

**SI/HBHE 684: Prototyping and Evaluation of  
Consumer Health Technologies  
Fall 2024  
Mondays 1pm-4pm DENT G378**

## Instructor

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## GSI

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## Course Overview

Designing effective digital health technologies requires a deep understanding of the needs of the population they are intended to support, knowledge of psychosocial theories that inform the design of effective intervention components, and the use of evaluations that can help the designers progressively refine and optimize the design, both for user experience and for effectiveness. This course focuses on the design processes, theories, and evaluation methods that can help you construct and iteratively test high-quality consumer health technologies, with the specific focus on behavior-change technologies. The course covers techniques for constructing causal diagrams that can inform selection of likely effective components, prototyping approaches (low and medium-fidelity prototyping, wizard of oz prototyping), psychological theories and constructs with direct applicability to consumer health technologies (e.g., goal-setting, behavioral economics, dual process models, operant conditioning), and evaluation techniques (e.g., single-case designs, micro-randomized trials) that can be used to formatively evaluate and optimize consumer-health technologies.

## Learning Objectives

In this course, you’ll learn...

- To construct graphical representations—causal pathway diagrams—of how you believe the

system you are designing is going to work to support the target health behavior

- To construct a range of interactive prototypes (low-fi, and medium-fi, wizard of Oz) of behavior change technologies for iterative testing
- To use off-the-shelf tools to quickly create fully-functional prototypes of design ideas that you want to evaluate in the real-world
- Concepts from behavioral economics, social psychology, and behavior analysis that have direct applicability to the development of intervention components of consumer-health systems
- To think about health technology development in terms of continuous optimization based on explicit optimization criteria, and to use this perspective to guide technology evaluation
- Evaluation methods that you can use to generate empirical data that can inform design decisions about intervention timing and contexts in which interventions should be provided

## Class Schedule

### 8/26 (Week 1): Course introduction

Introduction to the course; thinking of health apps as “interventions;” tensions in the design of consumer-health technologies; value of rapid prototyping, roles of evaluation in the design of health technologies.

### 9/2: Labor day—no class

### 9/9 (Week 2): How do you think your intervention will work? Conceptualizing how and why health technologies may (or may not!) bring about change

- Michie, S., & Johnston, M. (2014). Theories and techniques of behaviour change: Developing a cumulative science of behaviour change. *Health Psychology Review*, 6(1), 1-6.
- Abraham, C., & Michie, S. (2008). A taxonomy of behavior change techniques used in interventions. *Health Psychol*, 27(3), 379-87. [you can skim the paper. Mostly pay attention to the table that lists the actual behavior-change techniques that were identified.]
- Klasnja, P., Meza, R., Pullmann, M.D., Mettert, K.D., Hawkes, R., Pallazzo, L., Weiner, B., Lewis, C.C. (2024). Getting Cozy with Causality: Advances to the causal pathway diagramming method to enhance implementation precision. *Implementation Research & Practice*, 5, 1-14.
- The OPTICC Center. (2023). Causal Pathway Diagramming Toolkit. Pages 1-29.

### 9/16 (Week 3): Self-monitoring and self-tracking

- Korotitsch, W. J., & Nelson-Gray, R. O. (1999). An overview of self-monitoring research in assessment and treatment. *Psychological Assessment*, 11(4), 415-425.
- Nelson, R. O., & Hayes, S. C. (1981). Theoretical explanations for reactivity in self-monitoring. *Behavior Modification*, 5(1), 3-14.
- Kazdin, A. E. (1974). Reactive self-monitoring: The effects of response desirability, goal setting, and feedback. *Journal of Consulting and Clinical Psychology*, 42, 704-716.
- Li, I., Dey, A. K., & Forlizzi, J. (2011). Understanding my data, myself: supporting self-reflection

with ubicomp technologies. In Proceedings of the 13th international conference on Ubiquitous computing (pp. 405-414). ACM.

