

HONR 3310: Creating the Future: Transforming Healthcare with Mobile Health (mHealth)
(Section 11 of an Honors Interdisciplinary Seminar)

Fall 2021

Class Location: Forsyth 151
Class Time: Wednesdays 4:35-8:05
Credit Hours: 4 SH
Message Boards: The class Canvas message board (for assignment and team discussions)

Instructor of record: [Stephen Intille](#), Ph.D. (he/him)
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Course catalog description of this course

Proactive healthcare needs innovative, economically feasible solutions that will help people live healthier and higher quality lives. Recent advances in mobile technology are enabling novel approaches to deliver care for people outside of traditional approaches based on clinics and hospitals. Mobile Health (mHealth) and wearable technologies can also be used to gather data to deliver just-in-time interventions to help individuals make better health-related decisions. This course will introduce students to innovative approaches that utilize the principles and applications of this new technology in several areas. Students will first learn how to recognize health problems that would benefit from mHealth solutions and how to identify people who care about addressing those problems (stakeholders). Students will then learn to develop innovative and creative solutions using mHealth technologies, as well as ways to test and evaluate their mHealth applications.

Why should you take this course?

The reason to be in this course is because technology – especially mobile technologies – will eventually allow us to transform our health ‘sickcare’ system into a truly proactive ‘healthcare’ system. In this course we will discuss this future, drawing upon the interdisciplinary backgrounds and experiences of students in the course. We will work together on two fronts:

- We will consider how mobile technology could be used to better understand and change health-related behaviors, by collecting data on ourselves and thinking about how similar “intensive longitudinal data” data could be used at both the individual and group levels to advance science and health.

- We will work together in teams, engaged in a large class project, exploring how to create a unique “Campus Living Lab” at Northeastern, where new ideas in mobile health can be invented, pilot tested, and used to ignite new and exciting research and innovation in health and wellness.

As we do this, we will learn more about the role mobile technologies will play in our future health. You will practice design innovation, creative idea generation, teamwork, presentation, and writing that will help you in all aspects of your future career, regardless of where it may take you.

Our aim is bold: to put forward some new and exciting ideas that might ultimately change the practice of medicine and public health, and to solidify Northeastern’s place in the research and tech communities as a top innovator in public health innovation using mobile technology.

As we embark on this semester together, you will be using mobile technologies to collect data on your own health-related behaviors, and you will be trying to make sense of those data. You will identify one or more interesting questions related to health, wellness, or healthcare that could be explored – using your own data or data of other students and staff at Northeastern. You will develop resources that others can use in the future to learn about themselves in the same way that you do – using mobile technology.

This is a course for self-motivated learners who want their work – even coursework – to have impact!

I am certain when you leave this course you will think differently about your own data, mobile technologies, and the future of healthcare. I hope that this course will also help you in other activities in the future that require creative thinking and “thinking outside the box.” In fact, our goal will be to go one step better: to learn to think without a box!

Why will this course give you a new perspective on healthcare and technology?

Health is something we all care about. Every one of us will get sick at some point. Most of us will develop one or more chronic health conditions. Our loved ones will get sick as well. One of the greatest gifts we can give back to humanity is to find ways to help more people stay healthy and happy for longer periods of their lives. Leveraging the emergence of mobile technology is one way we might do that. These new devices can be worn all the time, collect a huge amount of health-related data, enable exciting new forms of communication, and provide us with information in compelling, interactive ways. We just need to figure out how to use these amazing new capabilities effectively to improve health during the entirety of our lifespans; an even better goal is to use them to not only prevent us from getting sick, but to prevent illness and help us cope with chronic conditions – i.e., to extend our healthspans.

We will focus on both technology and data. We will define health data broadly. We not only have medical record data, but we also have data being acquired from wearable monitors, mobile

phones, assistive aids, social media, smartwatches, environmental measurement devices, home medical devices, fitness devices, and even sensors in our homes, workplaces, and vehicles. What will these data tell us? How can we use them to invent new ways to help us stay healthy?

There are many exciting possibilities for how we use current and future mobile devices and the information they produce. We will be looking towards this future and generating new ideas.

How might this course help you in your career?

The primary goal of this course is to teach you how to think creatively, especially about the future of healthcare. In the process, you will practice basic and critical skills related to ideation, teamwork, communication, writing, and presentation.

You will generate ideas for two related projects, and by the end of the semester you will have worked in teams to create artifacts that will demonstrate the skills mentioned above. This is where I come in. I will do my best to help you develop standout projects that will “wow” not only people at Northeastern, but employers and your family and friends. Further, by the end of the term, you will have crafted materials that will hopefully be used by future students and help ignite a major new health initiative at Northeastern that could play an important role in the future of mobile health.

