



Vietnam National University of HCMC
International University
School of Computer Science and Engineering



UI/UX Design & Evaluation

★ Introduction ★

Dr Vi Chi Thanh - vcthanh@hcmiu.edu.vn

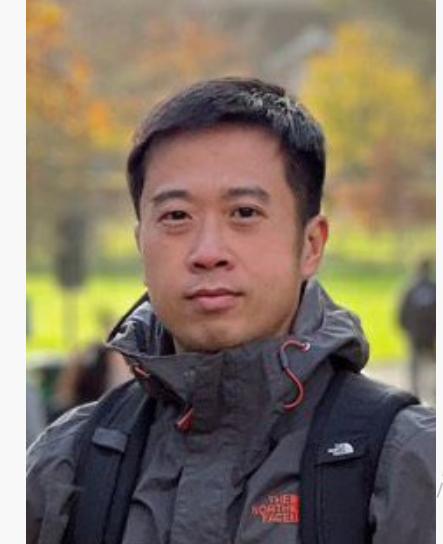
<https://vichithanh.github.io>



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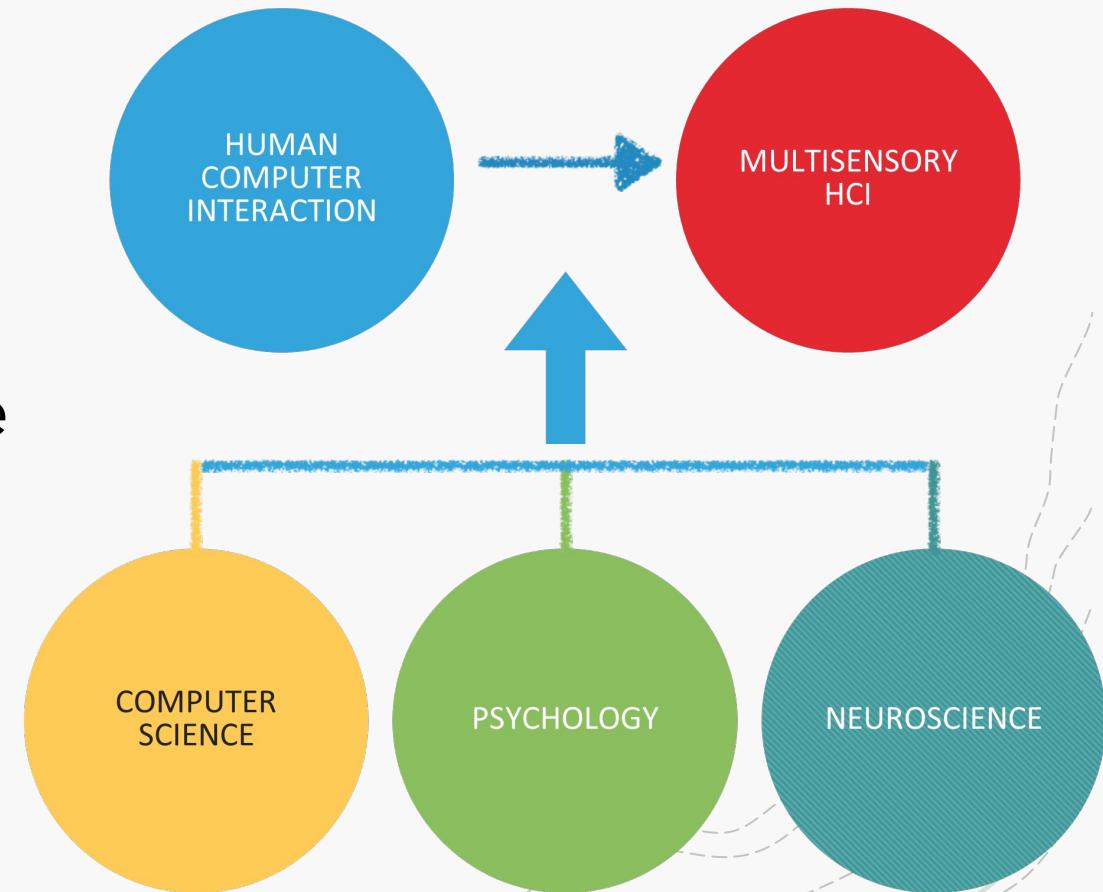
Course lecturers

- Dr Chi Thanh Vi - lecturer (vcthanh@hcmiu.edu.vn)



Research Interest

- Human-Computer Interaction (HCI)
- User Experience (UX)
- Brain-Computer Interfaces
- Multisensory Experience & Interface (touch, taste, and smell)
- Human-Food Interaction
- Physiological Signals
- Experimental Psychology





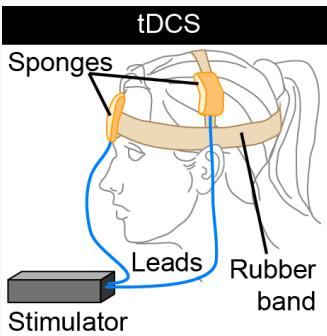
ERN. CHI 2012 & 2014.