#### **9/23 (Week 4): Self-experimentation, Wizard of Oz prototyping, and using off-the-shelf tools to prototype functional interventions**

- Roberts, S. (2004). Self-experimentation as a source of new ideas: Ten examples about sleep, mood, health, and weight. *Behavioral and brain sciences*, 27(2), 227-288. (read the main article, pp. 227-261).
- schraefel, m. c., Muresan, G. C., & Hekler, E. (2021). Experiment in a Box (XB): An Interactive Technology Framework for Sustainable Health Practices. *Frontiers in Computer Science*, 3, 47. <https://doi.org/10.3389/fcomp.2021.661890>
- Bernsen, N. O., Dybkjær, H., & Dybkjær, L. (1994). Wizard of oz prototyping: How and when. *Proc. CCI Working Papers Cognit. Sci./HCI*, Roskilde, Denmark.

Review the following tools:

- <https://careevolution.com/mydatahelps/>
- <https://www.textmagic.com>
- <https://ifttt.com>

#### **9/30 (Week 5): Using empirical evaluations as part of design; single-case experiments**

- Consolvo, S., Bentley, F., & Hekler, E. B. (2017). *Mobile User Research: A Practical Guide*. Williston, VT: Morgan & Claypool Publisher. Chapter on experimental designs: pp. 101-132.
- Dallery, J., Cassidy, R. N., & Raiff, B. R. (2013). Single-Case Experimental Designs to Evaluate Novel Technology-Based Health Interventions. *Journal of Medical Internet Research*, 15, e22. <https://doi.org/10.2196/jmir.2227>
- Dallery, J., & Raiff, B. R. (2014). Optimizing behavioral health interventions with single-case designs: from development to dissemination. *Transl Behav Med*, 4(3), 290–303.

#### **10/7 (Week 6): Behavioral economics: Framing, temporal discounting, defaults**

- Simpson, C. A., & Vuchinich, R. E. (2000). Temporal changes in the value of objects of choice: Discounting, behavior patterns, and health behavior. In W. K. Bickel & R. E. Vuchinich (Eds.), *Reframing health behavior change with behavioral economics* (pp. 193-215). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, 121(1), 3. Retrieved from Google Scholar.
- Lee, M. K., Kiesler, S., & Forlizzi, J. (2011). Mining behavioral economics to design persuasive technology for healthy choices. In *CHI '11: Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 325-334). ACM.
- Choe, E.K., Lee, B., Munson, S.A., Pratt, W., Kientz, J.A. (2013). Persuasive Performance Feedback: The Effect of Framing on Self-Efficacy. In the Proceedings of the American Medical Informatics Association (AMIA '13).

## 10/14: Fall break—no class

## 10/21 (Week 7): Low-fidelity prototypes + goal-setting

### Low-fi prototyping:

- Moggridge, B. (2007) "Prototypes." In *Designing Interactions*. Cambridge, MA: The M.I.T. Press, pp. 682-723.
- Greenberg et al. (2012). *Sketching User Experiences: The Workbook*. Waltham, MA: Morgan-Kaufman. Read Section 3.7: Sketching with Office Supplies & Section 3.8: Templates.
- Rettig, M. (1994). Prototyping for tiny fingers. *Communications of the ACM*, 37(4), 21-27.

### Goal-setting:

- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, 57(9), 705-717.
- Strecher, V. J., Seijts, G. H., Kok, G. J., Latham, G. P., Glasgow, R., DeVellis, B., . . . Bulger, D. W. (1995). Goal setting as a strategy for health behavior change. *Health Education & Behavior*, 22(2), 190-200.

## 10/28 (Week 8): Associative and operant learning

- Hanley, G.P. & Tiger, J.H. (2011). Differential reinforcement procedures. In Fisher, W. W., Piazza, C. C., & Roane, H. S. (Eds.), *Handbook of applied behavior analysis*. Guilford Press.
- Hofmann, W., De Houwer, J., Perugini, M., Baeyens, F., & Crombez, G. (2010). Evaluative conditioning in humans: A meta-analysis. *Psychological Bulletin*, 136(3), 390.
- Antoniewicz, F., & Brand, R. (2016). Learning to like exercising: Evaluative conditioning changes automatic evaluations of exercising and influences subsequent exercising behavior. *Journal of Sport and Exercise Psychology*, 38(2), 138–148. <https://doi.org/10.1123/jsep.2015-0125>

