1. Introduction to Android

What is Mobile Apps with Android?

- Android Development along with Cloud Algorithms
  - no TAs; rely on peer help
  - sharing of ideas encouraged (not code)
  - peer grading component

Machine Problems 30%
Quizzes 20%
Assignments & Challenges 10%
Projects 40%

- Prerequisite:
  - basic Java programming knowledge
  - object-oriented programming
  - Some data structures (`ArrayList`, `HashMap`, etc.)

What is Android?

- mobile operating system maintained by **Google**
  - originally purchased from Android, Inc. in 2005
- runs on phones, tablets, watches, TVs, ...
- based on **Java** (dev language) and **Linux** (kernel)

- the #1 mobile OS worldwide
  - and now #1 overall OS worldwide!
- has over 1 million apps published in Play Store

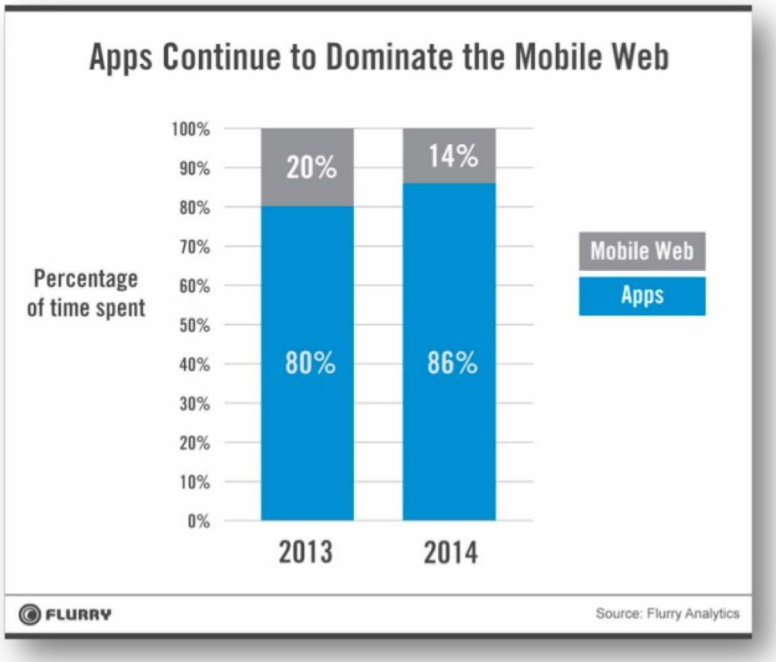
- code is released as open source (periodically)
  - easier to customize, license, pirate, etc. than iOS

Why develop for Android?

- Why not just write a **web site**? Android has a browser...
  - better, snappier UI with a more consistent user experience
  - able to use different kinds of widgets/controls than in a web page
  - more direct access to the device's hardware (camera, GPS, etc.)
  - users highly prefer apps over mobile web browsing