Vibrotactile MI. INTERACT 2013



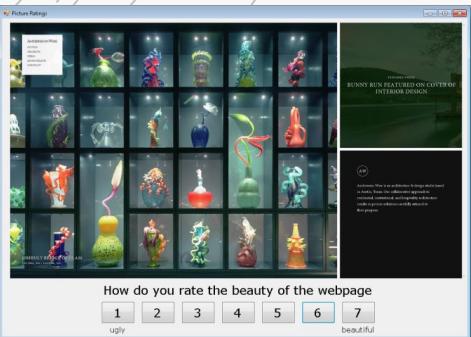
D-FLIP. ACE 2013



TDCS. IUI 2016



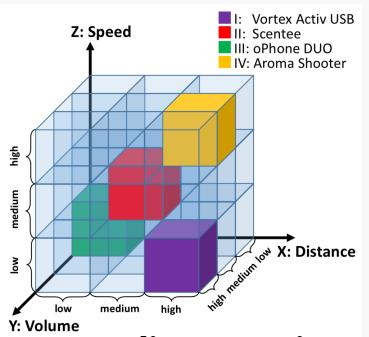
Multisensory. CHI 2016



fMRI and Usability. UIST 2017



Sense of Agency. CHI 2017



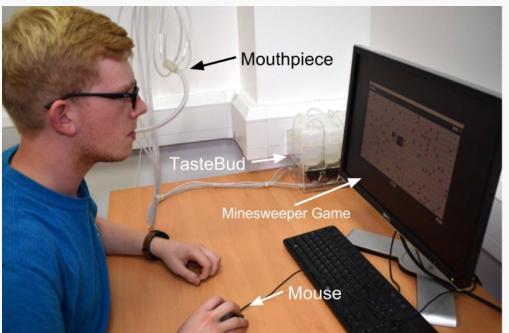
Scent-Delivery Devices.
AUI 2016



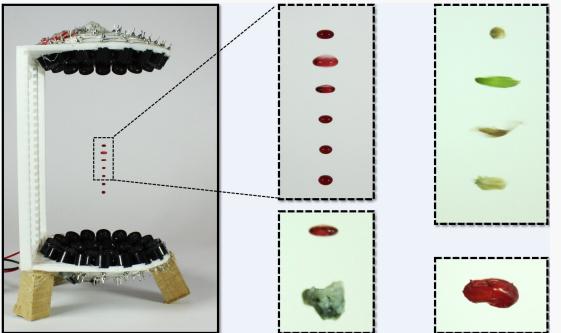
Smell mapping. AUI 2017



Tate Sensorium. IJHCS 2017



TasteBud. MHFI 2018



TastyFloats. ISS 2017



Taste & Risk Taking.
Nature Scientific Reports 2018



LeviSense.
IJHCS 2020





Expectations?

What do you hope to learn in this course?

Goals

- Understanding how to design the user experience when interacting with modern applications, devices, and environments
- Gaining in-depth knowledge of a human-centered process to create interactive systems
 - and how to apply it in practice
- Becoming familiar with methods to gather and listen to users' needs
- Learning to evaluate interactive systems with their users

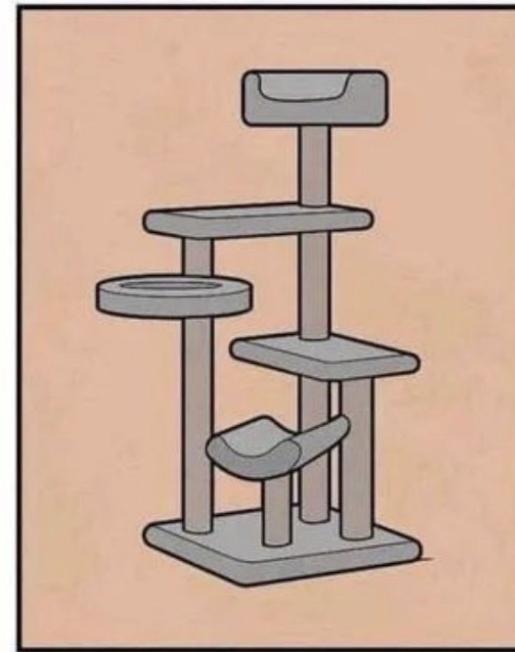
Why?



