

# **Comp 441 - Human-Computer Interface Design**

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Week 1 - 19th January 2017

Dr Nick Hayward

# Course Details

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## Lecturer

- Name: Dr Nick Hayward
- Office: 53I Lewis Towers (WTC)
- Office hours
  - *Monday afternoon by appointment (53I Lewis Towers, WTC)*
- [Faculty Page](#)

# Course Schedule

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## Important dates for this semester

- Class schedule = Thursday @ 7pm (9/9.15pm with no break)
- Spring break: 6th to 11th March 2017
  - **n.b.** no formal class: 9th March 2017
- Easter holiday: 13th to 17th April 2016
  - **n.b.** no formal class: 13th April 2017
- Final class: 27th April 2017
  - Final presentation due on Thursday 27th April 2017 @ 7pm
- Exam week: 1st May to 6th May 2017
  - Final assessment due on Thursday 4th May 2017 @ 7pm

# Assignments and Coursework

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## Course will include

- weekly bibliography and reading
- weekly notes, examples, extras...

## Coursework will include

- quizzes or group exercises at the end of each section (Total = 30%)
  - *based on course notes, reading, and examples*
  - *multiple-choice questions for quizzes*
- preparatory work for final assessment (Total = 40%)
  - *throughout the semester*
  - *posted to Trello group...*
- demo and report of final assessment (Total = 30%)
  - *demo due 27th April 2017 @ 7pm*
  - *report due 4th May 2017 @ 7pm*

# Final Assessment

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## Initial overview

- combination of semester's preparatory work and final demo and report
- final demo
  - *presentation, online demo, video overview...it's your choice*
  - *anonymous peer review*
- individual work or group (max. 4 persons)
- design and develop a new interface for an existing computing product, service, application, tool or publication
  - *idea is not to invent completely new product etc...*
  - *iterate or modify to meet specified requirements*
- explain pros and cons of existing interface
- contrast old and new interface

## Goals of the course

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A study of the interaction between humans and computer-based systems.

Course will provide

- methods for evaluating, designing, and developing better interfaces
- focus upon interface design
  - *guidelines and examples*
  - *prototyping*
  - *testing...*
- additional details on interaction
- acquire an awareness of different design and evaluation methods
- practical and effective methods for improving interfaces and interaction

# Course Resources

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## Website

Course website is available at  
<http://csteach44l.github.io>

- timetable
- course overview
- course blog
- assignments & coursework
- bibliography
- links & resources
- notes & material

## GitHub

Course repositories available at  
<http://github.com/csteach44l/>

- weekly notes, examples, and source code (where applicable)

# An Introduction to HCI - I

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## What is human-computer interface design?

- inherently a simple topic or concept
- simple act of inserting a mediating computer
- eg: a user wants to send a message or play some music...
  - *could use paper and pen, or play an instrument*
  - *may involve an intermediary tool*
  - *essence of design and usage bears some resemblance to HCI*
  - *related discipline of human factors*
- it is the computer that makes HCI distinctive



# An Introduction to HCI - 2

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## Adding a computer

- transforms the representation of a task and required skills
- changes our user's act of writing or playing a musical instrument
  - *flesh out a message or story*
  - *compile, contrast, splice, and manipulate our music*
- add users, become a crowd or group
- add networks and more machines
- disparate variants of computer mediation forming our concept of HCI

# An Introduction to HCI - 3

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## HCI Components

- an object, an artifact that needs engineering and implementing
- the process of design for the interaction, and the objects themselves
- the principles, theories, abstractions, guidelines, facts...surrounding HCI

## We can consider these as

- engineering interaction
- designing interaction
- the actual science of interaction itself

# An Introduction to HCI - 4

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## HCI as a technology

- importance of linking engineering, design, and science together
- technologies largely derived from other technologies
  - *Brian Arthur, W. 'The Nature of Technology: What it is and how it evolves.' Free Press. 2011.*
- technologies composed of disparate parts, each technologies as well
- technologies devolve to a point where they cease to be a technology
  - *this is the point where science plays a role*
  - *eg: keyboards and electrical capacitance*
- exploitation of natural occurrence of capacitance
  - *provides HCI function of signaling known, reliable interaction*