Mobile Web App

Native App on iOS



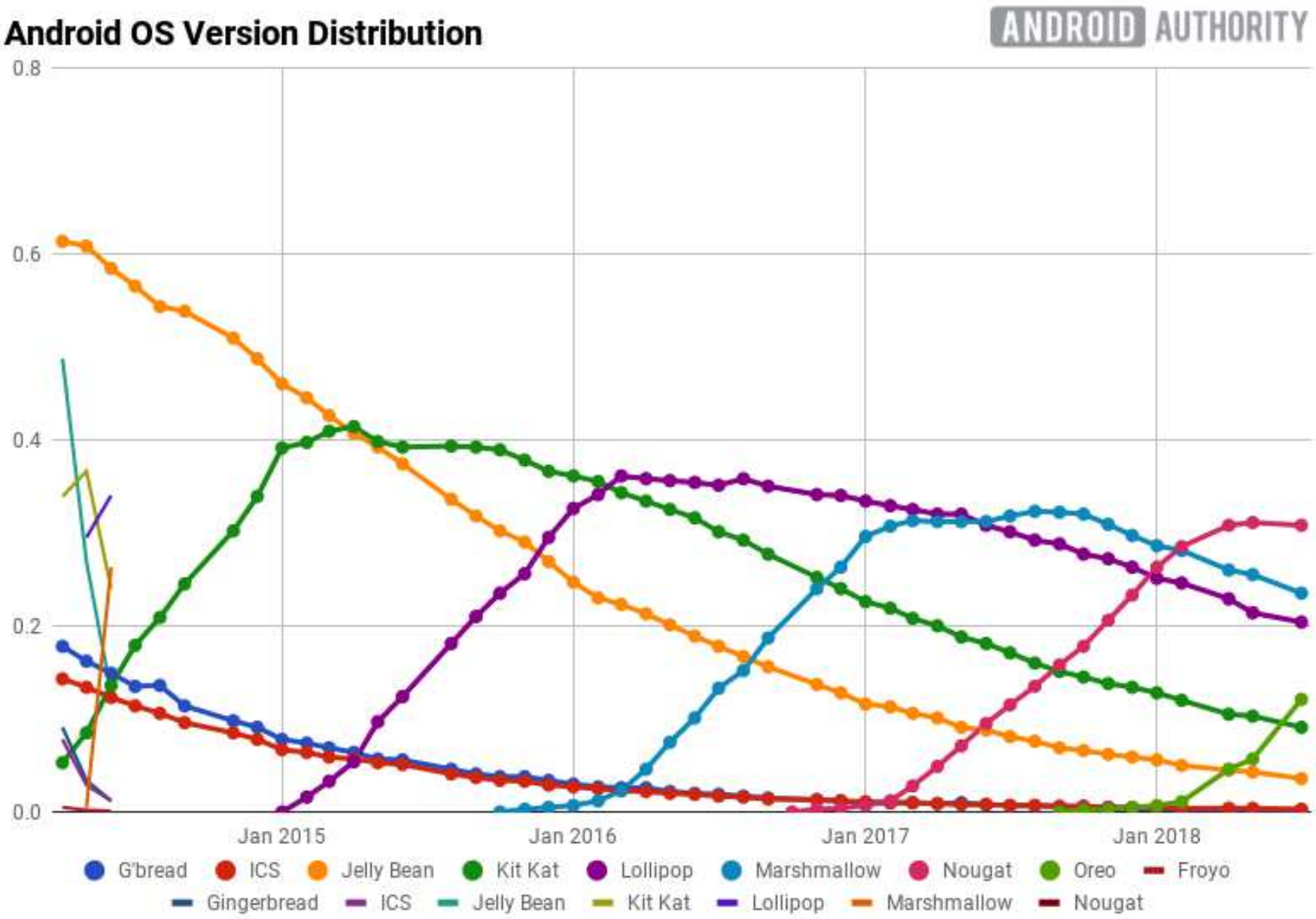
Why not iOS?

- Why not write apps for **iOS**, which runs on iPhones and iPads?
  - familiar programming language
    (Java instead of Obj-C or Swift)
  - free developer tools
    (Apple charges $$$ for theirs)
  - more liberated app store
    (can make an app and put on your phone or others')
  - Android has a larger install base

Android architecture

- Android OS provides libraries for many system features like contacts, phone dialing, notifications, 2D/3D graphics, database access, security / encryption, camera, audio, input/output, ...
  - Java code is compiled into **Dalvik** binary (now **Android Runtime**)

