Syllabus: SCS 08-766/08-781 – Tepper 45-887- Spring 2016

Mobile and IoT Computing Services

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Background

With nearly 5 billion mobile phone users worldwide, including well over 2 billion smartphone users, new mobile and IoT computing applications and services are changing the way enterprises interact with their customers and employees. The explosion in smartphone ownership and a slew of other smart devices (e.g. activity bracelets, smart thermostats, Bluetooth beacons) along with the deployment of 4G (and soon 5G) networks is leading to a slew of new mobile and Internet of Things (IoT) applications and services. They range from mobile commerce services to wireless enterprise apps and mobile social networking apps, all the way to more futuristic IoT scenarios

Objective

The objective of the course is to introduce participants to the technologies, services and business models associated with Mobile and IoT Computing. It also provides an overview of future trends and ongoing research in this new and fast growing area.

What You Will Learn

Students who take this course will **learn to evaluate critical design tradeoffs** associated with different mobile and IoT **technologies**, **architectures**, **interfaces** and **business models** and how they impact the **usability**, **security, privacy** and **commercial viability** of mobile and IoT computing services and applications.

Topics Include

Mobile & Wireless Communications, Mobile and IoT OS's, Mobile Web technologies – including app development, Mobile Security, Mobile Payments, Mobile Web Apps and Services (e.g. Mobile Entertainment, Mobile Banking, Mobile, Mobile Social Networking, Mobile Health, etc.), Location-Based Services, RFID, Mobile Enterprise Apps, Internet of Things applications, services and infrastructure.

Discussions cover technologies, usability, business models and policy issues (e.g. privacy). The course also provides an overview of future trends and ongoing research in this new and fast growing area.

Projects

Students enrolled in the 9-unit section of the course are expected to complete a team project.

Course Approach/Philosophy

The course's approach is one that emphasizes "learning by sharing" and "learning by doing" with a substantial percentage of a student's grade being based on a project to be defined jointly with the instructor (9-unit section only).

6-Unit vs. 9-Unit Mini-Semester sections and 12-Unit/Full-Semester Option

- 6-unit section: Includes three homework assignments
- 9-unit section: Class project – including final report and project presentation as part of Project Fair at the end of the Mini-Semester (see calendar below).

Both sections share the same lectures and same midterm and final exams.

There is an option to enroll in a **12-unit (Full Semester) version of the course**. Students who opt for the 12-unit section are subject to the exact same expectations as those in the 9-unit section, which includes completing a class project by the end of the first mini-semester and taking the same midterm and final exams as students enrolled in the mini-semester sections. During the second half of the semester, they are given a chance to further refine their prototype. There are no classes during the second half of the semester. Students just have a couple of meetings with the instructor and then provide an updated version of their final project report along with a demo of their refined prototype. This option is primarily intended for students who want to refine their app prior to releasing it on the iOS App Store or Google Play store.

Grading

6-Unit Format (Mini-Semester)

- Closed Book Midterm: 25%
- Closed Book Final Exam: 20%
- Homework Assignments: 50%
- Class Participation: 5%

9-Unit Format (Mini-Semester)

- Closed Book Midterm: 25%
- Closed Book Final Exam: 20%
- Project: 50%
- Class Participation: 5%

12-Unit Format (Full Semester)

- Two grades:
    - Mini 1 grade (9 units): same as 9-unit section
    - Mini 2 grade (3-units) : 100% based on progress made on the project, which involves giving a final demo and delivering an updated project report

Important Note on Recording and Videotaping

- Videos of lectures prepared by Carnegie Mellon personnel will be made available online to students within a few days of each lecture (often on the same day). These videos are for use only by students enrolled in the course and are not to be copied or made available to others.

- Please note that if you ask questions in class they will likely be captured on video. If you do not feel comfortable having your questions recorded, please talk to the instructor about other possible arrangements.
- No student may record or tape any classroom activity without the express written consent of the instructor.

Lectures

Meeting Times: Tuesdays & Thursdays, 10:30am - 11:50am, 4307 Gates Hillman Center

Lecture 1: Course Summary and Objectives (Jan 12) – N. Sadeh
- Objectives of the course
- Context and Trends: The Forces Behind Mobile and Pervasive Commerce
- A first look at i-Mode and the iPhone App Store
- Reference material: to be provided at the end of the lecture's slides

Lecture 2: Mobile Programming Environments (Jan 14)
Note: This lecture will be given by the TA's. It will include a managerial overview of major mobile programming environments. This lecture is primarily intended for people enrolled in the 9 and 12-unit sections of the course, namely people working on course projects. Nevertheless, it should also be of interest to students enrolled in the 6-unit sections, including Tepper MBA students. There will not be any programming involved in the HW assignments or the exams.
- iPhone SDK
- Android
- HTML5 & web development environments
- Voice technologies
- Relevant APIs – including Facebook and more
- Reference material: to be provided at the end of the lecture's slides

Lecture 3: Mobile OSs and Mobile Internet Technologies (Jan 19) – N. Sadeh
- A Brief Managerial Overview of Mobile and Wireless Communication
- A first managerial overview of Android, iPhone SDK, HTML5 and more
- Understanding available sensors and external sources of contextual information
- Understanding the importance of the cloud
- A first look at usability considerations
- Reference material: to be provided at the end of the lecture's slides