For example, text editor keypress demo

# An Introduction to HCI - 5

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## HCI and Science

- science should continue to play an important role in the development of HCI
- development and promotion of theory
- enables further *explanatory evaluation*
  - *expand upon rudimentary A-B testing*
  - *limited without an understanding of why*
- enables *generative design*
  - *allows us to modify design based upon an understanding of interaction*
  - *adjust design according to interaction*

# User-Interface Design Rules - I

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## Historical Background

- advent of interactive computer systems and promotion of good design
- publication of user-interface design guidelines
- notable examples since early 1976
  - 1976: *CHERITON* and early interactive computer systems
  - 1983: *NORMAN's rules for designing user-interfaces based upon human cognition*
  - 1986: *SMITH & MOSIER* penned one of the most comprehensive sets of user-interface design guidelines
  - 1987: *SHNEIDERMAN's "Eight Golden Rules of Interface Design"*, which is now in its fifth edition.
  - 1988: *BROWN* wrote a set of design guidelines, simply entitled "*Human-Computer Interface Design Guidelines*"
  - 1990: *NIELSEN & MOLICH* suggested a set of design rules for the application of heuristic evaluation of user interfaces.
  - 1992: *MARCUS* presented guidelines for graphic design in online documents and user interfaces

# User-Interface Design Rules - 2

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## 21st Century Approach

- growing popularity of mobile platforms and online systems
- new and targeted user-interface guidelines
- notable examples include
  - 2005: *STONE et al outlined general guidelines for user-interface design and evaluation*
  - 2006: *KOYANI et al addressed design and usability guidelines specifically for research-based web design*
  - 2007: *JOHNSON suggested some common user-interface design do's and don'ts*
  - 2009: *SHNEIDERMAN updated his well-known tome to its current 5th edition*

# User-Interface Design Rules - 3

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## Platform Guidelines

- new century saw more platform specific publications
  - *Apple, Google, Microsoft...many, many others*
- each set promotes design suggestions, preferences, rules for their given platform
- examples include
  - *Apple - UI Design Basics*
  - *Gnome - Human Interface Guidelines*
  - *Google - Material Design*
  - *Microsoft - Guidelines for Windows Runtime apps*
  - *and many, many more...*

## Links & Resources

More to come later in the semester.

# Video - User-Interface Design Rules - 4

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## Introduction to Google's Material Design

DesignBytes: Intro To Material Design



YouTube - Google's Material Design



# Image - User-Interface Design Rules - 5

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## Microsoft's platform convergence...



# User-Interface Design Rules - 5

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## Resolving Conflicts

- following user-interface design guidelines is not always simple
- aspirational goals of design rules and guidelines
  - *inherently general to broaden potential application*
  - *often open to broad interpretation*
- many rules will appear to be suitable for a given design situation
- applicable design rules will often appear to conflict
- application of these rules will suggest potentially different designs
- designers will need to choose their preferred design rule for a given situation...
- designers choose an order of precedence for their design

# User-Interface Design Rules - 6

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## Conflicting Goals

- design problems and scenarios will often present conflicting goals
- potential for conflicting design guidelines and rules
- examples such as
  - *Powerful and Simple*
  - *High Resolution and Fast Loading*
  - *Multifunctional and Easy to Learn*
  - *WYSIWYG and Accessible for the Blind*
- designers need to address such conflicts and make informed decisions
- decisions guided, not restricted or dominated, by design guidelines and rules

# User-Interface Design Rules - 7

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## Application of Laws

- consider user-interface design rules and guidelines as a set of laws
  - *instead of step-by-step recipes*
- laws interpreted and applied by experienced practitioners
- understand the basis for user-interface rules
- learn from experience the application of these rules
- focus upon an understanding of how to apply these guidelines
- understand the underlying rationale of user-interface rules

# User-Interface Design Rules - 8

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## Quick Comparison: User-Interface Design Guidelines

