

Updated: July 17, 2017

University of Southern California

Affective Computing CSCI534

Fall 2017

Objective:

Affective Computing is computing that relates to, arises from, or deliberately influences emotions. This course overviews the theory of human emotion (how it arises from and influences cognition, the body and the social environment), techniques for recognizing and synthesizing emotional behavior, and illustrate how these can be applied to application design. The graduate Computer Science and Computer Engineering major will gain a strong background in the theory and practice in human-centered computing as it relates to games, immersive environments and pedagogical applications.

Instructors: [Jonathan Gratch](#)

Number/Units: 3 (4)

Date/Time: Mon-Wed 330-5:20, WPH 102

Grades: Grades determined by class participation 10%, in-class quizzes 30%, mid-term project presentation 10%, homework 10%, final project presentation 15%, final project writeup 25%

The course is largely project based. Students are expected to work in teams to develop, executed and present a research project. Students are encouraged to build on existing tools. A complete list of pre-existing software tools available to students, and summaries of some prior student projects build with these tools can be found [here](#)

Source book: [Oxford Handbook of Affective Computing](#) (OHAC): useful but not required

Software: Students will gain knowledge and/or hands-on experience with the following software tools related to affective computing including:

- Emotion Recognition Techniques
- Emotion Synthesis Techniques
- Cognitive and Emotional Modeling
- Machine Learning algorithms that support the above methods

Course Outline [Tentative]

(WARNING: Below is tentative and will change quite a bit before class starts. Largely the same topics will be presented but some changes to their order will occur)

Lecture 1 (Aug21) Course Overview. Introduction to Affective Computing

- Review structure of course
- What is affective computing?
- Broadly overview functions of affect and why of interest to computer science
- Overview applications that take advantage of these perspective
- Readings:
 - [OHAC, Chapter 1](#) (skim). Summarizes major topics in affective computing
- Optional Readings:
 - [OHAC, Chapter 2](#). Entertaining retrospective on field of affective computing from founder of the field
- [Lecture slides](#)

Lecture 2 (Aug23) Experimental Design, Methodology and Analysis

- Guest Lectures by [Gale Lucas](#), USC ICT
- Reading:
 - sparknotes reading on [Research Methods in Psychology](#), a good summary of research methods. You have to click through each section separately to read. Or, if you pay Barnes and Noble \$5 you can get a “clean” version w/o ads [here](#)
- Homework 1: Assigned during class
- [Lecture slides](#)

Lecture 3 (Aug 28) Emotion Theory

- Define affective phenomena (emotion, mood, attitude/sentiment, personality)
- What is theory and why does it matter?
- Present alternative theoretical perspectives on emotion
- Readings
 - [OHAC, Chap 3](#). Short history of psychological perspectives on emotion
 - [Barrett video interview](#) (first 15min): Outlines alternative theories of emotion
- Optional readings
 - [Scherer\(2010\)](#), p10-19: Another take on alternative theories of emotion
 - [The science of ‘Inside Out’](#)
- [Lecture slides](#)

Lecture 4 (Aug 30) Emotion Theory (continued)

- For class, first complete the [NFC Scale](#), then score the scale based on these [Instructions](#) and email me the result
- Optional Readings
 - [Ellsworth and Scherer 2003](#): review of appraisal theories
 - [Smith and Lazarus 1990](#): description of their appraisal and coping theory
- Paper related to in-class experiment
 - [Thorndike 1920](#)
- [Lecture slides](#)

Sep 4: Labor day

Lecture 5 (Sep 6) Emotion Modeling

- Introduce appraisal theory and the component model
- Discuss EMA
- Reading- [Marsella, Gratch and Petta \(2010\)](#): reviews modeling research
- Reading- [Marsella and Gratch \(2009\)](#), sections 1.1, 1.2, 2 and 3: describes model of “the Bird”
- Optional Readings
 - [Gratch \(2012\)](#): Argues for role of computer science in emotion research
- [Lecture slides](#)

Lecture 6 (Sep 11) Emotion Modeling (continued)

- [Lecture slides](#)

Lecture 7 (Sep 13) Emotion and the Mind

- Decision theory review
- Emotion and decision making (Loewenstein)
- Contrast between human and rational decisions (e.g. prospect theory)
- Reading: [Loewenstein and Lerner 2003](#), p620-633. You should understand figure 31.1
- Reading: Watch PBS’s “[Mind over Money](#)”
- Optional Reading: [Mellers et al 1999](#): Emotion-based choice
- Experimental materials: [Stim1](#); [Stim2](#)
- [Lecture slides](#)

Lecture 8 (Sep 18) Emotion and the Mind (continued)

- Discussion of group projects. Explore topics and tentative teams
- [Lecture slides](#)

Lecture 9 (Sep 20) Emotion and the Body

- Psychophysiology: Guest lecture by [Sarah Townsend](#), (9/22). USC Marshall School
- Embodied theories of emotion: Guest lecture by Stacy Marsella, Northeastern Univ.
 - Physical manifestation of emotion
 - Embodied theories of emotion
- Reading: [Blascovich & Mendes 2010](#): Reviews psychophysiological findings. Only required to read following sections:
 - Neurophysiological systems, advantages & Indices (p199-203)
 - Uses [affect, attitudes, emotion] (p 210-215)
- Optional Reading (Sep22): [OHAC, Chap 14](#): Reviews physiological sensing of emotion
- Reading (Sep29): [Niedenthal 2007](#): Discusses embodied approaches to emotion
- Optional Reading (Sep29): [Cuddy body language TED Talk](#)
- [Lecture slides](#)

