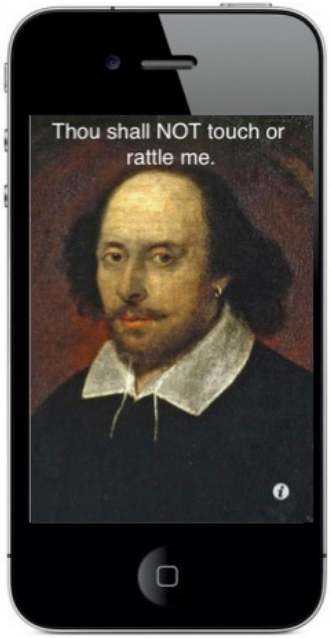
# ECE 1778:
# Creative Applications for Mobile Devices

Instructor: Jonathan Rose

Department of Electrical & Computer Engineering

# Welcome!

- Recent advances in technology and access to it have given us a new creative canvas : **mobile smart phones**
- They are revolutionary
  - despite prior existence of both computers and cell phones

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# Why Revolutionary?

**All in one device:**

- Portability
- Powerful Computer
- Networked
- Sensor inputs
- Output methods

**Key**: **Programmable**

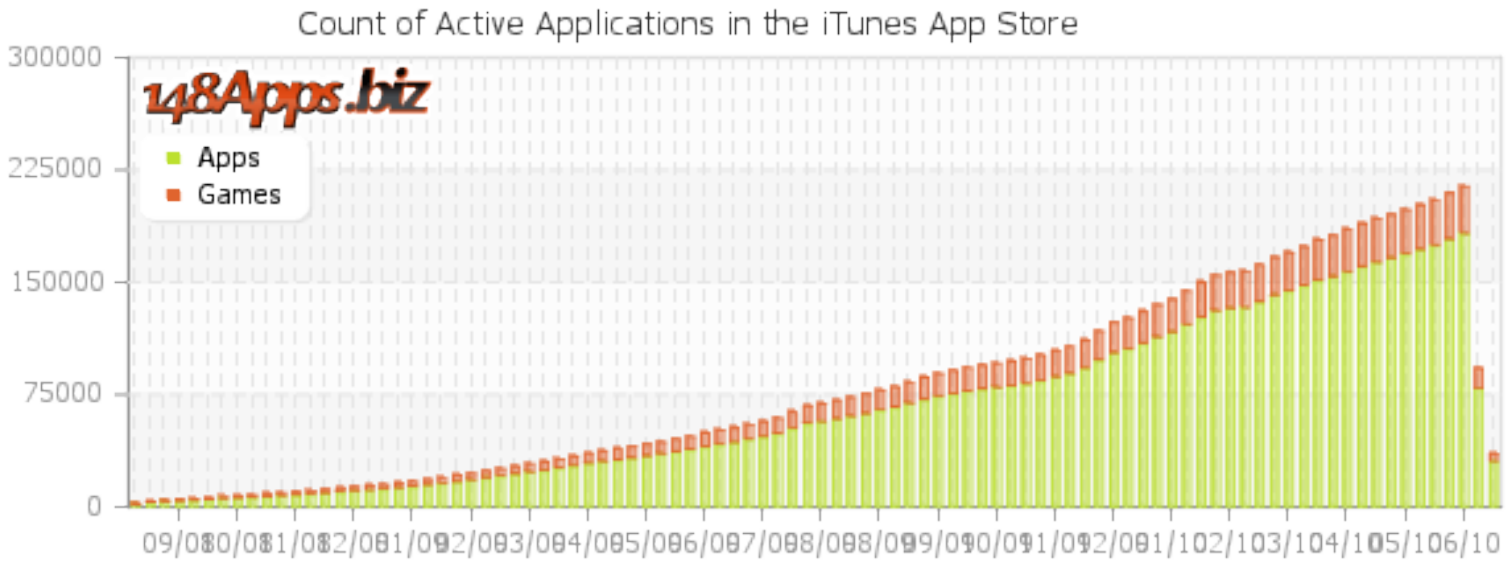
- we are all allowed to create with them