Nielsen & Molich (1990)	Shneiderman & Plaisant (2009)
Aesthetic & minimalist design	Cater to universal usability
Consistency & standards	Design task flows to yield closure
Error prevention	Make users feel they are in control
Flexibility & efficiency of use	Minimise short-term memory load
Help users recognise, diagnose, and recover from errors	Offer informative feedback
Match between system and real world	Permit easy reversal of actions
Provide online documentation & help	Prevent errors
Recognition rather than recall	Strive for consistency
User control & freedom	
Visibility of system status	

# User-Interface Design Rules - 9

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## Origin of Design Guidelines

- similarity between each set of rules is not simply due to coincidence or inheritance
  - *not the result of author's whim...*
- noticeable similarity, and close association in context and emphasis
- due to the influence of human psychology
  - *how we learn, perceive, reason, remember, process and convert intentions into actions*
- many authors of guidelines had a background in psychology
  - *this was then applied to the design of computer interfaces*
- Brown, Molich, Nielsen, Norman, and Shneiderman...
  - *applied knowledge of cognitive and perceptual psychology*
  - *improve the design of interactive systems*

***User-Interface guidelines are based upon human psychology.***

## Image - Design Example - I

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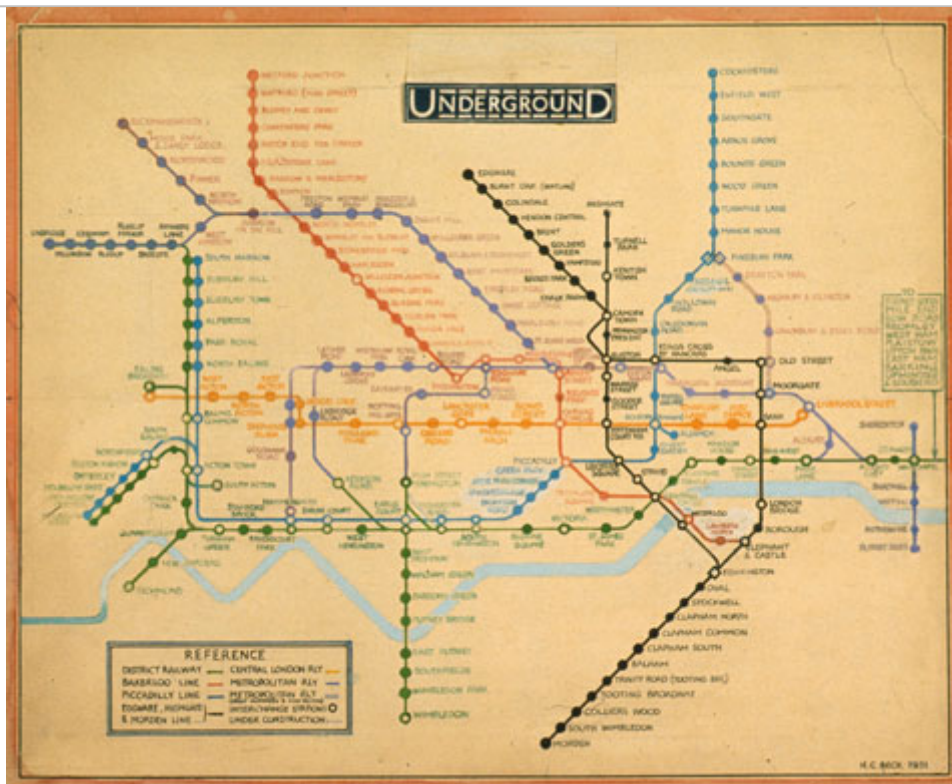
The world is awash with poorly designed things...



Remote controls are a prime example!

## Image - Design Example - 2

and many good things aswell...



1931 London Underground Map

1931 London Underground Map



## Image - Design Example - 3

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Does it really matter if things are poorly designed?



You may camp in the wrong place, and at the wrong time...