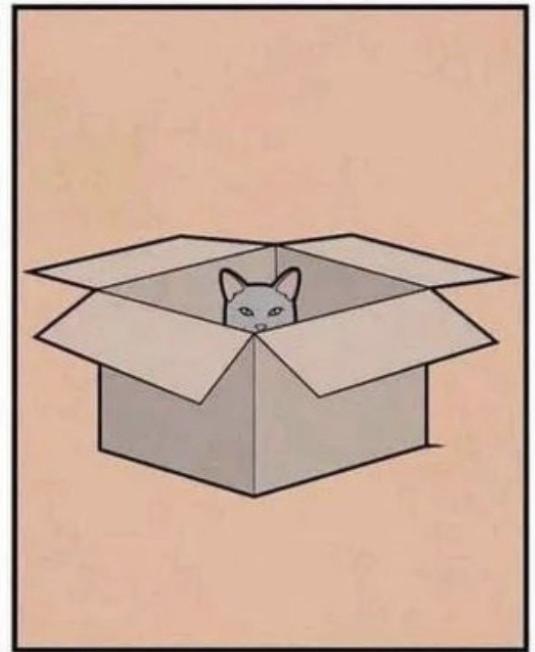
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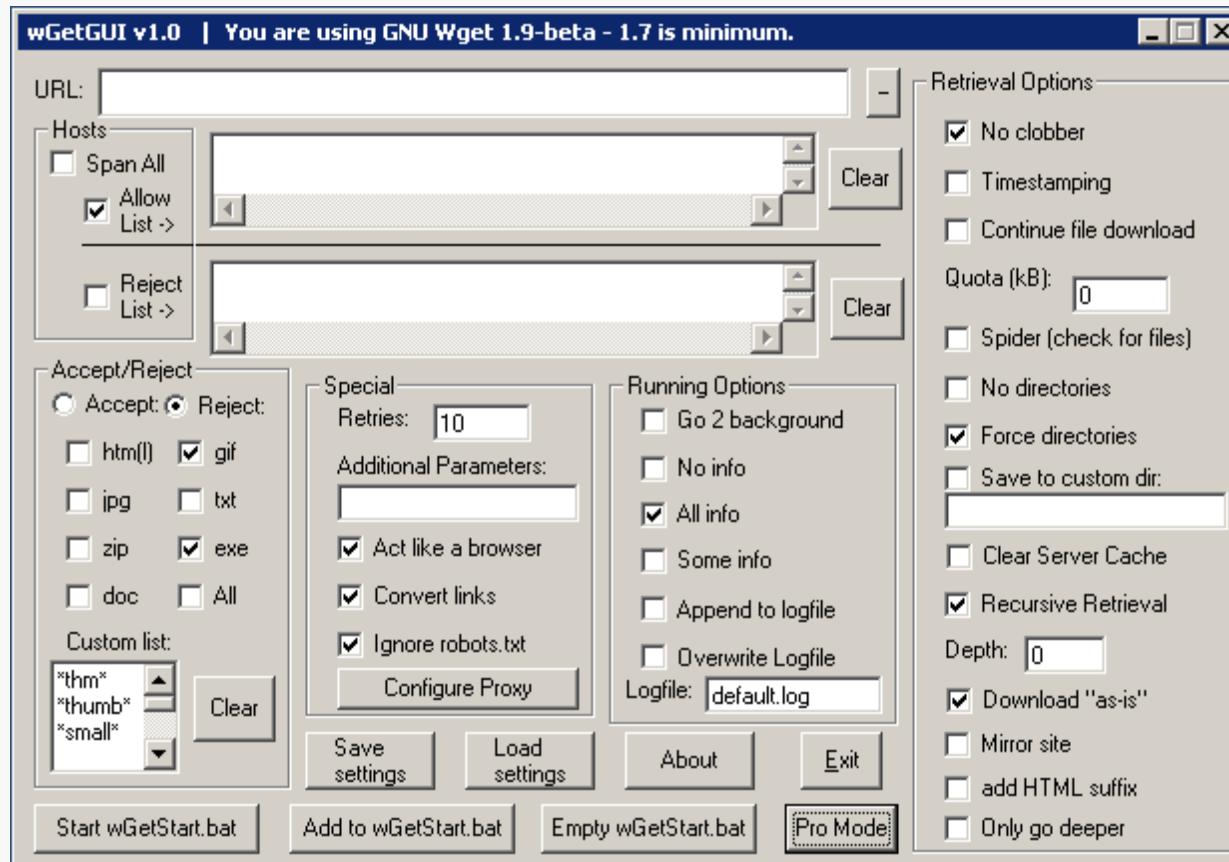
**Product
features**



**User
needs**



Hall of Fame or Shame?



How to Design and Develop Good Interactive Systems?

- Iterative and *human-centered* process
- People needs (not “wants”)
- Design principles and guidelines
- Usability goals
- Prototyping (rapidly)
- Evaluation (various kind)
- Programming

What We Will Learn

Introduction to Human-Computer Interaction

Definitions, the human, the computer, vision of the future

Building interactive applications with a human-centered process

Main tasks and methods to design, develop, and evaluate an interactive application

Needfinding strategies, low-, medium, and high-fidelity prototypes, mental models and visual design, heuristic evaluation, and basic concepts and methods for user studies

Application & Projects

Practical part on a specific application domain

Various kind of interactive prototypes (with and without writing code)

"Beyond WIMP" paradigms

Tangible interaction, wearables, voice user interfaces, gestures, interaction with AI systems, ...