How will this honors class be different than a typical class?

This class will have an unusual large-team approach. Although you will be broken into smaller sub teams, the goal is for the class to work together – much like a [Skunkworks project](#) or entrepreneurial startup team might – to advance a big idea in health at Northeastern. Students will build upon their individual strengths and skills and learn from each other. There will be relatively little traditional lecture instruction in the course.

This is a truly interdisciplinary course with no specific prerequisites. You will be required to work with students who have very different backgrounds and skills than you. Sometimes topics we discuss may be familiar to you, in which case you should help teach others what you know. Other times, you will be the one being exposed to new ideas, and you will benefit from your classmates’ experiences.

What do you need to know before you take this course?

The most important things to know are:

- Programming experience is *not* required for this course, even though we are dealing with technology and data. However, you will be asked to use mobile apps and collect and analyze some data from those mobile apps. Those with programming experience may use it in the team projects.
- You should have a genuine interest in studying problems in health or wellness using technology and health data. You need a sufficient interest in the topic to have fun doing

additional research and reading on your own, beyond what is assigned, in order to develop outstanding projects.

- You should be enthusiastic about collecting data on yourself and trying to learn from it, and the prospect of helping others to do the same.

What will you be able to do by the end of the course?

You will be able to:

- Identify challenges facing our current healthcare system
- Explain the potential benefits of proactive and preventive mHealth care
- Identify approaches to enable and enhance innovative solutions
- Discuss health data analysis and how it might impact future public health and healthcare
- Determine the applicability of mHealth solutions in various healthcare applications
- Understand some techniques for early-stage design and prototyping of interfaces
- Design mHealth experiments using mHealth platforms or data from them
- Present complex ideas to stakeholders evaluating those ideas in written and oral form

How will the class work?

Most classes will involve the following:

- Assigned readings/videos to be reviewed prior to class.
- A weekly module where you will conduct data collection on yourself throughout the week, using mobile apps, and then reflect upon the data you collected by doing some simple graphing or other data analysis.
- Contribution to a class discussion board reflecting upon the readings and/or the weekly data collection experience (due the day before class, including thoughtfully commenting on the post of a classmate).
- Presentations by students on the topic of the day, which are designed to ignite class-wide discussion.
- Teamwork (both entire class and in subteams) as we work on developing ideas for new data modules and the Campus Living Lab concept.
- In some classes, team presentations followed by discussion, to assist with project development; in some cases additional faculty or NU administrators/stakeholders in the Campus Living Lab concept may be invited to attend and provide feedback.
- Planning, as a startup would do, where the class itself develops ideas for the following week's deliverables from teams.

What materials will I read for class?

This course will require you to do readings and self-data-collection outside of class each week. As part of your projects, you will also need to find and review articles, academic papers, and videos beyond those specifically listed in the syllabus.

Any readings that are not publically available will be posted online in Canvas (there are no textbooks or other materials to purchase).

In addition to other selected videos, articles, and research articles related to weekly topics, readings will be drawn from these inspirational books (you will not regret reading any of them if you want to go beyond the required material):

- **The Creative Destruction of Medicine: How the Digital Revolution will Create Better Health Care** (Topol, Eric J) New York: Basic Books, 2012. Available online through Northeastern ([link](#))
- **The Innovator's Prescription: A Disruptive Solution for Health Care** (Hwang, Jason ; Christensen, Clayton M ; Grossman, Jerome H) New York, N.Y: McGraw-Hill Education, 2016. Available online through Northeastern ([link](#))
- **How We Do Harm: A Doctor Breaks Ranks About Being Sick in America** (Brawley, Otis Webb. ; Goldberg, Paul) New York: St. Martin's Press, 2012. ([Amazon](#))
- **Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again** (Topol, Eric J). New York: Basic Books, 2019. ([Amazon](#))
- **The Power of Habit: Why We Do What We Do in Life and Business** (Duhigg). New York : Random House Trade Paperbacks, 2014. ([Amazon](#))
- **Thinking, Fast and Slow** (Kahneman). New York : Farrar, Straus and Giroux, 2011. ([Amazon](#))

For some mHealth case studies, skimming these materials for relevant articles could prove useful:

- **mHealth in Practice: Mobile Technology for Health Promotion in the Developing World** (Donner, Jonathan, editor. ; Mechael, Patricia, editor.) London: Bloomsbury Academic, 2013. Available online through Northeastern ([link](#))
- **m_Health: Current and Future Applications** (Perego, Paolo, editor. ; Andreoni, Giuseppe, editor. ; Frumento, Enrico, editor) Cham, Switzerland : EAI: Springer, 2019. Available online through Northeastern ([link](#))

Are any additional learning materials required?