## Image - Design Example - 4

### Confusion due to poor design

**Confusion at Palm Beach County polls**  
Some Al Gore supporters may have mistakenly voted for Pat Buchanan because of the ballot's design.

Although the Democrats are listed second in the column on the left, they are the third hole on the ballot.

Punching the second hole casts a vote for the Reform party.

Party	President	Vice President
(REPUBLICAN)	GEORGE W. BUSH	DICK CHENEY
(DEMOCRATIC)	AL GORE	JOE LIEBERMAN
(LIBERTARIAN)	HARRY BROWNE	ART OLIVIER
(GREEN)	RALPH NADER	WINONA LADUKE
(SOCIALIST WORKERS)	JAMES HARRIS	MARGARET TROWE
(NATURAL LAW)	JOHN HAGELIN	NAT GOLDHABER

Party	President	Vice President
(REFORM)	PAT BUCHANAN	EZOLA FOSTER
(SOCIALIST)	DAVID McREYNOLDS	MARY CAL HOLLIS
(CONSTITUTION)	HOWARD PHILLIPS	J. CURTIS FRAZIER
(WORKERS WORLD)	MONICA MOOREHEAD	GLORIA LA RIVA

**WRITE-IN CANDIDATE**  
To vote for a write-in candidate, follow the directions on the long stub of your ballot card.

Sun-Sentinel graphic

Ballot Paper

### 2000 USA Presidential Ballot in Florida

## Cultural considerations...

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- standardising an interface or localising...
- local issues arise from cultural misunderstanding
- Cardiff City Football Club change their colours...then change them back again
  - *Report*

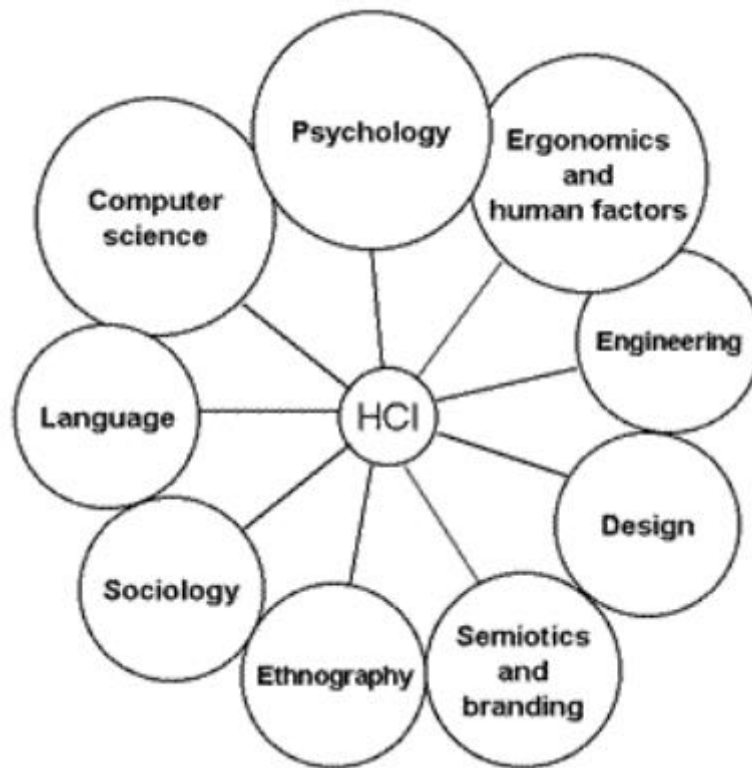
This is a very interesting consideration for interface design.

More to come later in the semester.

# Image - HCI - I

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## The many fields of HCI



Field of HCI

Not just computer science and design...

### HCI Components

- Guidelines
- Methods
- Models
- Principles
- Techniques
- Theories

## HCI - 3

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HCI is

- Creative
- Design aware
- Evaluative

## Design

- design is all around us
- art, music, culture in general
- to be good designers we have to appreciate the arts
- understand the rich history of graphic design
- its trends, products, and leading figures
- Vimeo - Milton Glaser Intro
  - <http://vimeo.com/11577085>

## References

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