Thematic seminars on emerging topics and case studies

Course Topics... At a Glance!

1. Introduction to HCI (this week!)
2. Needfinding
3. Defining needs and tasks
4. Prototyping
5. Design guidelines, principles, and heuristics
6. Human abilities and theoretical models
7. Visual design and design patterns
8. Heuristic evaluation
9. Usability testing
10. Advanced interactions

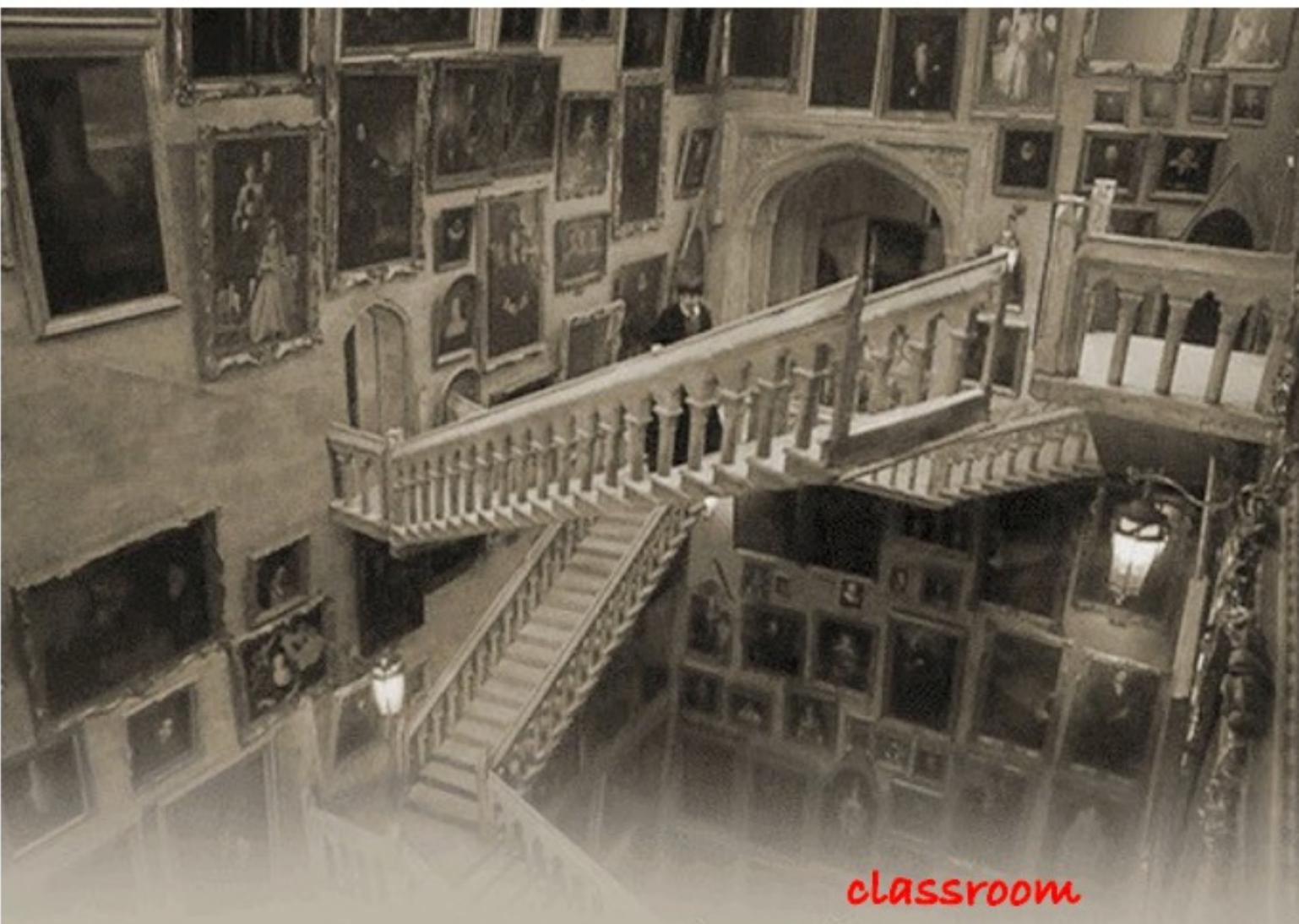


Learning Material & Communications



- Course slides, exercises, lab texts, and textbooks
- We will use **Slack** for quick communications
 - Among students, with teachers, etc.
- Join at https://join.slack.com/t/vcthanh/shared_invite/zt-2czvbruk2-Lych1NI9IJonnYcJtIDn0Q
- Announcements, reminders, and official information will have the **NEWS** tag
- Feel free to contact the teachers for feedback and ask questions
 - use the **@vichithanh** tag, if writing in the group
- Emails are an **alternative** for longer, slower, and private conversations
 - Use "Student Hours", too





classroom

Keep an eye on the ~~staircases~~.

