. They are also available to 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.

#### *Interactions with MBI Program Staff*

- Request suggestions for potential mentors.
- 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 mentor.

#### *Deadlines*

- Traditional MBI + Accelerated MBI Part-time, Class of 2021
  - List of 3-5 potential mentors: **February 13<sup>th</sup>**
  - Final Mentor Selection with contact information: **March 1st**
  - Signed Mentor Agreement form due from mentor: **March 15<sup>th</sup>**

#### **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.

#### *Interactions with Mentor*

- Discuss project idea, identify data sources, and techniques.
- Discuss how to obtain IRB and other approvals required for proposed project.

#### *Interactions with MBI Program Staff*

- 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*

- 48-credit MBI + Accelerated MBI Part-time, Class of 2021: **March 23<sup>rd</sup>**

#### **Step 3. Conduct Research under Guidance of Mentor** (*also see "Progress Report Format" below*)

Students conduct research under the guidance of their mentor and co-mentors. Students and mentors meet regularly to discuss the project. Students produce a final report in the form of a full-length journal article manuscript.

#### *Interactions with Mentor*

- 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 6 weeks for review and approval by the Capstone Oversight Committee
- Agree on a journal that is appropriate for the capstone research.

#### *Interactions with MBI Program Staff*

- Submit progress reports as .pdf or .doc to Canvas approximately every 6 weeks at fixed dates (see below). A progress report has to be submitted at each deadline after the project proposal deadline or the declared start date if that is earlier than the deadline. If you start your capstone at an earlier date than the timeline due date, please confirm your progress report submission schedule with the MBI Program Manager.

#### *Progress Report Deadlines*

- 48-credit MBI + Accelerated MBI Part-time, Class of 2021: **May 1<sup>st</sup>, June 15<sup>th</sup>, and October 1<sup>st</sup>**
- Accelerated MBI, Part-time, Class of 2021: **May 1<sup>st</sup>, June 15<sup>th</sup>, October 1<sup>st</sup>, December 1<sup>st</sup>, January 15<sup>th</sup>, and March 1<sup>st</sup>**

#### **Step 4. Submit Report** (see “Report Format” below)

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.

#### *Interactions with MBI Program Staff*

- Submit report as .pdf or .doc to Canvas
- Receive feedback from Capstone Oversight Committee that needs to be incorporated into the final report.

#### *Deadlines*

- 48-credit MBI, Class of 2021: **November 10<sup>th</sup>**
- Accelerated MBI, Part-time, Class of 2021: **April 9<sup>th</sup>**

#### **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.

#### *Deadlines*

- 48-credit MBI: **December 11, 2020**
- Accelerated MBI part-time: approximately **May 10<sup>th</sup>. Date TBD**

## **Proposal Format**

The student must prepare a capstone proposal that is reviewed and approved by their mentor. The student must submit the mentored-approved capstone proposal to the Program Manager 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.

## Progress Report Format

The student must prepare a capstone progress report approximately every 6 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.

## 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 –**D**igital **A**ccess to **S**cholarship at **H**arvard – 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](https://dash.harvard.edu).

## Changes to Project and/or Mentor

In the event that 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 before the due date of the second progress report. In the event that the change is approved, a new project proposal will need to be submitted for approval. Changing mentors or projects may negatively impact the points earned towards the capstone project.

## Timeline

Dates shown here are the latest possible dates unless stated otherwise by Program Administration. Students may start and complete their capstone projects before the dates shown here with Program approval.

Date	Accelerated MBI	48-credit MBI	Accelerated MBI, part-time	Date
9/3/2019	<b>Fall Term Begins</b>	<b>Fall Term Begins</b>	<b>Fall Term Begins</b>	9/3/2019
9/9/2019	Submit Mentor Shortlist			9/9/2019
10/1/2019	Select Final Mentor			10/1/2019
10/15/2019	<b>Submit Project Proposal</b>			10/15/2019
12/1/2019	Submit Progress Report			12/1/2019
1/15/2020	Submit Progress Report			1/15/2020
1/27/2020	<b>Spring Term Begins</b>	<b>Spring Term Begins</b>	<b>Spring Term Begins</b>	1/27/2020
2/13/2020		Submit Mentor Shortlist	Submit Mentor Shortlist	2/10/2020
3/1/2020	Submit Progress Report	Select Final Mentor	Select Final Mentor	3/1/2020
3/23/2020		<b>Submit Project Proposal</b>	<b>Submit Project Proposal</b>	3/23/2020
4/10/2020	<b>Submit Final Report</b>			4/10/2020
5/1/2020		Submit Progress Report	Submit Progress Report	5/1/2020
5/8/2020	<b>Give Presentation</b>			5/8/2020
6/15/2020		Submit Progress Report	Submit Progress Report	1/15/2020
				6/15/2020
				1/27/2020
		<i>Summer Break</i>	<i>Summer Break</i>	
9/1/2020		<b>Fall Term Begins</b>	<b>Fall Term Begins</b>	9/1/2020
10/1/2020		Submit Progress Report	Submit Progress Report	10/1/2020
11/10/2020		<b>Submit Final Report</b>		11/10/2020
12/1/2020		<b>Give Presentation</b>	Submit Progress Report	12/1/2020
1/15/2021			Submit Progress Report	1/15/2021
1/25/2021			<b>Spring Term Begins</b>	1/25/2021
3/1/2021			Submit Progress Report	3/1/2021
4/9/2021			<b>Submit Final Report</b>	4/9/2021
5/1/2021			<b>Give Presentation</b>	5/1/2021

## Grading and Evaluation

In their final semester of the MBI program, students will enroll in the **course BMI 750 – MBI Capstone Research** for 6 credits. Students can only earn these credits during their final semester. The course **BMI 750 – MBI Capstone Research** is graded as either ‘Satisfactory’ or ‘Unsatisfactory’ and does not count towards the student’s GPA. 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. In order to receive a grade of ‘Satisfactory’ for BMI 750, you must earn at least 160 out of 200 possible points:

Assignment	Content	On Time
Mentor Selection	N/A	10
Proposal	16	20
Progress Report 1	8	10
Progress Report 2	8	10
Progress Report 3	8	10
Final Report	50	30
Final Presentation	20	N/A
<b>Area Total</b>	110	90
<b>Grand Total Possible Points</b>		<b>200</b>
<b>Points needed for 'S' grade</b>		<b>160</b>

**\*For Part-Time Accelerated MBI students, each of the 6 progress reports will be worth 4 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.

### **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 to 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, 4 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 listed 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 before the assignment due date in order to be given an extension (2 business days for progress reports, five business days for mentor selection, project proposal, and final report). For each extension request, the student will lose half of the 'on time' points possible for that assignment. 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 considered to be not meeting expectations.**

### **Not Meeting Expectations**

When a student has lost a total of 20 points between the *on time* and *content* categories, 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. 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 more than 40 points 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 750 – Capstone Research**, 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 BMI 750 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 semester directly following the issue of the 'Incomplete' grade for BMI 750, they will need to then retake BMI 750 and pay the part-time MBI tuition rate to continue with their capstone

project in order 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 4.09 of the HMS Master's Student Handbook on Academic Dishonesty and Plagiarism](#).

**All final reports will be analyzed using the plagiarism detection software, Turnitin. Students will be given access to run their final reports through Turnitin for similarity analysis ahead of the final report 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.***