You will need to bring your fully-charged laptop to every class.

Will this class be the same as in past semesters?

This course has been taught a few times in the past by Prof. Misha Pavel. I have taken it over for this semester. Some aspects from the past semesters will be kept in place, but our emphasis on personal data collection, modules to teach students about themselves using data, and the Campus Living Lab team project are new.

How will the project work?

If you join this class, you need to think of yourself as joining a Skunkworks project or startup team. We will have amazing talent, and we will need to figure out how to best use our weeks together to ignite some exciting changes at Northeastern. We want to think big, and convince others that our big ideas have merit.

We will work as one big team, with subteams. The subteams will be assigned by me and intentionally chosen so you are working with students with different backgrounds than your own.

Individually, you will do some work generating and presenting ideas, stimulating class discussion with presentation, and reflecting upon the semester in a final paper. In teams, you will work on developing a new data collection module and experiment to help future students learn about mHealth technology. You will also work with a second (different) team to develop one or more components of the Northeastern Campus Living Lab concept. Your team will be tasked with generating ideas for how the living lab might work to advance health, and then developing materials to convince others to join your team in adopting that goal – including campus stakeholders who would need to buy into the idea to make it a reality.

Teams will form after the first few weeks of the semester. At that point, teams will submit a proposal for their planned work. Your team(s) will provide critique back to other teams throughout the semester.

I will meet with your teams both inside and outside of class as the semester goes on.

Your teamwork on the data module will culminate in a new module that will be tested by other students. Your teamwork on the Campus Living Lab concept will culminate in a polished, professional presentation designed to engage potential stakeholders in possibly implementing your ideas in the future, a presentation that will be coordinated with other teams into a master concept pitch.

What are the expectations for the data module project in this class?

The goal of the data module project is to create a module, to be used by other students in the class and beyond, that demonstrates an interesting way to collect health-related personal data or engage in an n-of-1 study, analyze the data that result, and in doing so reflect in an interesting way about behavior and health.

The project will lead to a polished data module -- somewhat more extensive and polished than some of the modules you will use in class. You will need to do something different from the modules used in class, including any developed by your peers.

The project will draw upon your experiences using the eight weeks of modules provided in class, which have exercises that use data on physical activity, sleep, self-reported stress, Netflix use, and more.

Other students in the course will test out your module and revise it as part of their final report.

Specific project goals will be:

- To identify one or more apps that can be used to track the constructs of interest.
- To create an interesting experiment that uses one or more weeks of data that are collected to help a person better understand the person's own behavior (or to make a behavior change).
- To create supplementary instructions and reflection materials, including identifying interesting readings on the topic(s) being explored, that will "hook" students in to want to learn more about the topic of the module.
- To ensure the module can be easily used by other students without assistance.

What are the expectations for the Northeastern Campus Living Lab project in this class?

The goal of this team project is to demonstrate your skills applying the ideas discussed in class, in both written and presentation form.

Overall, your project is expected to show off your creativity and professionalism. The project should also demonstrate that you have thought about how the course readings and discussions relate to your idea.

Specific project goals will be:

- To identify and describe a novel way that the Northeastern Campus Living Lab as envisioned could be used to advance health research or development.
- To demonstrate that you have developed the idea in response to needs of potential stakeholders in the idea at Northeastern.
- To submit a proposal (1–2 pages), that will identify (1) team member(s) and division of labor, (2) the general idea, (3) core important questions to address and how this team's questions are complementary with topics other teams will pursue, and (4) a plan for working together to advance the specific goals of the team. The idea must be complementary to topics other teams are working on.
- To realistically assess the viability of the idea, and to propose ways to overcome barriers you identify.
- To gather information from academic research about the viability of the idea.
- To gather information from interviewing campus stakeholders about the viability of the idea.
- To develop a compelling presentation and report with your team to advance your idea.
- To thoroughly address both the opportunities and challenges raised by the idea. For example, you might reflect on the ethical implications of your proposal. This should address the potential benefits of your idea(s) (to science, healthcare, knowledge, human society, etc.) and whether they outweigh the potential harms. This includes discussing challenges and possible solutions for issues related to privacy and security, but also on

the scientific integrity of proposed study designs, potential unintended consequences of the system(s) proposed, and the human and social context of the ideas proposed, more broadly. For example, what are the potential consequences if your assumptions are wrong? What might happen if data collected are compromised? Or, what might happen if your proposed system or the data that result from it are used in ways you didn't intend? You should consider the ethical implications of each step of the data analysis life-cycle: data collection, study design, data analysis, and the dissemination and application of findings that result from your proposed system.