They like to change

Student Hours

Why?

- An opportunity for individual students (or groups) to discuss any need or challenge
- To clarify information and ask questions about the course
- To discuss academic and/or career goals
- To know more about certain topics
- ...

When?

- Every **Friday 13:00-14:00** in my office: [book a slot on my calendar](#)
- On request, either in person (in my office) or remotely (on Zoom)

Course Methodology

- Learning method
 - Project-based → students learn by doing a project, in teams
 - Problem-based → the project work starts from elicited and real users' needs (*needfinding phase*)
- Projects developed **during** the semester and **step-by-step** (assignments)
 - Within a given *theme* and mostly in the labs
 - Iterating on prototypes
- *Intermediate checks* at the end of the assignments' work: the main way to provide **feedback** to the teams
 - Feedback is there to help students improve the next step in their projects, in the course, in addition to possibly improve the final grading

Course Organization

- Classes (Monday @ 8 AM)
 - 2.5 hours/week
 - Interactive lectures + exercises (mixed)
- Laboratories (Friday @ 12:15)
 - 2.5 h/week
 - Starting from Week 5
 - For group projects

Assessment

- Midterm exam: 25%
- Final exam: 25%
- Course project: 50%

Classes

- In-person, in rooms: bring your laptop

Laboratories

- Starting Friday, 29/03/2024
- In rooms with power outlets at the desk
- For group activities

Laboratories... As Design Studios

- Set up in a *design studio* way
 - “A design studio is a workplace for people engaged in conceiving, designing and developing new products or objects”
 - Each team will be in the **same slot** and will work with the **same teacher** for the entire semester
 - The teacher is there to *support* the teams’ work, **not** just reply at questions
- Two **main activities** within studios, identical for the three slots:
 - *Assignments* - Teams work on steps of the project with the guidance of the teacher
 - *Checks* - Teams present their assignment work to the teacher and receive feedback

Laboratories... As Design Studios

- Each of the three slots will have a specific theme
 - All the projects must fall in the slot's theme and specialize it
 - Slots must have around the same number of assigned teams
- Themes: choose one of the two
 - Hardware: hand-on activities with Arduino, electronic boards, etc.
 - Software: AI, visual & interactive programming

Laboratories... As Design Studios

Hardware

- **H1:** Smart scale for real-time weight monitoring
- **H2:** Taste delivery device
- **H3:** Smell delivery device
- **H4:** Arduino-based robot arm
- **H5:** Muscle, haptic, or pain stimulation communication

Software

- **S1:** Digital Wellbeing
- **S2:** Humans Meet AI
- **S3:** AR/VR for Education
- **S4:** Assisting Tools for Aging Population

Theme H1: Smart scale

- **Description:** We measure and judge things around when we hold them in our hands. Here we aim to develop an IoT system that lets us monitor the item's weight and interactively communicate with users based on specific context (i.e., monitoring eating speed based on how fast the food is taken off the bowl).
- **Features:**
 - Real-time monitoring of the item's weight
 - Connect to PC/ Mac: Bluetooth or USB
 - Hardware: Arduino/ Raspberry Pi, pressure sensor, etc.

Theme H2: Taste delivery device

- **Description:** This project re-builds the existing **TasteBud** device, that has an Arduino board connected to six peristaltic pumps controlling six bottles of aqueous stimuli. Multiple tastes can be delivered independently to the participant's mouth using a 3D-printed mouthpiece mounted on a stand in front of the participant.
- **Features:** The device allows three levels of control:
 - Push/pull direction of delivery.
 - Flow rate (ml per second) in the range of 2.15ml/sec to 5.11ml/sec
 - Delivery duration (in seconds or indefinite)
 - Connect to PC/ Mac: Bluetooth or USB
 - Hardware: Arduino/ Raspberry Pi, laser cutter, 3D printing, etc.
(training will be provided)



Theme H3: Smell delivery device

- **Description:** This project smell delivery device inspired by the work of Dmitrenko, Maggioni and Obrist (2017) and Vi et al. (2020). The device is electrically controlled by an Arduino board and composed of electro-valves that regulate the air passage from a mini device compressor. The air gets split into several channels (e.g., three channels for the use of 3 smells); each is controlled by an electro-valve and arrives at a small glass bottle.