Lecture 4: Designing for Mobile and IoT Usage Scenarios (Jan 21) – N. Sadeh
- Designing Mobile Internet Applications: Usability Challenges
- User-Centered Design Principles and Methodologies
- Reference material: to be provided at the end of the lecture's slides

Lecture 5: Mobile & IoT Security (Jan 26) – N. Sadeh
- Mobile Security Challenges: Organizing the threats
- Android and iOS Security
- Mobile Malware
- Mobile App Security
- IoT Security

- Securing the Mobile and IoT Users
- Reference material: to be provided at the end of the lecture's slides

Lecture 6**: **Mobile Commerce & Mobile Enterprise Apps Today (Jan 28) – N. Sadeh

- Understanding prevailing and emerging business models
- A Closer look at the iPhone App Store and Android Market: Who makes money and how?
- Understanding Mobile Advertising
- Mobile Payment Solutions: Understanding the tradeoffs
- Mobile enterprise applications
- In-depth look at a few trend setting applications
- Reference material: to be provided at the end of the lecture's slides

***Lecture 7**: **IoT Today** (Feb 2*) – N. Sadeh

- Mapping the IoT Landscape
- Smart Buildings
- Smart Cities
- Smart Cars
- Wearable Devices
- Robots and Drones

Lecture 8 Mobile Fitness & Health Apps (Feb 4) – N. Sadeh

- Understanding the trends, technologies, value chains and business models
- Understanding associated usability, security and privacy issues

Lecture 9: MIDTERM EXAM (Feb 9) 10:30am to 11:50am – check below to see what location you should report to –

Classroom 4307 Gates Hillman Center
Students enrolled in 08-781

3305 Newell Simon Hall
Students enrolled in 08-766

6115 Gates Hillman Center
Students enrolled in 45-887

Lecture 10**: **Location-Based Services (Feb 11) – N. Sadeh

- Overview of positioning/location tracking technologies
- GPS, A-GPS, WiFi-based location tracking, hybrid solutions, combining 3-axis gyroscope and 3-axis accelerometer readings, etc.
- Overview of Location-Based Services (LBS)
    - Services, Technologies and Business Models
- Indoor navigation (malls, airports, corporations)
- The Value of location data
- Mining location data
- A first look at privacy issues

Lecture 11: Siri, Google Now and the Emergence of Intelligent Assistants (Feb 16) – N. Sadeh

- Context Awareness: Beyond location – understanding the drivers
- Underlying technologies
- Siri as the future operating system
- Emerging value chains and business models

Lecture 12: Mobile and IoT Privacy (Feb 18) - N. Sadeh
- What is Privacy?
- Why does it matter?
- Why is it challenging?
- Relevant laws and regulations
- Mobile Privacy: What are the "best practices" or how do I stay out of trouble?

Lecture 13: Mobile and IoT: What Next? (Feb 23) – N. Sadeh
- Understanding the trends and technologies
- Selective overview of ongoing development, including ongoing research in industry and academia

Lecture 14: Project Poster Session (Feb 25) – **4405 Gates Hillman Center, 10:30am to 11:50am**
- This is your show!
- Popular-vote and staff-judged poster contests
- $1,000 prize for best team

FINAL EXAM SECTIONS 08-766 & 08-781: TBD

TEPPER FINAL EXAM SECTION 45-887: Friday, February 26, 2:00pm-5:00pm; room 153 Posner Hall

FINAL PROJECT REPORTS due by midnight on Wed, March 2, 2015

- **Late submission policy (Project Report & Homework Assignments)**: 10% of the grade deducted per late day (e.g. submission of the final project report at 12:01am on Thursday March 3 is considered one day late)….**Don't be late!**

Office Hours and Contact

TAs:

Andrew Orobator
email address: aorobato@andrew.cmu.edu; office hours: Mondays/Wednesdays, 2:00pm to 3:00pm in room TBD

Aerin Zhang
email address: shikunz@andrew.cmu.edu; office hours: Tuesdays/Wednesdays, 9:30am to 10:30am in room TBD

Devansh Kukreja
email address: dkukreja@andrew.cmu.edu; office hours: ??????

Seongmin Park
email address: seongmi1@andrew.cmu.edu; office hours: Mondays/Fridays, 5:00pm to 6:00pm in room TBD

Instructor: Norman Sadeh: 5303 Wean Hall, sadeh@cs.cmu.edu – **Please email the TAs first - they are likely to respond much faster.**
Office Hours: Tuesdays/Thursdays: 3:00pm to 4:30pm on a first-come-first-serve basis….or (**strongly recommended**), if you want to avoid the wait, reserve a 15 minute slot by contacting Ms. Linda Moreci (laf20@cs.cmu.edu). **Each project team should aim to come and meet with the instructor every other week.**

Communication

- Use blackboard to submit your final project report and HW assignments
- Project proposals (including team composition) should be submitted using the "DropBox" on Blackboard.
- **General questions should be emailed to one of the TAs first. The TAs handle most day-to-day issues and are coordinating with Prof. Sadeh, as appropriate.**