Android version distribution



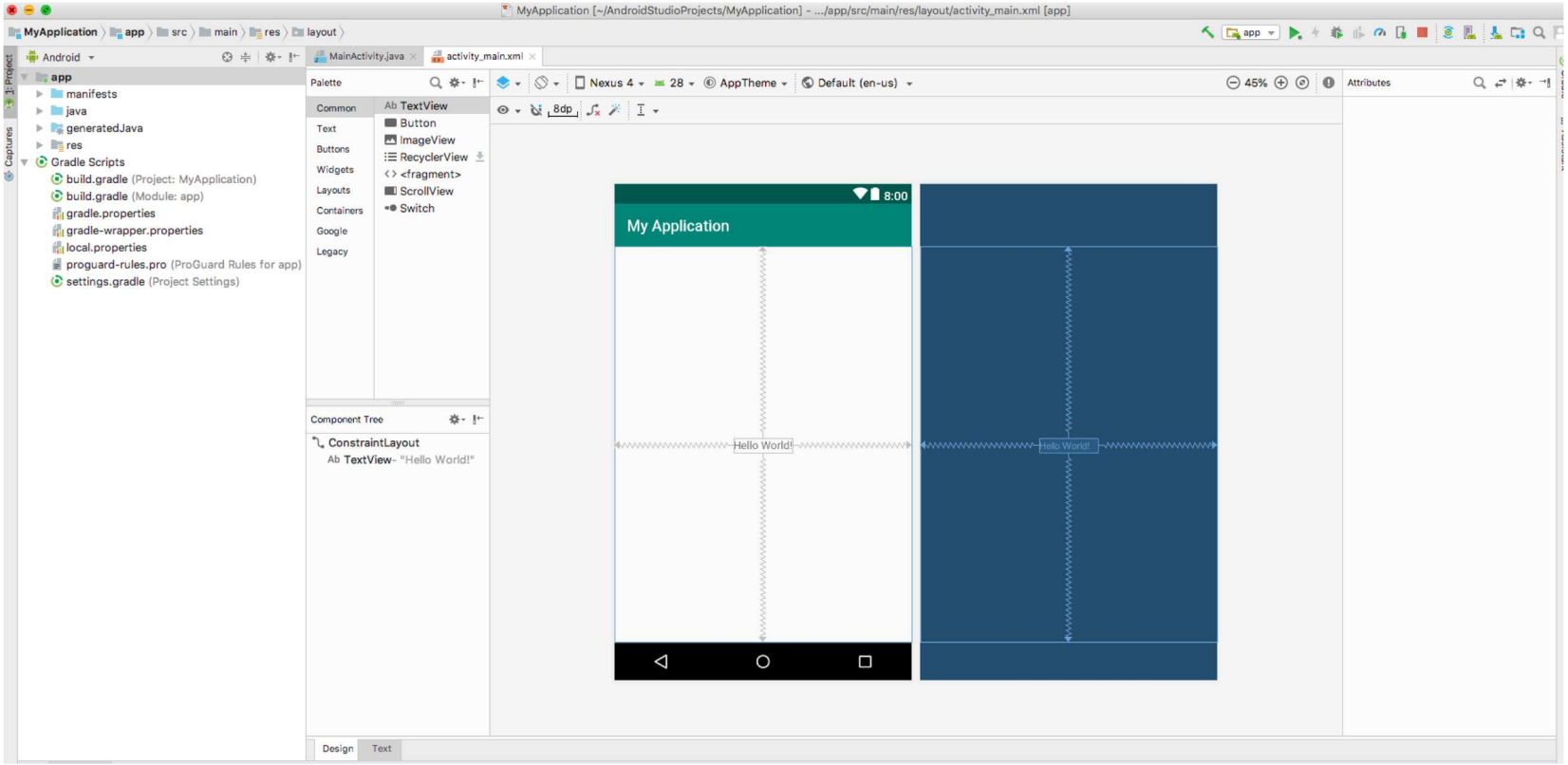
Version issues

- Check your phone's version of Android:
  - Settings → System → About Phone
  - "Why wouldn't my phone have the newest Android version? Can't I just update it?"
- Several companies affect whether your device is up-to-date:
  - Google; phone manufacturer; service provider; ...

- If any company in the chain doesn't want to push out an update for your device, it can become out of date.