- **Features:**

- Manipulate the delivery speed of the smell.
- Control duration and direction of the release determine the lingering period of the smell.
- Hardware: Arduino/ Raspberry Pi, laser cutter, 3D printing, etc. (training will be provided)

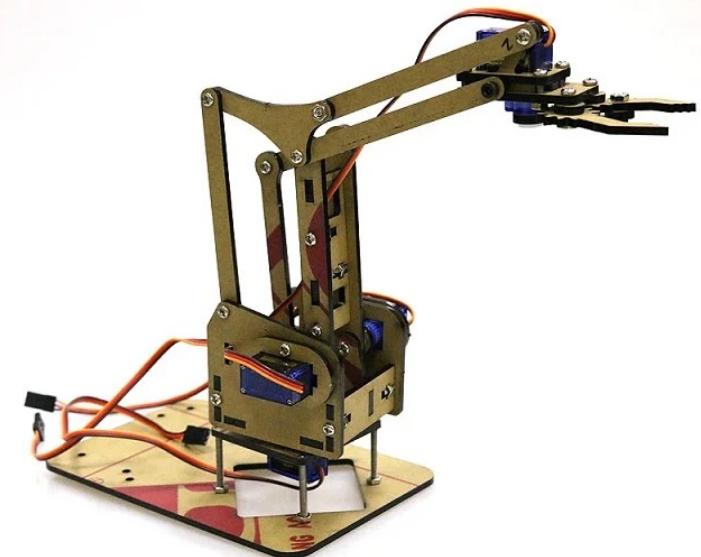


Theme H4: Arduino-based robot arm

- **Description:** Robotic prototypes are gradually gaining more academic and research traction, while robots are becoming a more common encounter within the human social trusted cycles. Generally, in the fields of Robotics - besides the mandatory high standards of safety - engineers are keen to build their concepts with an intuitive, natural-like motion and characteristics. This project will go through the process of building a novel 3-degrees of freedom robotic arm.

- **Features:**

- Controlled by Arduino/Raspberry Pi
- Wood board laser cutting
- Connected to PC/Mac via Bluetooth or USB
- Hardware: Arduino/ Raspberry Pi, servo motors, laser cutter, 3D printing, etc. (training will be provided)
- Some examples:
 - <https://github.com/a-dossari/3-DOF-robotic-arm>
 - <https://robu.in/product/orange-diy-arduino-3-dof-robotic-arm-kit/>



Theme H5: Muscle, haptic, or thermal stimulation communication

- **Description:** When contact occurs on human skin, we perceive a sense of pressure and temperature through the receptors. When a person engages in touch communication, the static pressure and temperature as well as movement while touching are involved. Therefore, it is necessary to reproduce the pressure sensation of being touched, the temperature sensation of being touched, and the dynamic movement of both pressure and temperature sensations for rich tactile communication.
- **Features:**
 - Stimulate the sense of touch/ haptic feedback, using temperature, force, muscle stimulation, etc.
 - Hardware: Arduino/ Raspberry Pi, thermal/ haptic/ muscle stimulation, laser cutter, 3D printing, etc. (training will be provided)

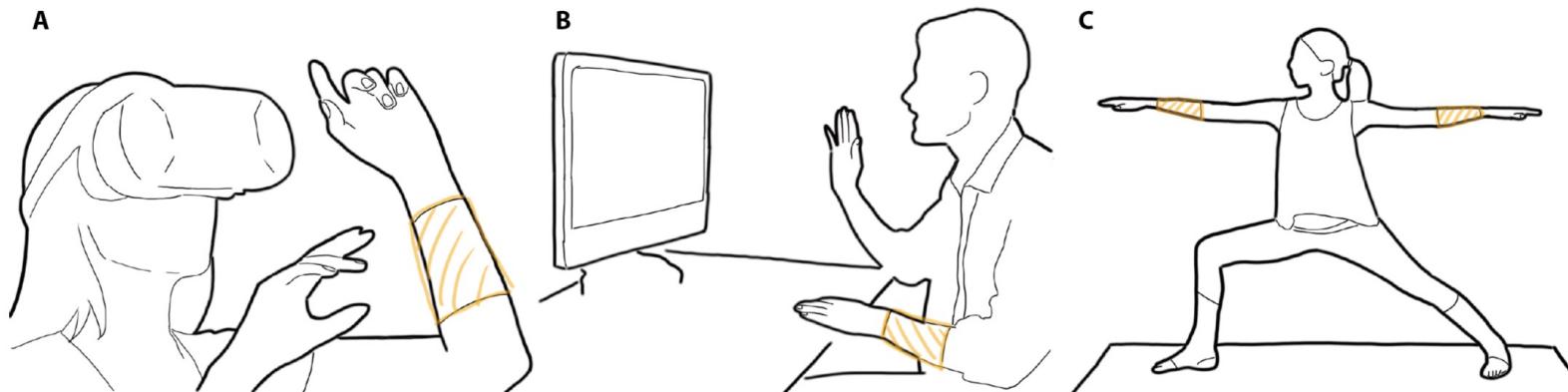


Figure 10: Possible examples of application of ThermoCaress. (A): Haptic feedback in VR entertainment. (B): Online communication tool. (C): Online training for posing instruction.

Theme S1: Digital Wellbeing

No one: Are you okay?
Me: Yeah. I'm totally fine.
My Phone:

© Digital Wellbeing

Check your weekly report

You used your phone 42 h 6 m more than last week.