# The Revolution Began July 2008

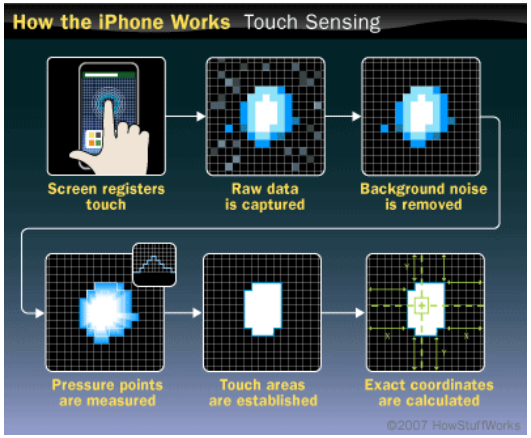
- With the advent of the Apple iPhone App Store
- Today:

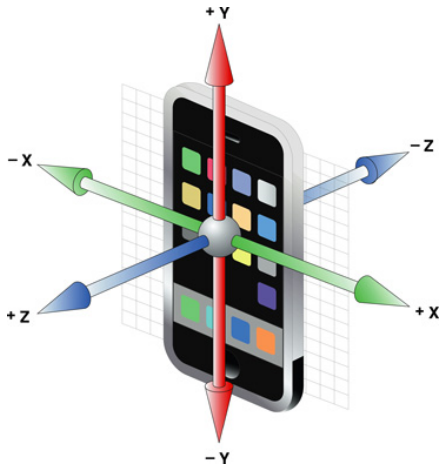
# While There are Many Apps Out There …



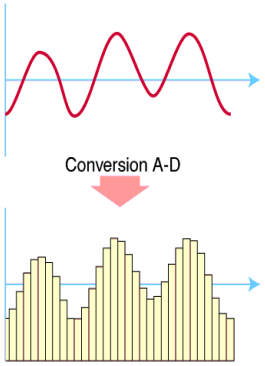

- I think these have only scratched the surface

# Touch, Feel, Locate, Hear, See, Connect





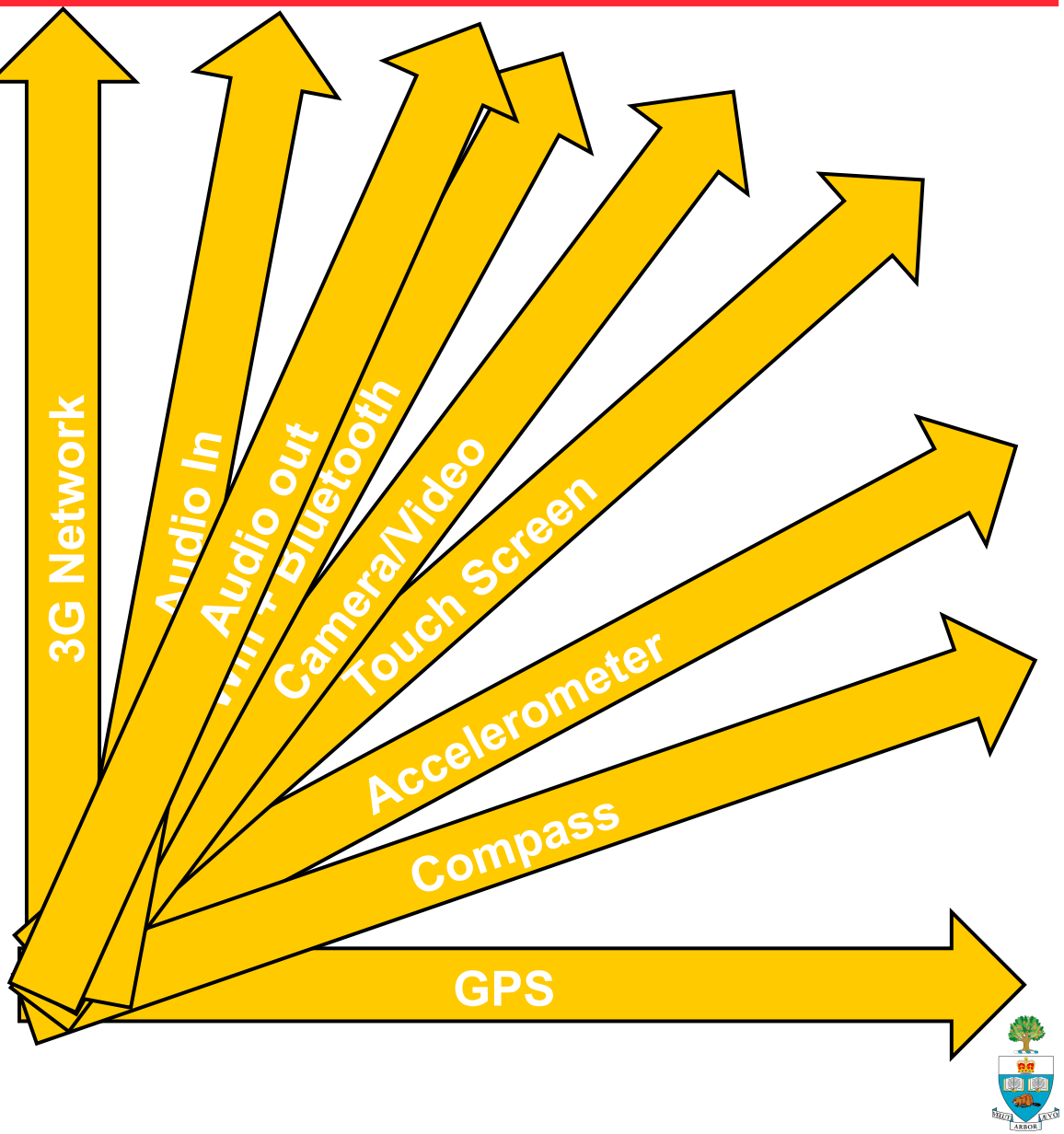



# Many New Ideas are Possible

- In research, human interaction and business
- As people get used to using them for ever more functionality
- As phone hardware capabilities grow (better sensors, faster processors)
- As connected websites/servers provide more capability

# Many *Axes* of Invention Possible

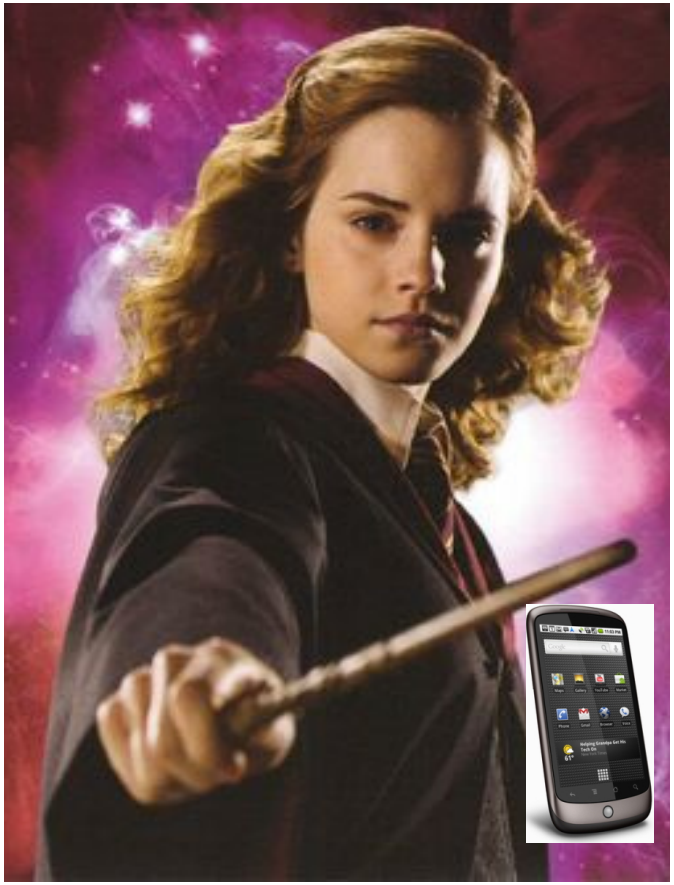
- Each capability is an axis
- Each kind of software capability is also an axis
- Each axis multiplies what is possible with the others!



# This Devices are Really Magic *Wands*

# And the Folks that Create Apps Are …

Magical!



# Goals & Outcomes

# Goals of Course

- **The goal of this course is to have you create an interesting mobile application in a group project**
- This course is open to students from *all* disciplines
- This is an experimental course!
  - I am learning along with you, on several fronts
  - It will be quite a bit of work, for all of us
- The groups **must** consist of people from a mixture of graduate disciplines
  - and include at least one programming-literate person



# Who Is Eligible to Take Course

1. Engineering, Science and other graduate students with strong programming backgrounds
   - Undergraduates with permission of instructor
   - '**Programmer**'

2. Graduate Students from Other Disciplines
   - With some computer literacy
   - A desire to create new app, in art, science, engineering
   - **'Apper'**

