Welcome!

cpsc 344: introduction to Human Computer Interaction methods

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Instructors:

- Paul Bucci (pbucci@cs.ubc.ca) & Juliette Link (jlink@cs.ubc.ca)

Office hours (for now):
- Wed ~30m after lecture
- By appointment (email instructors)

Juliette’s background: Bachelor’s and Master’s in Computer Science from UBC. Has worked in industry (BlackBerry, Autodesk, EA, BCLC) in fields related to Human Computer Interaction for many years. Currently working in innovation/new product development.

Paul’s background: Bachelor's in Visual Arts and Computer Science, Master’s in Computer Science. Extensive experience working in visual design and media production. Currently researching emotional human-robot interaction via the sense of touch.
344 TAs

Lotus  Kevin  Matthew  Hayley

Regina
waitlisted?

- Current waitlist length = 45
- Policy: from this point on, we’ll move people into the class based on their attendance of initial lectures.
- *We want you to take course! But if you decide not to, please drop the course so others can register.*
attendance

Since we’ll move people into the class based on their attendance of initial lectures, we’ll need to take attendance so…

grab an index card
today - part 1

• HCI and User Interface Design – what is it?
• Who this course is for
• What you’ll learn in this course
• How you learn these things (course format):
  – participation in lecture and workshops
  – weekly pre-readings
  – weekly assignments/project deliverables
  – teamwork
  – how you will be evaluated
today - part 2

- Thinking about your designed world
- Dispelling the myth of human error
- Why interface design is tough
- Technology vs. human centred design
- Setting UX goals
Lecture slides will be posted on the course website (dashboard page) after each lecture.

http://www.ugrad.cs.ubc.ca/~cs344
HCI and User Interface Design – what is it?
Activity 1:
let’s break it down...

quick note:
today’s in-class activities will *not* be marked
in HCI, think about what’s meant by…

human  computer  interaction

draw and label examples for each on your worksheet

feel free to talk to your neighbour

stuck? just draw the first example that come to mind!
human

individuals – Joe, Justin Trudeau

groups – teachers, 344 students, older adults, hockey players

organizations – National Association for Professional Pet Sitters, American Association of Candy Technologists
computer

monitor & keyboard
smartphone
your car
the fridge
your dog’s collar
wearables
workstation
spacecraft cockpit
microwave
smart thermostat
interaction

pull out sofa
refrigerator door
alarm panel
compass card reader
volume control
## the computer: what’s happening?

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>new form factor</td>
<td>larger memories / faster systems</td>
</tr>
<tr>
<td></td>
<td>miniaturization</td>
</tr>
<tr>
<td>deeply connected</td>
<td>↓ power requirements</td>
</tr>
<tr>
<td></td>
<td>new display &amp; input technologies</td>
</tr>
<tr>
<td>pervasive</td>
<td>embedding of computation into appliances</td>
</tr>
<tr>
<td></td>
<td>specialized computer hardware</td>
</tr>
<tr>
<td></td>
<td>→ new functions</td>
</tr>
<tr>
<td>broadened user base</td>
<td>↑ networked + distributed computing</td>
</tr>
<tr>
<td></td>
<td>↑ adoption of computers &amp; access by those currently denied</td>
</tr>
</tbody>
</table>
what is user interface design?

methods and theories for iteratively designing, implementing, and evaluating human interaction with a computer

Humans

Tasks

Technology

Design
some early landmark HCI innovations

• mouse [Engelbart, ’65]
• direct manipulation [Sutherland, ’63]
• spreadsheet [VisiCalc, Frankston & Bricklin, ’77]
• desktop metaphor [Xerox Star, ’81]

…all of these were behind the emergence of the PC in the 80s.

What’s the biggest HCI innovation in your time?
who does HCI?

it’s a multidisciplinary area...

on the purely machine side:

- computer graphics
- operating systems
- programming languages
- development environments
- networking
- software engineering

and increasingly...

- industrial & product design
- digital media processing
- robotics
who does HCI?

on the human side:

psychology and kinesiology
  • cognitive, perceptual and motor behavior
  • human capabilities to use and learn machines

sociology and anthropology
  • group and cultural behavior

art and graphic + tactile design
  • visual design principles and aesthetics
    – layout, color, icon selection, feel, etc.
what makes it HCI?

where they come together:

• the **joint performance** of tasks by humans and machines

• the **structure of communication** between human / computer, and human/human mediated by computers

design methods:

• **analysis** of interface flaws

• specification, design, and implementation of interfaces to **support human activity**

• design **trade-offs**
HCI jobs

• Companies with HCI-related jobs: Google, Amazon, Apple, EA, Oracle, Microsoft, Hootsuite, Facebook, Twitter, LinkedIn, Blizzard, Vancity, Government of B.C., and more.