## 11/4 (Week 9): Dual process models and automatic self-regulation

- Fitzsimons, G. M., & Bargh, J. A. (2004). Automatic self-regulation. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 151-170). New York: The Guilford Press.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, 54(7), 493-503.
- Sheeran, P., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 32(5), 460-73.
- Wood, W., Mazar, A., & Neal, D. T. (2022). Habits and Goals in Human Behavior: Separate but Interacting Systems. *Perspectives on Psychological Science*, 17(2), 590–605. <https://doi.org/10.1177/1745691621994226>

## 11/11 (Week 10): Intervention optimization and experimental designs for optimizing interventions

- Collins, L. M. (2018). *Optimization of behavioral, biobehavioral, and biomedical Interventions: The multiphase optimization strategy (MOST)*. New York: Springer. Chapter 1.
- Collins, L. M., Trail, J. B., Kugler, K. C., Baker, T. B., Piper, M. E., & Mermelstein, R. J. (2014). Evaluating individual intervention components: making decisions based on the results of a factorial screening experiment. *Translational Behavioral Medicine*, 4(3), 238–251.
- Klasnja, P., Hekler, E. B., Shiffman, S., Boruvka, A., Almirall, D., Tewari, A., & Murphy, S. A. (2015). Microrandomized trials: An experimental design for developing just-in-time adaptive interventions. *Health Psychol*, 34 Suppl, 1220–1228. <https://doi.org/10.1037/hea0000305>

### **11/18 (Week 11): Medium-fidelity prototyping + social support**

#### Medium-fi prototyping:

- Rudd, J., Stern, K., & Isensee, S. (1996). Low vs. High-fidelity prototyping debate. *Interactions*, 3(1), 76-85.
- Dow, S.P., Heddleston, K., Klemmer, S.R. The Efficacy of Prototyping Under Time Constraints. *Creativity & Cognition*, 2009

#### Social support:

- Schwarzer, R., & Leppin, A. (1991). Social support and health: A theoretical and empirical overview. *Journal of Social and Personal Relationships*, 8(1), 99-127.

### **11/25 (Week 12): Self-determination theory, emotion, and health behaviors**

- Ryan, R. M., & Deci, E. L. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, 11.
- Brand, R., & Ekkekakis, P. (2018). Affective–Reflective Theory of physical inactivity and exercise. *German Journal of Exercise and Sport Research*, 48(1), 48–58. <https://doi.org/10.1007/s12662-017-0477-9>
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A Test of Self-Determination Theory in the Exercise Domain. *Journal of Applied Social Psychology*, 36(9), 2240–2265. <https://doi.org/10.1111/j.0021-9029.2006.00102.x>

### **12/2 (Week 13): Identity and health behaviors; Project presentations Pt. 1**

- Oyserman, D., Lewis, N. A., Yan, V. X., Fisher, O., O'Donnell, S. C., & Horowitz, E. (2017). An Identity-Based Motivation Framework for Self-Regulation. *Psychological Inquiry*, 28(2–3), 139–147. <https://doi.org/10.1080/1047840X.2017.1337406>
- Oyserman, D., Fryberg, S. A., & Yoder, N. (2007). Identity-based motivation and health. *Journal of Personality and Social Psychology*, 93(6), 1011–1027. <https://doi.org/10.1037/0022-3514.93.6.1011>

### **12/9 (Week 14): Project presentations Pt. 2**

# Materials

## Readings

No textbook is required for this class. Course readings will be posted as PDFs on Canvas.

## In-Class Sketching

This course includes a fair bit of group-based, in-class design work. Often, the most efficient way to do this is by sketching on paper. If you prefer, though, you are welcome to use digital tools for this as well. Any prototyping tool you are familiar with will work—Figma, XD, etc. There are other options as well—like [Miro](#) and [Microsoft Whiteboard](#)—so feel free to go with whatever you are familiar with and can use efficiently.

## Low- and Medium-Fidelity Prototyping

**Low-fi prototypes:** Typically, you would create low-fidelity prototypes of your design projects using really low-tech tools like post-it notes, tape, and scissors. However, you are welcome to use a digital prototyping tool, if you prefer. The key thing to remember is that the low-fidelity prototypes should be low-fidelity—you are trying to just communicate concepts and user flow at this stage, not make it beautiful. One digital prototyping tool that enforces this emphasis on low fidelity is [Balsamiq](#), but if you already know a wireframing tool like Sketch or Figma, feel free to use it but stick with *really simple* wireframes, so that the feedback you get when you test your low-fi prototype is about the functionality, rather than the visual presentation.