What are the expectations for the final paper in this class?

Your individual final paper, due at the conclusion of the semester, will reflect upon your experience being in the class, review and make suggestions for improving a data collection module you will test (designed by another team), and present a compelling, well-justified vision for one way the NU Campus Living Lab, as envisioned by the class, could be used for advancing a particular topic of interest to you in public health, wellness, or medicine.

What are the topics covered in each class?

The class will meet once per week in person. I will also ask to meet with teams at least once during the semester during office hours (or a specially-scheduled time).

Readings will be assembled based on the backgrounds and interests of students in the practicum and modified as we go forward in response to the direction that projects take.

The schedule of weekly topics will be forthcoming in Canvas.

How will my performance be assessed?

This has been revised as of 11/10/21 to simplify for the remainder of the semester and reduce assignments.

Your grade will be based on the following assignments and weightings:

Type	Assignment	Percentage
Individual	Idea brainstorming presentations	5%
Individual	Discussion board posts/responses on readings and data collection modules	20% + borderline
Team	Campus Living Lab (CLL) project proposal	5%
Team	Team Paper Prototype and Topic Presentations	10%

Team	CLL project presentation and report (individual grades will be adjusted based on TEAMMATES evaluations)	35%
Individual	Final report (Reflection, your vision for the NU Campus Living Lab)	25%

How will work be assessed?

This is an Honors course, so students will be expected to demonstrate self-initiative, creativity, and attention to detail in all work. Prior experience suggests that work will generally fall into one of four categories:

- Superior, striking, or unexpected pieces of work with excellent effort demonstrating a mastery of the subject matter and a skillful use of concepts and/or materials discussed in class; work robustly and fully implemented; work that shows imagination, elegance of presentation, originality, creativity, and effort.
- Good work demonstrating a capacity to use the subject matter and the ability to handle problems encountered in the course.
- Work that is adequate but that would benefit from increased effort or preparation.

Course work falling into these categories correspond roughly to A, B, and C grades. As this is an honors course, I would expect a high percentage of work will likely fall into the first category.

Reports will be evaluated on clarity, quality of writing, attention to detail, professionalism, and evidence of having done the related reading. Presentations will be expected to be professional, demonstrating good coordination among team members, with clarity, good coverage of the topic, and a compelling presentation of the overall story being conveyed. All work should aim for a “wow!” factor: Is there a deep dive into an interesting question that is thoughtfully examined? Is the quality of the research and argument used to justify the work’s conclusions strong? Does the work take risks and aim high?

Peer Evaluation: Group projects are sometimes viewed as “unfair.” To combat contribution inequity, each team member’s perception of the quantity and quality of work each team member contributed will be assessed against the perceptions of the team member(s). Sometimes this will be done using a system called TEAMMATES recommended by the Center for Advanced Teaching and Learning Through Research at Northeastern. Each team member will submit a report rating the relative contributions of each team member (including her/himself). The aggregate rating for each student will determine the final project grade that individual receives, relative to the group grade. More details on this process will be provided later in the course.

Is class attendance required?

We will be working in teams, and so class attendance is required (but see note about pandemic protocols below). *Prior to* a class, if you cannot make it for some reason, please notify me (as well as your team(s)). Unexplained poor attendance will be reflected in your final grade.

Co-op interviews should be scheduled around class; potential employers should be respectful of your need to attend class. I am happy to talk with them if that is helpful.

Can work be turned in late?

Prior to an assignment due date, you may request an extension with a reasonable explanation. It is at my discretion whether to permit late assignments, and I will typically only do so with advanced notice and a very good reason. If an extension has not been granted, late work will be penalized a half a letter grade per day late.

How will the course be impacted by COVID-19?

As you know, this is a most unusual period of time that requires flexibility.

This course will be entirely in person, unless we receive new guidance from Northeastern during the semester (cross your fingers all goes well!). Students must follow all NU guidelines with respect to attendance and COVID-19 protocols. We will be masked, but otherwise working together and in smaller groups.

Students who are unable to attend class due to illness or required quarantine or isolation should contact me as soon as they know and I will make accommodations.

Due to the likelihood that some students may need to participate remotely at times, everyone, including those in the classroom, must be prepared to be on Zoom if necessary (e.g., to allow a team member to participate in team discussions).

Unfortunately, we cannot eat in class. We will discuss how to deal with the long length of class in the first meeting.

Office hours will be online.

Will class sessions be recorded?

