Announcement

• On Monday your February plan is due
• Please submit your plan to your Github Classroom Repo by 11:59 PM on Monday evening
• Details regarding the February plan are on the course website

Today – Frontend/Backend Techniques

• Xcode Debugger
• AutoLayout Review
• SwiftUI
• App States
• More about backend and Firebase
Let’s admit it...

When they ask you to fix a bug...

Source: https://me.me/i/debug-properly-using-a-debugger-println-5f3a117e2b0d4228b775268ead9c0851

Back to reality...debuggers are pretty awesome

- ...and it’s probably something you have to learn at some point
- Xcode uses LLDB debugger as its default debugging tools.
- According to its [homepage](https://lldb.llvm.org):
Debugging teaser demo

Debugging Tutorial by Apple
Swift UI

- Introduced in WWDC 19. A radically new and powerful way to code UI
- No storyboard anymore. All UI is codified using Swift
- Feels a little bit like React?
- We don’t require you to use this as it’s relatively new, but you are more than welcome to try it.
Resources to learn more about SwiftUI

There is a series of SwiftUI tutorials by Apple available here that covers it very well:

Apple’s SwiftUI Tutorials

WWDC 19 Intro to SwiftUI

SwiftUI teaser demo
App Life-Cycle

In iOS 13 and apps that support scenes:

Scene-Based Life-Cycle Events

Before iOS 13 or for apps that don’t support scenes:

App-Based Life-Cycle Events

For more information, check out Apple’s Managing Your App’s Life Cycle.
From Not-running to Inactive: App Launch Sequence

Launch Time
- main()
- UIApplicationMain()
- Load the main UI file
- First initialization
- Restore UI state
- Final initialization

Your code
- applicationWillFinishLaunchingWithOptions:
- Various methods
- applicationDidFinishLaunchingWithOptions:

For more information, check out Apple’s [About the App Launch Sequence](https://developer.apple.com/documentation/userexperience/interactive_app_transitions/app_launch_sequence)

From Not-running to Inactive

application(_:willFinishLaunchingWithOptions:)
application(_:didFinishLaunchingWithOptions:)

For more information, check out Apple’s [Responding to the Launch of Your App](https://developer.apple.com/documentation/userexperience/interactive_app_transitions/app_launch_sequence)
Inactive And Active

For more information, check out Apple’s Preparing Your UI to Run in the Foreground

Inactive And Background

For more information, check out Apple’s Preparing Your UI to Run in the Foreground and Preparing Your UI to Run in the Background
### UIScene

- Introduced in WWDC 19 as another feature in iOS 13
- Features better support for multiwindow
- Using UIScene, one app can have two running instances at the same time, like the one on the left.

For more information, check out WWDC 19 video *Architecting Your App for Multiple Windows*.

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### Relationship between App Delegate and Scene Delegate

![Diagram showing the relationship between App Delegate and Scene Delegate](image)

For more information, check out WWDC 19 video *Architecting Your App for Multiple Windows*. 
Scene-Based Life Cycle Events

For more information, check out Apple's [Managing Your App's Life Cycle](#).

Inactive And Active (Scene)

For more information, check out Apple's [Preparing Your UI to Run in the Foreground](#).
Inactive And Background (Scene)

For more information, check out Apple’s [Preparing Your UI to Run in the Foreground](#) and [Preparing Your UI to Run in the Background](#).

Backend
General Backend Notes

- Even for mobile apps, it’s usually not sufficient to just have a database as your backend.
- Sometimes you want to perform more complicated or intensive tasks than what your database can handle.
- And you want to keep the frontend as lightweight as possible for better user experience.

Firebase cloud functions

- Powerful, lightweight backend functions
- Easy to implement and test; each function is usually a short snippet of code.
- Integrates well with cloud messaging and other Firebase services.
- Available in both JavaScript and TypeScript.
- Firebase official docs: https://firebase.google.com/docs/functions
Cloud function demo

Firebase ML Kit

- Backend machine learning functions provided by Firebase
- Comes with a set of pre-trained model.
- Easy to use. Using each of them is like calling an API.
- Can also handle your own Tensorflow model.
- Docs: https://firebase.google.com/docs/ml-kit
Other notes about backend

- We think a combination of database, cloud functions and machine learning kit can satisfy many needs for backend in the case of a mobile app.
- But if your app requires more backend support, you can develop fully fledged web apps to achieve that.
- Firebase is integrated into Google Cloud, so if you want to stay within it, Google App Engine is a great choice.
- For those of you who had 330, AWS is also a very popular platform.