**Medium-fi prototypes:** For the final, medium-fidelity prototype, you have many options, from online tools like Figma Adobe XD, to a simple slide-based solution like Keynotopia.

## Assignments

Your work for this course will involve three types of assignments:

- Weekly reading reflections
- [Individual](#) self-experimentation project
- [Group](#) design project

Each of these is described below:

### Weekly Reading Reflections

This course involves a fair bit of reading, likely more than you have had in some of the other classes you have taken at UMSI. The purpose of the readings is to ground you in the behavioral-science literature that is a foundation for many of the intervention components that are present in health technologies. To be able to analyze digital health technologies and design effective intervention components for such

technologies, you need to understand what these components are intended to do and how they are intended to work. Reading the theoretical and empirical literature on which these features are based is the most direct way to get a sufficiently deep understanding of the psychological processes that will need to be activated by health technologies if those technologies have any hope of being effective for support people's health practices.

To help you reflect on the material you are reading, and to maximize the likelihood that we have useful, informed discussions of these ideas in class, most weeks (10 out of 12 weeks) you will need to submit a short, 1 to 2 paragraph write-up about one or more readings for that week. These write-ups are not intended to be summaries of the readings but your reactions to them—things like the following:

- What was the most interesting thing you found in the readings this week?
- What surprised you in what you read?
- Anything you read that you disagree with, and if so, why?
- Anything you read that matches your own experiences?
- Etc.

These are just some possible options. You are welcome to write about anything that a reading (or several) has brought up for you, as long as it's grounded in the reading itself.

The basic rules for the reading reflections:

- Keep it short. One to two paragraphs max.
- Connect your ideas to one or more points from the readings. The purpose of this is to help you better understand what you are reading. Try to engage with the ideas in a substantive way.
- A deeper engagement on a single idea (e.g., a paragraph where you try to flesh out your thoughts on a single idea from a reading) is preferable to superficial engagement with multiple ideas.

### Grading for reading reflections

We have 12 weeks of readings this semester. To get full credit for your reading reflections, you will need to submit a reading reflection for 10 out of those 12 weeks. This means that you can choose not to write a reflection for two class sessions and still earn the maximum of 20 reading-reflection points. This gives you some flexibility to skip this work during weeks when you have a lot of other assignments.

**Reading reflections are due at midnight the night before class (i.e., at midnight on Sunday).** Having the reflections be due the night before the class gives us an opportunity to look through them before class so we can engage with some of the ideas that were brought up in these write-ups.

Reading reflections will be graded on a simple scale:

- 0 if no reflection was turned in
- 1 if the reflection was clearly completely perfunctory (e.g., one or two sentences, or no attempt to actually engage with the reading material)
- 2 for any kind of reasonable response

## Self-Experimentation Project

To sensitize yourself to the process of behavior change, over the course of the semester you will work on a self-experimentation project. **This is an individual project that each student will do for themselves.**

As a starting point, pick a behavior that you would like to change. This can be a health behavior, but it does not have to be. You may decide you want to be more physically active, or cut down how much processed food you eat, but you also may decide you want to reduce how much you watch YouTube or increase focused study time. What behavior you choose is up to you, but it should be something that you care enough about to spend time during the semester trying to understand it more deeply and to find ways to change it. Once you pick a behavior, you will do the following:

- **Tracking and understanding.** Spend two to four weeks just trying to understand your behavior better. You can do this in various ways, from just journaling about it to using an app or a spreadsheet to track the behavior in detail. The purpose of this initial period is to better understand the *dynamics of the behavior* (when it occurs, how often, how much variation there is in its occurrence), and the *factors that may be influencing it* (e.g., are you more likely to watch YouTube when you are tired or when you are procrastinating on an assignment?). At the end of your self-tracking period you will write 1 to 2 pages that describe what behavior you chose and why, how you tracked it, and what you learned about its dynamics and what may be influencing it.
- **Coming up with an intervention.** Once you have a good understanding of the behavior you were tracking, you will need to come up with one—yes, just one—intervention that you think may be effective, *for you*, to change this behavior, given what you learned and the constraints of your own life. You should start this process by coming up with multiple ideas for interventions, creating causal diagrams for them, and working through the tradeoffs of different options until you find an intervention that you think is (1) feasible to do, (2) may plausibly help you change the behavior, and (3) you can test. You will turn in a short write-up (1 to 2 pages) describing the intervention, along with a causal diagram that shows how you think it would function to change the behavior.
- **Prototyping the intervention.** Once you have your intervention idea, you will need to create a fully functional prototype of this intervention. The prototype can use just off-the-shelf tools (e.g., MyDataHelps or TextMagic, or even low-tech tools like post-it notes!), or you may want to build something yourself, but it should actually work, in the sense that you should be able to try it in your life and see if it is effective for you. Clearly, being able to create a functional prototype will be an important constraint in choosing which intervention you settle on.

One note about this: In general, the intervention you choose should not be a complex, commercial app like Fitbit or MyFitnessPal. The reason for this is that typically such systems include many different intervention components, and it is hard (although not impossible) to figure out exactly which aspect of the system is having an impact (or not). What you should be aiming for, instead, is to come up with an intervention idea for which you can postulate a clear causal mechanism, and which you can evaluate—ideally both for effectiveness and for whether

your causal hypothesis is correct—with the study that you design. This will all become clearer as we go through the semester.

- **Testing the intervention.** Finally, once you create a prototype, you will run a study (an N-of-1 experiment) that will give you initial evidence about whether this intervention is effective for you. Thinking through what kind of study to run, for how long, and what to measure, will be a key piece of this. Likely, you will need to run the study for at least two weeks, but the duration will depend on the behavior you are trying to change, your intervention, and the experimental design you decide to use. After you run the study, you will write up what you did: how you prototyped your intervention, what kind of study you ran, and what you learned. The write-up doesn't need to be long (4-ish pages is fine), but should describe concisely what you did, what you found, and what conclusions you drew from these findings.

### Project Deliverables and Due Dates

**Self-experimentation deliverables are due at 12pm (noon) on the following Mondays:**

- **Due 9/23:** Write-up of your self-tracking results (1 to 2 pages).
- **Due 10/7:** Write-up of your intervention idea along with a casual diagram (1 to 2 pages).
- **Due 11/11:** Write-up of the self-experiment (4 to 5 pages).

### Group Design Project

The main assignment in this course is a group design project that you will develop over the course of the semester from an initial formulation of the health problem your system is intended to solve, to a medium-fidelity prototype of a consumer-health technology that addresses that problem. The core of the project will be a set of features intended to support health behavior change that are based on at least two theories from behavioral science. You are free to choose which theories you want to use and can go beyond the theories we are covering in the class.

**Group size:** Optimal group size is 3 to 4 people. The maximum group size is 5.

**Design Problem:** More than a third of the population in the U.S. is now clinically obese, and chronic conditions—diabetes, coronary heart disease, depression, anxiety, etc.—account for more than two-thirds of all healthcare expenditures. Behavioral and lifestyle factors, such as physical inactivity, poor diets, stress, smoking, lack of regular sleep, and poor medication adherence are significant contributors to these conditions.

For your class project, select a behavior that, if adopted (for health-promoting behaviors) or reduced/stopped (for health-damaging behaviors), could positively affect one or more health conditions. Choose a population you want to support for this behavior, and then develop a prototype of a consumer-health application that can help members of the population you want to support to adopt (or reduce/quit, as appropriate)—and/or successfully maintain—your target health behavior.

Most health behaviors can be supported in many different ways. For instance, one can promote physical

activity by helping individuals track how active they are being and set specific goals for how active they want to be the following week, by giving rewards for successful goal-attainment and progress, by staging competitions with friends and family members, by providing better access to gyms or sidewalks, and so on. Many of these strategies are based on constructs that have been developed and studied in behavioral science. **For your project, you will need to select at least two theoretical constructs** that you will use as a base for designing features of your system that will help your users to adopt a healthier lifestyle.