**Raise Your Hand if you Think you are a Programmer**

**Raise Your Hand if you Think you are an Apper**

**Raise Your Hand if you Think you are Both**



# Sign Up Sheet

- Name
- Student Number
- Department
- Degree
- Taking Course for credit
  - Yes, Maybe, Audit
- Programmer/Apper self designation
  - Can check both

# Working Across Boundaries

- A core notion of this course is you will work across disciplines

- I have crafted different paths for each of the two ‘types’
  - Programmer & Apper

- **Key**:
  - to reach across the boundaries of disciplines
  - learn the language of the ‘other’ discipline
  - gain ability to interact & collaborate

# Learning/Outcomes

- Knowledge & Experience
  - **Programmer:** How to program in a mobile environment
  - **Apper:** Capabilities of mobile devices & basic technical understanding & how it can be applied to your discipline
- How to Work across disciplines
  - Inter-disciplinary creativity
- Project Experience
  - With tangible deliverables
- Advance of research capability
- To evolve an environment that enables *creativity* in mobile applications



# Instructor Bio: Jonathan Rose

- Professor in Electrical & Computer Eng since 1989
  - Bachelor's, Master's & PhD from here, last in 1986
  - Post-Doc at Stanford 86-89
- Research Field: Field-Programmable Gate Arrays
  - 'soft' hardware that can be programmed to become any circuit
  - includes architecture, circuit design, software and algorithms
- Entrepreneur:
  - Co-founder of Right Track CAD Corp in 1998
  - Senior Software Engineering Director of Altera 2000-2003
  - Run the Engineering Entrepreneurship Seminar Series
- Administration:
  - Dept. Chair of ECE 2004-2009;
  - Newly appointed Director of Engineering Business Minor
- F.IEEE, F.ACM, F.CAE, Senior Fellow Massey College

# The Project

# The Project Group

- Done in Groups of 2 or 3
  - Preferably 2
- Need enough *programmers* : appers to make this work
  - otherwise will have to restrict enrolment
- OK to have groups of programmers-only, if extra



# Rules on Project App

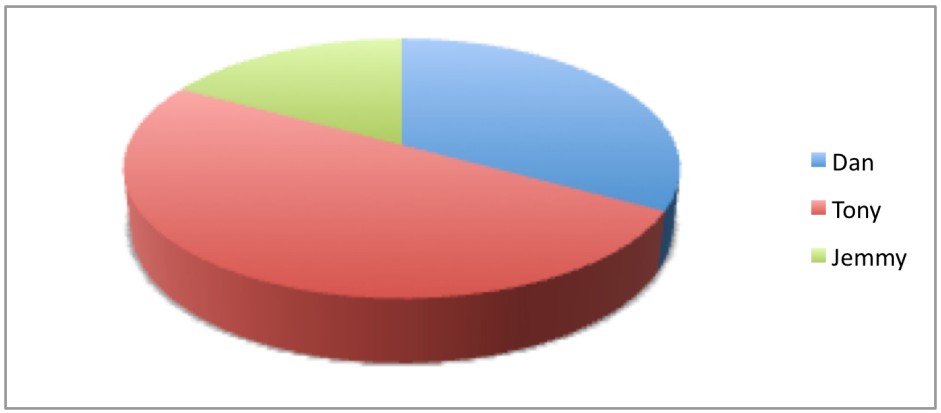
1. Must be in the **discipline of the Apper**
   - an idea to support research
   - or something useful/worthwhile/interesting within the discipline
   - should leverage expertise that discipline
   - e.g. anthropology app (see next page)

2. Must have sufficient technical depth
   - Will be an approval step in process to ensure this

3. *Should* be a new idea
   - Can be variant of existing app if enough different

# Measure the Fraction of Conversation

- Listen to a conversation, and measure the fraction of the conversation that each participant takes up!
- Currently working on this one with Daniel DiMatteo
  - 4th Year Undergraduate
  - Known as ‘Diarization’
  - Using open source software
- Could be used to measure ‘turn taking’ behaviours in different cultures in Anthropology



# Stages of Project

1. **Forming Groups**
   - Within 2 weeks.
   - No auditing of course/project – must commit!
2. **One-Page Proposal**
   - Due February 1st; Must receive approval to proceed
3. **Design Plan**
   - Due Feb 8th
4. **Proposal & Plan Presentations**
   - Weeks of March 8 & 15
5. **Final Presentations**
   - Weeks of April 12 & 19
6. **Final Report Due April 26th**