- **Description:** Internet-connected devices, such as smartphones, are an integral part of our daily life. They are always with us and gives us many opportunities for social support. They also show many negative aspects linked to the misuse and overuse thus negatively impacting our “digital wellbeing”. Within this theme, we will explore ways to build digital experiences that work with you and your wellbeing, not against you, to find a better balance with technology.
- **Examples:** Forest, Hinge: the dating app designed to be deleted, Google's Digital Wellbeing Experiments

Theme S2: Humans Meet AI



- **Description:** AI-powered systems have impacts on different aspects of our life, from the movies we watch (movie recommendation) to how we look for information (virtual assistants). They also changed many industries and professions. However, such systems are typically built with a technology-first approach, instead of a human- first. Within this theme, we will explore how an intelligent agent can augment human capabilities to really serve people needs.
- **Examples:** Amazon Alexa, Youper, GAUGAN2

Theme S3: AR/VR For Education

- **Description:** Virtual and, especially, augmented reality (VR/AR) can create new educational experiences for many, from primary-school students learning the different species of animals to developers wanting to create 3D videogames. Within this theme, we will explore how we might create VR/AR educational experiences for helping people learn better and possibly with more fun.
- **Examples:** [AR in Google Search](#), [timelooper](#), [SkyView](#)



Theme S4: AI-Tools for Aging Population

- **Description:** It is true that older adults are more likely than younger adults to experience accessibility related challenges in using digital technologies as a natural consequence of the aging process, and that they are more likely to have multiple health related constraints. This project aims to design digital technologies appealing for older adults, with methods might be effective in eliciting their design requirements, and with requirements might be embedded into digital technologies for the general population so that older adults need not rely on limited functionality, senior-friendly variants of common applications and devices.
- **Example:** SeniorTalk, Thriving.ai

Teams

- **Hardware theme: 4 students**
- **Software theme: 2 students**
- It is students' responsibility to form teams
 - Teachers may help, but not automatically assign anyone
- Teams cannot be changed during the semester
- In case of issues among teammates: please, talk with the teachers
- Each team will work on their own GitHub repository (will be assigned by the teachers)



About the Final Report (4000 words max)

1. Project development (up to 20 points)
 - In teams
 - Final report - process, execution, and outcomes of five group assignments
 - Prototypes "source"
2. Design Rationale & Heuristic evaluation (up to 5 points)
 - Individual
 - Report - outcome and execution of one individual assignment
3. Oral presentation of the project (up to 10 points)
 - As a group, mandatory

Evaluation Criteria

- Invested effort in the project activity, including the willingness to incorporate the provided feedback
- Originality, complexity, and richness of the work
- Methodological and technical correctness of the entire process
- Completeness and communication quality of the assignments' outcomes and report(s)
- Quality of the presentations and oral discussion
- Individual contribution

Project Development

- **Goal:**

- to give hands-on experience with the modern human-centered design process described during the course
- Projects will be built **step-by-step** and mostly carried on during studios
- Project's topic proposed by each group
 - Based on *needfinding*
 - Within the chosen theme
- *Assignments* represent the various process steps
 - Start during a studio
 - Are often followed by checks with teachers (in one of the following studios)
 - **Evaluated** through reports and discussion

(Planned) Assignments and Checks

- Assignment 1 [group]
 - *Needfinding*
 - Starts at week 2, ends/check at week 3 (duration: **1 week**)
- Assignment 2 [group]
 - *Refinement and project focus*
 - Starts at week 4, ends/check at week 5 (duration: **1 week**)
- Assignment 3 [group]
 - *Low-fidelity prototype and evaluation*
 - Starts at week 6, ends/check at week 8 (duration: **2 weeks**)

(Planned) Assignments and Checks

- Assignment 4 [group]
 - *Medium-fidelity prototype*
 - Starts at week 9, ends/ready at week 11, no check (duration: **2 weeks**)
- Assignment 5 [individual]
 - *Heuristic evaluation on another group's medium-fidelity prototype*
 - To be done **during** the studio of week 11
 - Results passed to the other group
- Assignment 6 [group]
 - *High-fidelity prototype (and final report)*
 - Starts at week 12, ends **one week before each exam date**

Assignments and Checks – Summary

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	...	Exam -1 week
A1			Check												
A2					Check										
A3								Check							
A4										Check					
A5											Check				
A6															

Projects Completion Level

- The realized final prototype *must* be a **high-fidelity interactive prototype** or **demo-able**, does not need to be a final “product”
- The application is not required to (fully) implement standard (yet important) features, such as sign-up, sign-in, ...
- Assume that your user is *already* registered and signed in
- This means that some (difficult or standard) features can be *faked* or *hard coded*