**Scoping:** A big part of working on your project will involve deciding precisely what and how much you want to prototype. One way to think about scoping is in terms of the number of steps or interactions that your system will support. Think about the process of shopping on Amazon. You first search, then the results page appears, then you click on a result to see the details for that item, then you add the item to cart, then you click to check out, etc. Each of these steps--entering a search term, clicking on a result on a page with a list of results, adding an item to cart--is an interaction. Some of these interactions happen on the same page (e.g., adding to the cart and clicking the Check Out button both happen on the item details page), while other interactions move the user to a new page (clicking on an item in the results list open the page with the detailed information for that item).

You should aim to prototype at least **25 to 30 user interactions** (steps through the system) that take place across at least **10 to 15 panels** (e.g., web pages, screens of a mobile application). Most of the panels should be unique.

**Final note:** this course focuses on *interaction design*, which means that we are primarily considering user-facing (front-end) aspects of consumer-health technologies: design of web sites, mobile apps, applications running on a smartwatch or a public display, etc. Many interesting problems in consumer health informatics involve sensing users' activities, using machine learning to understand patterns in their health metrics, and other such processes which can have user-facing outcomes but which are not user-facing themselves. For your projects, you can assume that you could make such under-the-hood pieces work. Your focus, however, should be on figuring out the user-facing components of the application that you decide to design. For a project to be a good project for this class, these user-facing pieces need to be rich enough and interesting enough that you can work on them throughout the semester.

### Project Deliverables and Due Dates

To keep you on track with your projects, you will need to turn in several deliverables throughout the term. **All group project deliverables will be due at 12pm (noon) on the following Mondays:**

- **Due 9/30:** Problem statement: A description of the health problem you are going to be addressing, your target population, the behavior you are trying to change, and your initial ideas about how you might go about changing this behavior.
- **Due 10/21:** Causal diagrams for your initial intervention idea.

- **Due 11/4:** Lo-fidelity prototype v.1. Bring initial wireframes of your prototype to class for peer feedback.
- **Due 11/18:** Lo-fidelity prototype v.2: Bring revised wireframes of your prototype to class for peer feedback.
- **Due 12/9:** Medium-fidelity prototype and final write-up.

The details of the process deliverables are listed below:

- *Problem statement for the project:* Submit a 2-page design problem for your projects. Describe what population and health condition you plan to target and what behavior you will be focusing on. Use the literature to justify why this behavior is important for managing the health problem you are focusing on, and to provide rationale for your initial ideas about what would count as success. When you are defining the behavior, try to be as specific as possible. For example, if you want to support physical activity, are you thinking of focusing on incidental activity built into daily life (e.g., walking to work or a grocery store) or on structured exercise? What would constitute success for your intervention? Some percentage of improvement? Reaching the level of a clinical guideline? If so, which one? For instance, for older adults the guideline levels of physical activity are lower than they are for adults and kids. And so on. Provide as much rationale for your early choices and working assumptions as you can. To do a good job with the problem statement, you will need to search for the scientific literature that can provide evidence for the importance of the problem you identified and ground the success criteria that your solution will aim to meet (e.g., the public health guidelines for how much physical activity one should try to get each week).
- *Causal diagrams:* An important step in figuring out how an intervention should work is articulating what “active ingredients” it contains and how you expect them to function. Submit a diagram that shows hypothesized causal functioning (i.e., how you think it would work) for at least 3 intervention components you are considering, and, where appropriate, identify the preconditions for their effectiveness, what moderators might influence whether each component is effective or not, and the various outcomes (proximal and more distal) that the component is intended to produce. The meaning of these terms will become clear in the first few weeks of the class.
- *Lo-fidelity prototype, version 1:* Using sketching or a prototyping tool of your choice, create an interactive low-fidelity prototype of your group project. Prototype as many features of your system as you can. Prioritize completeness over polish. The purpose of the prototype is to get substantive feedback on your design ideas, so your goal should be to get feedback on as many aspects of your system as you can—which means that you should try to make the prototype as complete as possible. For the Canvas assignment, upload a link to a **video** of the prototype to Canvas (and make sure the link is publicly accessible!), showing how the user would use the system and explaining how different features are intended to work. You will be testing your prototype with other students during the class.
- *Lo-fidelity prototype, version 2:* Based on the feedback on the first version of your prototype, and your evolving understanding about the project, create a revised low-fidelity prototype of your system. For the Canvas assignment, turn in link to a video of how the prototype works. We

will do another round of prototype testing in class.