• Job titles: User Experience (UX) Designers, Interaction Designers, UX Researchers, and more (we’ll discuss these terms later in the course)

• Growing field, in high demand
what you’ll learn in this course
what you’ll learn about HCI

you will (if you apply yourself):

• be able to critique real user interfaces
• be aware of HCI as a field (now and future)
• be skeptical about your own ‘design intuition’
• have applied several methods for involving users in design
• have experience with several interface prototyping methods
• have practiced multiple methods to evaluate interface quality
• have some ideas for how to make HCI practices work effectively in the face of real-world constraints
what you’ll learn about HCI

most importantly:

I want everyone in this class to understand

- The difference between good and bad user design
- Why HCI is a crucial part of computer product design, when those products are to be used by PEOPLE
- How HCI fits into a product design cycle
- *Structured* principles for apply HCI principles efficiently and effectively

Then, when you are out working in industry *in any role*, you will be able to support your team and its goals through this knowledge.
what you will *not* have become

• an expert in GUI, fonts and colours
  …that’s graphic/visual design school

• a competitive application for an HCI-type job
  …this course is a great start, but you’ll do better after taking CPSC 444 as well

• a maker of flashy websites and widgets
  …HCI isn’t about just making things. It’s about understanding what a human being is trying to do, and what support they need to do it; then (the creative part) coming up with and verifying new, sometimes radically new, ways of improving that person(s) life.
see course website for more details:
http://www.ugrad.cs.ubc.ca/~cs344
who this course is for
this class will be useful / fun

if you . . .

- are interested in HCI as a career option.
- don’t see a career in it, but ARE fascinated by how people and machines could relate better to each other
  …or always noticing how badly they often do.
- planning a career in CS, software development, or technology
  …and therefore NEED TO KNOW something about interface design.
who is this class NOT for?

people who…

• are quite confident they do not work well in teams
• are uncomfortable with firm schedules
• don’t have a reasonable grasp of English, spoken and written
  …you’ll learn / practice new communication skills.
• will not be able to accept that aspects of your course mark will be subjectively determined.
what kind of a class is this?

• project based and interactive: hands-on
• group-oriented: team based learning practices
• many strange and unfamiliar new skills
• less coding than other CS courses
  … we make up for that other ways :-) 
• heavy demands on your **ingenuity** and your people skills
course format
course components

lectures: 3 hours on Wednesdays
  • including regular classroom activities

exams: 1 midterm + 1 final
  • midterm may be scary (unfamiliar kind of test)

weekly pre-readings + quizzes:
  • due Tuesday nights

weekly assignments: generally due 1 hour before your workshop
  • some individual, most group-based
  • most build on one another

weekly hands-on workshops: Thursday or Fridays, 2 hours
  • attendance required - don’t let your team down.
# cpsc 344 grading scheme

<table>
<thead>
<tr>
<th>component</th>
<th>weight</th>
<th>type</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-reading quizzes</td>
<td>10%</td>
<td>individual</td>
</tr>
<tr>
<td>deliverables assignments, mini-project, project</td>
<td>45%</td>
<td>mostly group</td>
</tr>
<tr>
<td>midterm</td>
<td>15%</td>
<td>individual</td>
</tr>
<tr>
<td>final</td>
<td>25%</td>
<td>individual</td>
</tr>
<tr>
<td>project peer evaluation</td>
<td>5%</td>
<td>individual</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

- **individual:** 57%
- **group:** 43%
pre-readings + quizzes

• pre-readings will prepare you for each week’s lectures
• quizzes to confirm you’ve covered the material
• links to both on the course dashboard
  – first pre-reading released by tomorrow
  – generally released one week before due

  – buy (or rent!) from bookstore
  – textbook is needed for pre-readings
a note on pre-readings

good textbook, but alignment is not perfect with the way we want to move you through the material.
  • the pre-readings skip around a little

in each pre-reading, we tell you what we want you to get out of it – the foundation of that week’s work in class and assignments.
  • further framing will come in class

extra readings posted online in private section of website
( login info will be made available on Piazza)
workshops