Lecture 10 (Sep 25): Guest Tutorial

- Virtual Human Toolkit tutorial offered by [Arno Hartholt](#), USC ICT. This is one of the tools available for students to use in projects.
- Use time to plan group projects (note: in class presentations on Oct 6)
- [Lecture slides](#)

Lecture 11 (Sep 27) Emotion and the Body (continued)

- Review of major themes at Affective Computing Conference
- Physiological and Brain Computing
- Optional Reading: [OHAC, Chap 15](#): Discusses affective brain-computer interfaces
- Reading (Sep24): [Fairclough 2009](#) – Fundamentals of physiological computing
- Outside resource (Sep24): [Brain-Computer Interface Tutorial](#)
- [Lecture slides](#)

Lecture 12 (Oct 2) Embodied cognition

- Embodied theories of emotion
 - Physical manifestation of emotion
 - Embodied theories of emotion
- [Lecture slides](#)

Lecture 13 (Oct 4) Group Project Presentations

- Students will give 5min presentations of their project

Lecture 14/15/16 (Oct9/11/18) Emotion and Social Interaction

- Rational perspectives on social emotions:
 - game theory (decomposed example)
 - other regarding preferences
- Social theories of emotion
 - Theories of social emotions: leakage, social intention, social appraisal
- Mind perception theory
- Reverse appraisal theory
- Reading: [Game Theory Introduction](#), p1-11
- Reading: [Gray & Wegner 2012](#): Discusses mind-perception theory and uncanny valley
- Reading: [de Melo et al 2014](#), introduction, exp1, and general discussion: describes “reverse appraisal”
- Optional Reading: [Keltner and Haidt 1999](#): discusses social functions of emotions
- [Lecture 14](#), [Lecture 15](#), [Lecture 16](#)

Lecture 17 (Oct 20) Emotion interaction

- Emotional feedback and attunement
- Optional Reading: [Parkinson 2014](#): reviews theories of social emotions
- [Lecture 17](#)

Lecture 18 (Oct 25) Synthesis of emotional behavior

- Interactive emotions
- Encoding-Decoding: realistic vs. communicative approaches
- Expression synthesis techniques
- SmartBody
- Reading: [OHAC, Chapter 18](#), Section 2 only; Digital expression synthesis
- Reading: [OHAC, Chapter 21](#), Section 3 only; Robotic expression synthesis
- Optional Reading: [Parkinson2008](#): Emotions in social interactions
- Optional Reading: [OHAC, Chapter 20](#); Emotional speech synthesis
- Optional Reading: [OHAC, Chapter 19](#); Gesture & postures synthesis
- [Lecture slides](#)

Lecture 19-20 (Oct 27/30) Emotion Detection

- **Guest Lecture.** (Oct 27) Danny Bone, USC SAIL: Emotion in voice
- Overview of emotion recognition
- Impact of context in emotion recognition
- Emotion in the face
- Reading: [Zeng et al 2009](#), intro and section 4 (rest suggested); survey of affect recognition
- Reading: [Lee & Narayanan2005](#): formative paper in recognizing affect from speech

- Optional Reading: [Barrett et al 2011](#); Contextual influences on emotion perception
- Optional Reading: [OHAC, Chapter 10](#); Face expressions
- [Lecture19](#), [Lecture20](#) slides

Lecture 21/22 (Nov 1/6) Emotion Detection (continued)

- Guest Lecture [Stefan Scherer](#), (Nov3)
- Emotion in Text (Twitter, Facebook, etc)
- Multimodal techniques and machine learning: USC ICT
- Reading: [OHAC, Chapter 13](#); Recognizing affect from text
- Optional Reading: Bin Lu, [Web Data Mining Chap11](#)
- [Lecture21](#), [Lecture22](#)

Lecture 23 (Nov 8) Ethics and Affective computing

- Review HW4
- Discuss theories of how social machines might help or hinder human social interactions
- Discuss ethical frameworks
- Reading: [OHAC, Chapter 14](#)
- Optional Reading: [Robot sex](#): discusses ethics of building robots that have relations with people
- Optional Reading: [Turkle 2010](#): Discussion of robot companions
- Optional Reading: [Pickett and Garner](#): discusses social mechanisms that connect us to other humans
- [Lecture slides](#)

Lecture 24 (Nov 13) Personality and Culture

- Personality computing
 - Review Lens model
 - Discuss automatic personality recognition, perception, synthesis
- Personality (and motivation) in computer games
- Limitations of personality computing approach
- Sacred values and Moral decision making
- Optional Reading: [Haidt and Graham 2007](#): review of moral foundation theory
- Optional Reading: [Vinciarelli and Mohammadi 2014](#): survey of personality computing
- Optional Reading: [Yee et al 2011](#): expression of personality in World of Warcraft
- Optional Reading: [Connelly and Ones 2010](#): Discusses limits of personality approach
- [Lecture slides](#)

Lecture 25 (Nov 15) Emotion Applications (Games and serious games; health)

- Guest Lecture (Nov 19): Ning Wang
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- Discuss relationship between theories we've seen (appraisal; challenge/threat; flow)
- Introduce concept of achievement goals
- Introduce the "affective loop"
- Apply these concepts to educational and entertainment games
- Optional Reading: [Pekrun, et al. 2002](#): Discusses achievement goals
- Optional Reading: [Yannakakis and Paiva 2014](#): Emotions in games
- [Lecture slides](#)

Lecture 27 (Nov20) TBD

Lecture 28 (Nov 27) Final Project Presentations

Lecture 29 (Nov 29) Final Project Presentations