Oral Presentation & Discussion

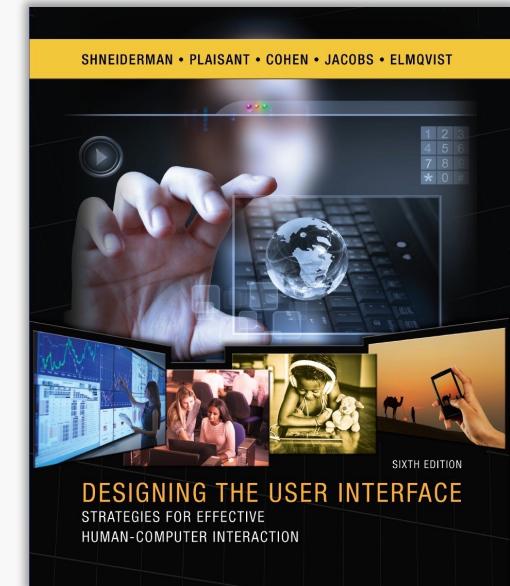
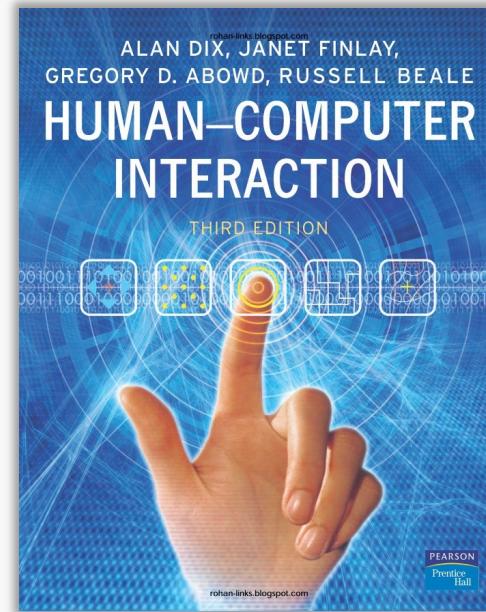
- **All teammates** present and presenting
- Each group will present their project with:
 1. A brief *introduction* to the project
 2. A *demonstration* of the implemented prototype, where students cover the main features and everybody in the team speak
 3. Answering some *questions* from the teachers, about what students showed and/or about the submitted report(s)
- **Beware:** the demonstration is typically the most critical part
 - it needs to be carefully prepared, and not rigged up at the moment
- Teachers will have already read the report(s) and had a look at the final prototype code, so there is no need to cover those

Introducing... the Assignment Zero

- Submit group composition
 - Group name
 - 4 persons (max), for each:
 - ID (matricola), Surname, Name, GitHub username, e-mail
 - Two preferred lab themes/ topics (ranked #1 and #2)
 - Submission link (Google Form):
<https://forms.gle/3wKnYSDNpuAqK3xA7>

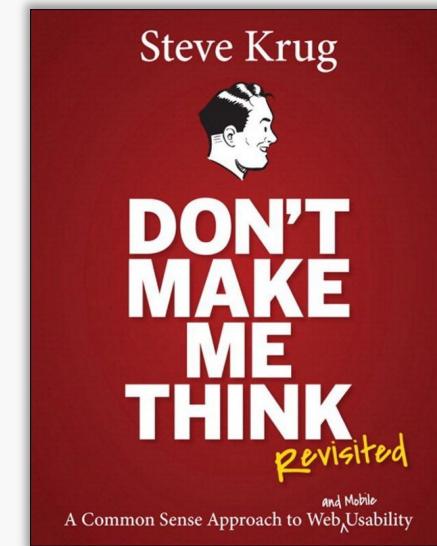
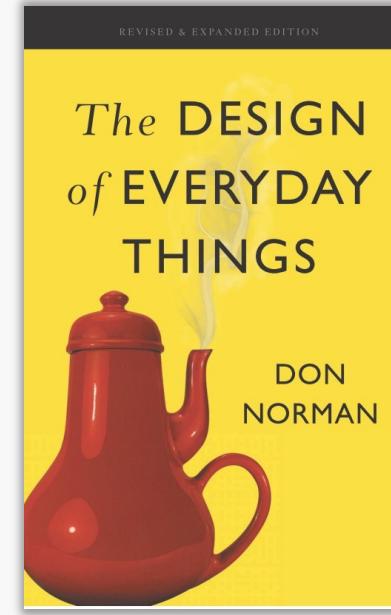
Suggested Books

- Alan Dix, Janet Finlay, Gregory D. Abowd, Russel Beale, "Human-Computer Interaction", 3rd edition, Prentice Hall, 2004, ISBN 0-13-046109-1
- Shneiderman, Plaisant, Cohen, Jacobs, Elmqvist, "Designing the User Interface: Strategies for Effective Human- Computer Interaction", 6th edition, Pearson, 2016, ISBN 013438038X / 9780134380384



Suggested Books

- Don Norman, "The Design of Everyday Things: Revised and Expanded Edition", Hachette UK, 2013, ISBN 0465072992/ 9780465072996
- S. Krug, "Don't Make Me Think: A Common Sense Approach to Web and Mobile Usability - revisited", Pearson Education, 2014, ISBN 0321648781/9780321648785





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THANK YOU

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<https://vichithanh.github.io>



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