Class sessions and office hours may be recorded for educational purposes, at times. These recordings will be made available only to students enrolled in the course and to any students helping administer the course. However, there is no guarantee class sessions will be recorded.

What should I do if I need a special learning accommodation?

I want everyone in class to feel comfortable learning. If you have a disability you are encouraged to seek accommodations through the University Disability Resource Center. Please

Speak with me privately about your needs for accommodation and recommended strategies to support your success early in the semester. This information will be kept confidential.

What could you do if you have trouble with writing?

I want the reports and other materials you generate to be professional; i.e., ready for you to show a potential employer without any concern. I will expect high-quality writing.

Assignments that involve writing and presentation will be evaluated based on clarity of presentation and professionalism of presentation, as well as intellectual content. If you are having difficulty with writing, consider using the services of the Northeastern University Writing Center (<https://cssh.northeastern.edu/writing/the-writing-center/>).

What are the additional classroom policies?

Actively engaging in verbal exchanges of ideas and concepts will be a major component of learning in this course. This will be stimulated by readings, class discussions and problem solving. You will be expected to actively and positively listen to others and to communicate your ideas during class (both in person and virtually). You will be expected to read course materials prior to class, and you will be called upon at times even when you do not raise your hand. Strong participation does not result from talking a lot, but as a result of critical thinking and succinct articulation of ideas that demonstrate you have done the assigned reading (and thinking!).

If you want to record class lectures, please ask me first (per University policy).

Avoid using cell phones in class, which can prevent you and others from learning. In cases of emergency, please take your phone outside. Similarly, avoid using your laptop computer for anything other than taking notes, working directly on classwork, or virtual interactions.

What are the policies on academic honesty?

You will be expected to demonstrate qualities of academic integrity: a commitment, even in the face of adversity, to five fundamental values: honesty, trust, fairness, respect and responsibility.

You will be expected and encouraged to discuss the topics raised by this course with other students. I will expect, however, that ideas incorporated from an outside source or another student be documented appropriately in write-ups or presentations.

You will be held to the NU Code of Student Conduct (<http://www.northeastern.edu/osccr/code-of-student-conduct/>) and Academic Integrity Policy (<http://www.northeastern.edu/osccr/academic-integrity-policy/>). Acts of academic dishonesty will be referred to the Office of Student Conduct and Conflict Resolution (OSCCR).

Academic honesty is fundamental to the learning process, and I have absolutely **no tolerance** for academic dishonesty. As a reminder,

- You are expected to present as your own only work that is actually yours.
- Purchasing term papers from commercial firms or individuals is a serious violation of University policy. Offenders are subject to disciplinary action (Office of Judicial Affairs). (Undergraduate and Graduate Student Handbook, 2000-2001, p.108)
- As a member of the academic community, if you witness an act of academic dishonesty, you are obligated to report it to the appropriate faculty member or department chair (or equivalent). The charge will be investigated, and if sufficient evidence is presented, the case will be referred to the Northeastern University Student Judicial Hearing Board.
- Plagiarizing includes: representing someone else's work as your own, insufficient acknowledgement, and receiving or giving unauthorized help on choosing a topic, analyzing data, or drawing conclusions. **Using the same paper or portions of a paper for two courses without explicit permission from professors of both courses is also unacceptable.**

If your project has any code that you did not write, you *must* have a citation to the source. A good guideline is that if you take more than three lines of code from some source, you must include the information on where it came from. A URL or a notation (e.g., "MATLAB help files") is fine. Provide a qualitative description of what you used, and what you changed/contributed.

Any student found cheating on assignments will receive a zero on that assignment and be reported to the administration of the student's college and OSCCR. A second offense will result in a failing grade for the course. If the student is on a team and the assignment is a team assignment, then all students on the team will receive a zero and be reported to the administration of each student's college and OSCCR.

If you ever have questions about what is acceptable or unacceptable collaboration on assignments, please ask me for clarification!

What is Title IX?

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here: [Northeastern and Title IX](#).

Why will I be asked to evaluate this course?

I may distribute optional mid-term and final course evaluations, to be returned anonymously. Responses to the questions help me to improve this course for you, during the current

semester, and for future students. I modify courses every time I teach them based on the most recent student feedback I receive.

You will also be strongly encouraged to use the TRACE (Teacher Rating and Course Evaluation) system near the end of the course to evaluate this course. A reminder about TRACE should arrive via email about two weeks before the end of the course. Your constructive feedback will help me and other instructors improve the course in the future.

I want this course to be a great experience for you

Please don't hesitate to reach out if there are ways I can make the course more effective during the term. I welcome your feedback, and I very much look forward to teaching you and learning from you!