# Course Material



# Course Website:

- http://www.eecg.utoronto.ca/~jayar/ece1778/

- Plus Blackboard for basic stuff
  - Discussion board
  - Grades
  - Announcements



# Course Material

- Lectures
  - Basic phone capabilities
  - Thinking/discussion about  how to use capabilities in project
  - Programming concepts and some details
  - Project basics
  - Case Studies of interesting/inspiring apps

- Weekly Assignments in first 4-5 weeks
  - Programmers: learning basic SDK and programming
  - Appers: learning Google App Inventor
    - How to create apps without programming



# Mobile Platform - Android

- We will focus on, and I will teach to, Google's Android
  - Widely available, works on all major operating systems (Windows, Mac, Linux)
  - Many phones available
  - Is successful
  - **Con**: Eclipse environment not very clean;
  - Programming Language: **Java**
  - App inventor perfect for **Appers'** learning



# Alternative, if you have a Mac: iPhone

- If you wish to do assignments & project on iPhone, that is allowed, but talk to me first
  - **Pro:** Better development environment
  - **Con:** New(ish) language: Objective C
  - **Con:** Must have a Mac computer

- Assignments are set up to be for Android, though.



# Physical Phones

- Hoping to have some phones donated to help with projects
  - I may purchase a few more
  - Good, also, if you have one yourself
- It is much better (and sometimes necessary) to have an actual phone to develop on
- Can use the emulator for lots of testing, though, and assignments

# Textbook

For **Programmers**

1. The Busy Coder's Guide to Android Development
2. The Busy Coder's Guide to Advanced Android Development
3. The Busy Coder's Guide to Android Tutorials
   - By Mark Murphy
   - $40 buys all current versions, and a year's subscription to the updates, that come out with each new version of Android

Draft Text for **Appers:**

**http://sites.google.com/site/appinventor/in-1**



# Assignments

Due January 25



# Computers to Use

- Your own (Windows, Mac, Linux) or ..
- ECE **Linux** Computers in
  - **Sandford Fleming** building Rooms 2204, 2102
  - **Galbraith** building 243, 251W
- To gain access to ECE Computers:
  - Send email to course TA (braiden.brousseau@utoronto.ca)
  - Will create account
  - Give you room access code



# Assignment P1 for Programmers

- Acquire textbook
- **Need some basic Java knowledge**
  - Get a Java book, or use pointers to wikibook on page xx of text
  - http://en.wikibooks.org/wiki/Java_Programming/Language_Fundamentals
- Download Environment or access ECE computers
- Do “Hello World” tutorial
  - Make it work on an emulator
- Read Chapters 1 through 5 of text, do small coding exercises
- Write simple android application
- Due January 25
- Posted under Assignments on Course Website



# Assignment A1 for Appers

- Gain access to computer (either ECE or your own)
- Access Google App Inventor
  - Need Google account
  - Need to download and install part of it on your computer
  - Or can use it on ECE computers
- Do ‘Hello Purr” tutorial
- Do ‘Paint Pot’ Tutorial
- Describe any issues encountered
- Suggest an idea for a Project
  - To get you thinking

- Posted under Assignments on Course Website



# Grading

- Assignments: **20%**
  - 4 or 5 assignments, starting today!

- Project: **80%**
  - Proposal 10%
  - Plan (incl presentation) 10%
  - Presentation/Demo 20%
  - Final Report 40%



# Commercialization

- If you wish to create an app for sale, feel free
- If not, consider giving away if useful

- University of Toronto Intellectual Property Rules apply
  - Work done here at UofT nominally
    - Requires disclosure & extraction of Universities' rights in exchange for fraction of licensing revenue
  - However, these rules aren't well set-up for apps/app store
  - However, if more than person contributes – group partner, your research supervisor, then their rights must be respected

# Warning: Intellectual Property Considerations

- Scope of course project is broader than those apps that are commercializable – should be motivated by research

- In my experience, all talk of IP tends to make people think about keeping secrets;  that's bad
  - Most ideas live and grow well in 'the light'
  - Don't get caught up in the IP side

# Introductions

# Why

- A crucial part of this course is the project
- You need to get to know each other, to explore who might work well together.

- So, please introduce yourself …



# Introduce Yourself

1. Name
2. Taking Course for Credit – yes, no, maybe
3. What discipline you work in & degree sought
4. What your thesis topic is (if doing thesis)
5. If you work, where.
6. Why you're taking this course
7. What idea you have for an app.