• 2 hrs/week of workshops, Thursdays or Fridays
• attendance is very important
• small-group, some hands-on activities and project brainstorming; peer feedback and critique;
• brief update meetings with project TA/instructor
• take advantage of scheduled time with your teammates;
  – can spend less time out-of-class

we have a great lab! HCI Learning Studio, X360
assignments and mini-project (weeks 2 - 7)

• work individually or in a group

• due weekly:
  • 2 stand alone assignments
  • mini-project: 3 assignments
    – 2 smaller checkpoints + 1 larger report
    – each assignment builds on the previous one

for these, you will…

• critique/evaluate/analyze user interfaces
• identify user tasks and problems, prioritize
project (weeks 7 - 13)

• work in teams of 4 - 5
• made up of 6 connected weekly assignments:
  • 4 smaller checkpoints + 2 larger reports

for these you will be given a design brief and asked to…

• come up with several possible solutions, and systematically choose the best
• iteratively prototype your solution, gradually increasing its detail and polish
• evaluate your solution

More about the project to come later in the course!
teams for **mini-project** and **project** formed by staff

- all team members in same workshop section

**topics** for both will also be assigned

…but you will have an opportunity to have input on both!

- via questionnaire (more info next week)

we’ve tried it both ways…

- similar results: same frequency of problems (about 1 per section) for self- and staff-formed teams
- this way is less hassle for everyone
workshop leaders: TAs/instructors

T1A (Thursdays, 10am - 12pm): Paul & Kevin

**T1B (Thursdays, 4 - 6pm): Juliette & Lotus**

New time!

T1C (Fridays, 10am - 12pm): Hayley & Regina

T1D (Fridays, 1 - 3pm): Hayley & Matthew

your project mentors:
primary source for marks and guidance related to your project
due dates / timing of components

your best friend: the course dashboard
https://www.ugrad.cs.ubc.ca/~cs344/current-term/calendar.html

dates subject to change – check back regularly!
resource: HCI Learning Studio

• where? ICICS x360
• it has: special collaborative space and tools
• use for: workshops and individual/team work
• you have 24/7 access (once class list settles)
• we’re the only course using it this term!
course communication

• **#1 website:** [http://www.ugrad.cs.ubc.ca/~cs344](http://www.ugrad.cs.ubc.ca/~cs344)
  - use for: schedule, pre-readings - START USING NOW

• **#2 discussion group (Piazza):**
  [https://piazza.com/class/j5wk4bj8s9f4gd](https://piazza.com/class/j5wk4bj8s9f4gd)
  - use for: anything relevant to larger group, including questions
  - TAs and instructors will check daily
  - sign up from link on course website overview page

• **#3 instructors + TAs directly**
  - use for: personal logistics (project, assignments, etc.)
  - in person: workshops; instructor office hours
  - piazza: private posts to instructor

• **#4 instructors direct email**
  - use for: personal (illness, etc.)
expectations (simple version)

1. on-time attendance of all classes and workshops
   exam coverage assumes full presence / participation – including
   weekly pre-readings.

2. participate in lectures and workshops

3. complete weekly deliverables and quizzes on time
   and well. “A” is for fully-meets; “A+” is for exceptional work.

4. be a considerate team member
   do your share of the job, well and on time. your team marks you.

5. abide by the university academic honesty guidelines
questions?
Activity 2

(this it will happen a lot!)
1. find a partner  
get up! move around!

2. on your handout (~ 5 min)

• one person (partner A):
  – create directions for a friend (imagine they live in the city)
  – explain how to get from this room, to XXX [some location in the city you know, moderately unknown]

• OTHER person (partner B):
  – draw a map of the city for a friend who has just moved to Vancouver for the first time, and wants to be able to get around easily via transit.
  – get as far as you can in time available
before we move on…

what does critique mean?
3. NOW, swap your handout with your partner
   - 1 minute to try out and critique the thing partner A created
   - 1 minute to try out and critique the thing partner B created

4. regroup & discussion
   - what was different between the designs?
   - what worked better for each purpose?
   - what didn’t work so well?
you all just created user interfaces

you thought about who was going to use it, built a prototype, and evaluated it.

if you tried it again, I bet you could do better.

this is user-centered design!

• we will spend a lot of time doing all of these steps this semester!
why take this course?

• You will be exposed to a completely different aspect of computation than in any other course in this department. Many students have said they found it transformative.

• You will spend a very large part of your life in contact with computer interfaces. Here, you’ll learn the difference between joy and torture, and how they get that way.

• The ones you participate in creating in the future, in whatever role, will be more of a joy, and less of a torture.