- *The medium-fidelity prototype.* Based on the feedback you received on your lo-fi prototypes, make any needed changes to the design of your project. Then, using a wireframing tool like Figma, Adobe XD, or similar, create an interactive prototype of your system. This prototype needs to be reasonably polished, with graphics, layout, etc. all at a level that could be presented to a client. The prototype should also “work” in the sense that you should be able to click through it (in the software’s presentation mode) to see how the various parts of the prototype are tied to each other to enable the system’s functionality.

### **Final deliverables and presentation**

The final prototype and the write-up are due at **12pm on Monday, December 9th**. Presentations are (obviously) due in class the week you want to present. There is nothing you need to turn in in Canvas for the presentation assignment.

Late submissions will have points deducted. If you aren’t able to meet this deadline and you have special circumstances, please contact me by December 2nd to discuss.

*Final Medium Fidelity Prototype:* Upload the [public link](#) to your prototype and to a video of the walkthrough of your prototype to Canvas. Make sure that the links are publicly accessible (i.e., that they don’t require an account on the platform to access).

*Final Write-up:* Your write-up should be 5 to 10 pages single-spaced with sketches and screen shots as appendices. Please don’t feel the need to add as many screenshots as you possibly can. Select the ones that convey useful information. Focus on quality and polish as if you were delivering it to a client. Suggested outline for write-up (you’ll note that a big part of this is a combination of pieces you have already written—you can just revise those, as needed, to account for any changes in ideas and/or design that occurred since you first submitted these assignments) :

1. Problem statement.
2. Overview of your solution (a high-level description of your solution, key aspects of the design rationale)
3. Describe the final design
  - Describe the functionality (i.e., what you can do with it)
  - Provide a description of the main parts of the design flow. This is important because it will provide you with a record of how the design worked or was intended to work, long after the implementation no longer works. It could in principle also act as a deliverable to hand off to an implementer.
  - What was left unimplemented?
4. For each of the key behavior-change features, describe the following:
  - a. the theoretical constructs on which the feature is based
  - b. the alternative designs you considered for this feature
  - c. tradeoffs of these different alternatives and how and why you decided to go with the option you implemented.

5. Going forward: If you were to really develop this app, how would you change it and what would you want to add to it and why.

### **Presentation details**

Presentation length: **5 minutes** followed by 2 minutes of questions. This length will need to be followed to ensure that everyone gets a chance to present their project and that we finish the class on time.

Presentation content: The main purpose of the presentation is to showcase to the class what you have been working on this term. To do this effectively in such a brief time, I'd suggest something like the following structure:

- A brief description of what problem you tried to solve in your project and why this problem is important.
- A high-level overview of your solution. (e.g., "we created a prototype for a mobile-phone application that enables users to do X, Y, and Z.")
- A walkthrough of the key features of the application. You can do this with screenshots in your slides, or you can create a video that walks the audience through these features. Please don't try to do a live demo! Script what you want us to see and then either video-record it or practice to do the walkthrough effectively with slides.
- The design rationale for the key design decisions you had to make during the project. This is to give us a flavor of the kind of thinking that went into the project.

The above is a suggested format, but this format is not required. If you decide you can give an effective introduction to your project using a different format, go for it. Feel free to do whatever you think will give your peers and me a good understanding of what you did and how you thought about your project.

## Grading

Here is how grades will work in this class:

- Reading reflections: 20 points
  - 2 points per reflection for 10 reading reflections
- Group design project: 48 points
  - Problem statement: 8 points
  - Causal diagrams: 7
  - lo-fidelity prototypes: 10 points
    - Lo-fi prototype 1: 5 points
    - Lo-fi prototype 2: 5 points
  - digital prototype and final write-up: 23 points
    - prototype: 13 points
    - write-up: 10 points
- Self-experiment: 32 points
  - Write-up of your self-tracking findings: 10 points

- Description of your intervention idea, including a causal diagram: 10 points
- Write-up of the self-experiment and findings: 12 points

Final Grades will be assigned according to the following scale:

A+	98-100%
A	93-97%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-77%
C-	70-72%
D	60-69%
F	below 60%

## Attendance

This class does not have a formal attendance policy but In-class activities rely on you being in class. I understand that the continued spread of COVID-19 may make this tricky for some of you or some of the time. To deal with this, all course sessions will be recorded, so you can watch them when you can. Clearly, though, we will not be able to recreate participation in in-class design exercises asynchronously, unless you decide to do them on your own when you are watching the video.