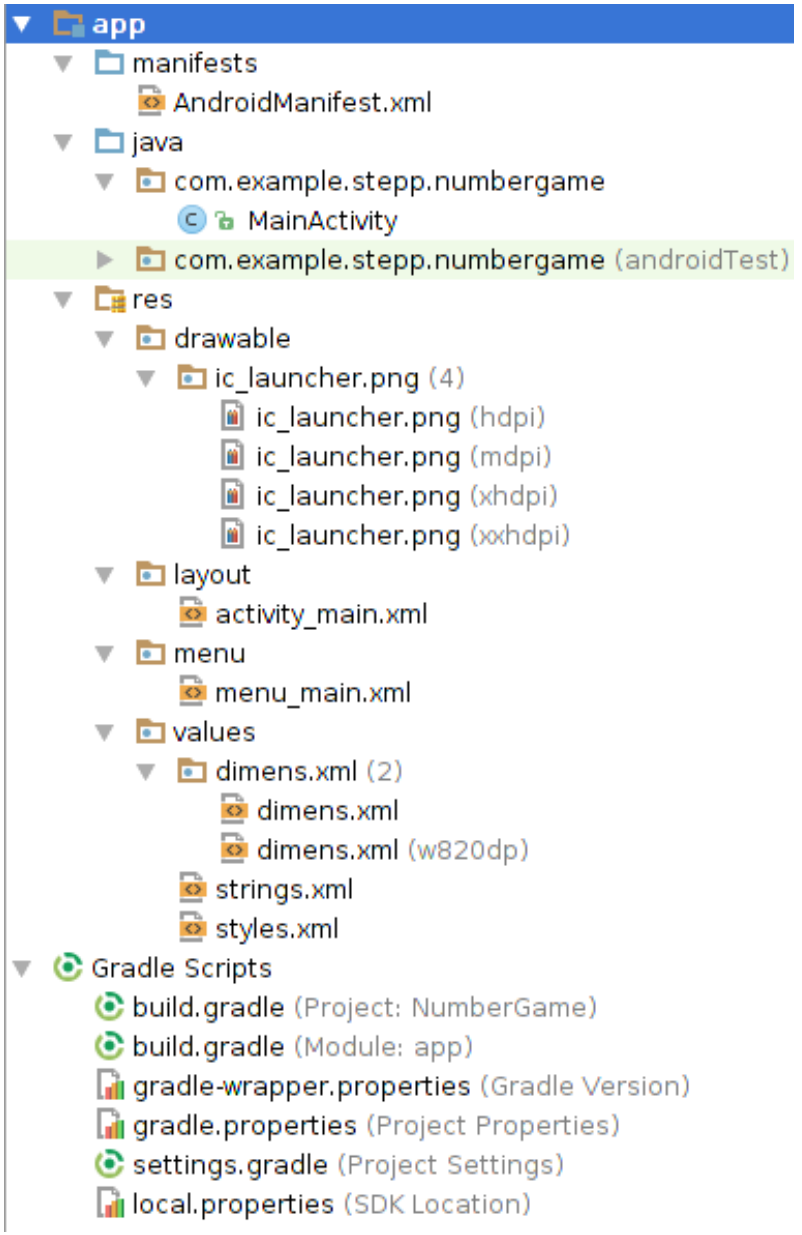
Android Studio

- Google's official Android IDE, in 3.2.1 currently
  - replaces previous Eclipse-based environment
  - based on IntelliJ IDEA editor; free to download and use



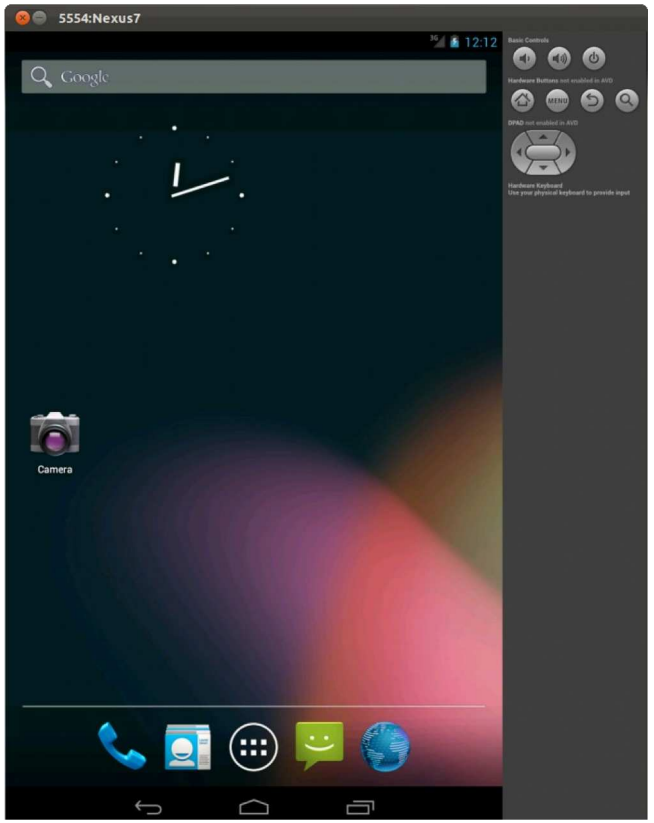
Project structure

- **AndroidManifest.xml**
  - overall project config and settings
- **src/java/**...
  - source code for your Java classes
- **res/**... = resource files *(many are **XML**)*
  - drawable/ = images
  - layout/ = descriptions of GUI layout
  - menu/ = overall app menu options
  - values/ = constant values and arrays
  - strings = localization data
  - styles = general appearance styling
- **Gradle**
  - a build/compile management system
  - **build.gradle** = main build config file



Virtual Devices (AVDs)

- allows you to run your project in an emulator
  - a software simulation of an entire Android tablet, phone, watch
  - when you click the "Run" button in Android Studio,
    it builds your app, installs it on the virtual device, and loads it
- must set up virtual device first
  in Android Studio
- alternative: install your app
  on your actual Android device!
  - pro: app will run faster,
    better test of real execution
  - con: requires Android device,
    must be plugged into dev PC



App build process