• You’ll get to exercise your creativity.

• Working in a team can be wonderful, or a pain; either way, it’s life. Better practice here than in your first job.

• This project may be the first real design problem you will solve. It will be challenging and potentially very satisfying.
workshop balancing

WE HAVE A FULL CLASS (limited by the classroom size)

**goal**: get everyone into a section they can deal with (maybe not your first choice); keep grads in clusters.

→ workshop balancing survey, where you can tell us your availability *(fine, could if necessary, can’t)* for each of the four Thurs/Fri labs.

We’ll inform of your workshop assignments by **Sept. 18th**.

**Please complete the survey by Wednesday, Sept. 13th**

(deadline also on course dashboard)

https://survey.ubc.ca/surveys/pbucci/cs344-2017w1-workshop-balancing/
- 15 minute break -

*next up: part 2*
today - part 2

• Thinking about your designed world
• Dispelling the myth of human error
• Why interface design is tough
• Technology vs. human centred design
• Setting UX goals
how interfaces fail

Lecture 01 2017 W1
learning goals

After this lecture, you should be able to:

• begin to understand the world in terms of choices that designers have made

• explain the relationship between the myth of human error and the goals of human computer interaction

• list concepts / heuristics / principles for good/bad interface design

• be able to identify and critique interface strengths and weaknesses in terms of this language

• explain the difference between technology-centered vs. human-centered design
thinking about design

where we’re covering it

upcoming

- Norman. *Design of Everyday Things (DOET)*
- RSP Chapter 1: *What is interaction design?*
- W02 Lecture
- 1st assignment: Interface Critique

today:

- thinking about the designed world
- examples of how interfaces fail
- introduction to UX goals
understanding your designed world

notice the choices designers have made about the world around you
understanding your designed world

• Everything around you has been designed.
• Somebody had to make a choice about every aspect of the built world.

  the colour of the walls
  the size of the window
  the placement of the trees outside

• Why did the designers make those choices? What were their values? Constraints? What functions were they supporting?
Activity III: understanding designers’ choices

• [worksheet]
myth of human error

human-centered design as a philosophy
understanding your designed world

• Designers always need to negotiate competing *values*, *constraints*, and *functional requirements*.

• It’s *always* a balancing act.

• Your job is to
  • try to understand the problem as best as possible
  • make decisions based on data
  • justify your design choices
  • prototype
  • iterate
human-centered design

• Place human experience at the center of your design decisions.

• Worry about

• …how people feel
  …how their bodies work
  …how things are actually used
  …what human limitations are

• before you worry about other considerations.
main lessons from reading: 
*the psychology of everyday things*

• **lesson 1: the myth of human error**
  • most failures of human-machine system are:
    – due to **poor designs** …
      that don’t recognize peoples’ **capabilities** and **fallibilities**
  • this leads to apparent machine misuse and “human error”

• **lesson 2**
  • good design accounts for **human limitations**
early tractors

used to be called “Driver’s Error” …

but, accidents became infrequent when designs changed to low center of gravity & wider wheel bases
getting serious about design: World War II = turning point

- control of new airplanes, submarines pushed sensorimotor abilities
  - frequent errors (often fatal) even after lots of training

- example airplane errors:
  - if booster pump fails, turn on fuel valve within 3 sec
    - test shows it physically required at least five seconds to do!
  - altimeter gauges difficult to read
    - pilots misunderstood altitude and crashed

- result: ‘got it’ that human factors in design are a big deal
harvard airplane (World War II)

• undercarriage crashes
  • symptom: pilots landed without dropping undercarriage (wheels)
  • solution: undercarriage warning horn sounds if wheels up and power low (landing condition)

• but, landing confound w/ another condition: stalling
  • what’s a stall? plane airspeed drops too low to maintain lift

• pilots practice stalling
  • deliberately stall and recover, when at safe altitude
  • but sometimes similar to landing with undercarriage up (undercarriage warning horn sounds, annoyance)

•→ installed “undercarriage horn cut-out button”
problem #1: conditioned response
  when U/C warning goes off → push button; therefore stimulus nullified
  (also, forget and leave it on)
problem #2: negative transfer
T-33’s: tip-tank jettison button in same location

Oops! Now why did I do that?
the myth of human error

• humans are imperfect and unpredictable.
  • we have lousy memories
  • we don’t see what’s really there
  • we don’t say what we really mean
  • we get confused when too much is going on
  • we get tired or bored and don’t pay attention
  • we are easily distracted

⇒ it’s your job to take that into account:

many so-called human errors and “machine misuses” are actually errors in design
how do interfaces fail?

take a closer look
a few way interfaces can fail:

• functionality problem
  what are the functions this object can perform? will it do what I want?