## Academic Integrity

Unless otherwise specified in an assignment all submitted work must be your own, original work. Any excerpts, statements, or phrases from the work of others must be clearly identified as a quotation, and a proper citation provided. Any violation of the School's policy on Academic and Professional Integrity (stated in the Master's and Doctoral Student Handbooks) will result in serious penalties, which might range from failing an assignment, to failing a course, to being expelled from the program. Violations of academic and professional integrity will be reported to UMSI Student Affairs. Consequences impacting assignment or course grades are determined by the faculty instructor; additional sanctions may be imposed by the assistant dean for academic and student affairs.

## Disability Statement

The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact [Services for Students with Disabilities](https://ssd.umich.edu/) <https://ssd.umich.edu/>; 734-763-3000 or [ssdoffice@umich.edu](mailto:ssdoffice@umich.edu)). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions

or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience. The instructional team will treat any information that you provide in as confidential a manner as possible.

## Student Mental Health and Wellbeing

Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers the following resources:

- [Counseling and Psychological Services \(CAPS\)](#) - confidential; 734-764-8312; for after-hours urgent support, call and press 0; counseling, workshops, groups and more. Ashley Evearitt, a CAPS counselor is embedded in UMSI, information about how to schedule an appointment with her can be found [here](#).
- [Dean of Students Office](#) - 734-764-7420; provides support services to students and manages critical incidents impacting students and the campus community
- [Ginsberg Center for Community Service Learning](#) - 734-763-3548; opportunities to engage as learners and leaders to create a better community and world
- [Maize and Blue Cupboard \(MBC\)](#) - 734-936-2794; Food pantry with groceries, kitchen and cooking supplies, personal and household items, and support
- [Multi-ethnic Student Affairs \(MESA\)](#) - 734-763-9044; diversity and social justice through the lens of race and ethnicity
- [Office of Student Conflict Resolution](#) - 734-936-6308; offers multiple pathways for resolving conflict
- [Office of the Ombuds](#) - 734-763-3545; students can raise questions and concerns about the functioning of the university.
- [Services for Students with Disabilities \(SSD\)](#) - 734-763-3000; accommodations and access to students with disabilities
- [SilverCloud](#) - Students may also use an online, self-guided, interactive mental health resource that provides cognitive behavioral interventions.
- [Sexual Assault Prevention and Awareness Center \(SAPAC\)](#) - confidential; 734-764-7771 or 24-hour crisis line 734-936-3333; addresses sexual assault, intimate partner violence, sexual harassment, and stalking
- [Spectrum Center](#) - 734-763-4186; support services for LGBTQ+ students
- [Trotter Multicultural Center](#) - 734-763-3670; intercultural engagement and inclusive leadership education initiatives
- [University Health Service \(UHS\)](#) - 734-764-8320; clinical services include nurse advice by phone, day or night

- [Well-being for U-M Students website](#) - searchable list of many more campus resources
- [Wolverine Wellness](#) - 734-763-1320; provides Wellness Coaching, Collegiate Recovery Program, and much more

## Audio and Video Recording

### Class Recordings

We will be doing audio and video recording of all sessions to enable those who cannot attend class in person on a given day to access the content. These recordings will not be made available publicly. Recordings of all sessions will be available on Canvas only to students registered for this class. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact the professor during the first week of class to discuss alternative arrangements. The camera only picks up the front of the room (instructor and slides), but this may require you, if you don't want to be accidentally recorded, to sit in a particular place in the room, outside the cameras' view. The instructor's microphone records audio in the room; however, our classroom does not have a ceiling mike that picks up student voices. Students may not copy and share the lecture videos with those not in the class, or upload them to any other online environment (this is a violation of the Federal Education Rights and Privacy Act (FERPA)).

### Personal recordings are prohibited except with permission

Students are prohibited from recording/distributing any class activity without written permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.