• system status visibility problem
  what *mode* is this object in?

• control visibility problem
  which control or sequence of controls do I use to get what I want?

• feedback problem
  how do I know if I got what I wanted? what’s wrong?
designers don’t start with basic needs:
might try to make it exciting or beautiful first.

These lists are **EXAMPLES** of things that can be defined in a given context, and then measured.

---

### User Experience

<table>
<thead>
<tr>
<th>Usability</th>
<th>Undesirable Aspects</th>
<th>Desirable Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>effectiveness</td>
<td>unpleasant</td>
<td>exciting</td>
</tr>
<tr>
<td>efficiency</td>
<td>frustrating</td>
<td>fun</td>
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<tr>
<td>safety</td>
<td>gimmicky</td>
<td>rewarding</td>
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<tr>
<td>utility</td>
<td>...</td>
<td>...</td>
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<tr>
<td>learnability</td>
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<tr>
<td>memorability</td>
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</tbody>
</table>
time to start the blame game…

where exactly do designers go wrong?

• designers fail to …
  • understand the range of users and their physiological limitations
  • communicate what it does
  • provide a model (i.e., apparent to user) of how something works
  • provide feedback
  • foresee possible contexts of use
Activity IV:
good and bad interfaces around you

• [worksheet]
time to start the blame game…
where exactly do designers go wrong?

designers don’t start with basic needs:
might try to make it exciting or beautiful first.

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</tr>
<tr>
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</tbody>
</table>

**undesirable aspects**
- unpleasant
- frustrating
- gimmicky
- …

**desirable aspects**
- exciting
- fun
- rewarding
- …
what makes interface design hard?
what makes interface design hard?
the task of interacting is complex, often poorly defined

- interaction is unpredictable (and complex)
- cooperative (coordination is complicated)
- users change their minds & get distracted
- they use in unforeseen ways – then evolve that use.
- tasks are implicit (and complex)
- the machine often doesn’t “know” the user’s goal.
- distribution of tasks between human & machine is a moving target
what makes interface design hard?
the user task is getting more complex, too

• over the last century:

  • the **number of things to control** is increasing
    – car radio: AM, FM1, FM2, 5 pre-sets, station selection, balance, fader, bass, treble, distance, mono/stereo…

  • display is increasingly **artificial**
    – e.g., red lights in car indicate problems vs flames for fire

  • **feedback more complex**, subtle, and less natural
    – is your digital watch alarm on and set correctly?

  • **errors increasingly serious** and/or costly
    – airplane crashes, losing days-worth of work…
what makes interface design hard?

market place pressures:
users themselves don’t always make good purchase choices

• adding functionality (complexity) is easy & cheap
  • computers

• adding controls/feedback expensive + takes up space
  • physical buttons, speakers, vibrators cost money
  • every added control takes up space!

• designer time is expensive
  • design usually requires several iterations before success
  • product pulled if not immediately successful

• and then - consumers value cost / looks over usability!!
  • looks great in store…but doesn’t work the way you expected
technology-center vs. human-centered design

different attitudes toward design
attitudes towards design

• natural to design for all kinds of reasons ...

• technology-centered design

• design decisions are guided by technology

• prevalent attitude in real world because . . .

• technology is fun!

• making novel things is engaging – for the designer

• If it seems like it should work well – or looks cool – people often buy it, too.
maxwell smart: 
the “father” of technology centered design

mad scientist? hmmm
maxwell smart: the "father" of technology centered design

mad scientist? hmmm
try: google “wearable phone”

cool!
but - what would it actually be like to use these?
Segway:

- what is it for?
attitudes towards design

• Technology- (or curiosity-driven) design:
  • can be the basis of radical innovation that eventually will change peoples’ lives.
  • Not necessarily a bad thing.

• The problem?
  • risk of leaving out real people, who have real problems right now.
spectrum of attitudes towards design

technology

• attitude of technology–centered design
  – progress made by technological advances
  – goal is to show off gadgets and inventions

attitude of designer-centered design

  – progress made by considering designers’ intuition
  – imagining what the user will do and feel

• attitude of human-centered design
  – progress made by incorporating people into the process
  – empirical studies integrated early into the design + users as part of the development team
learning goals

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