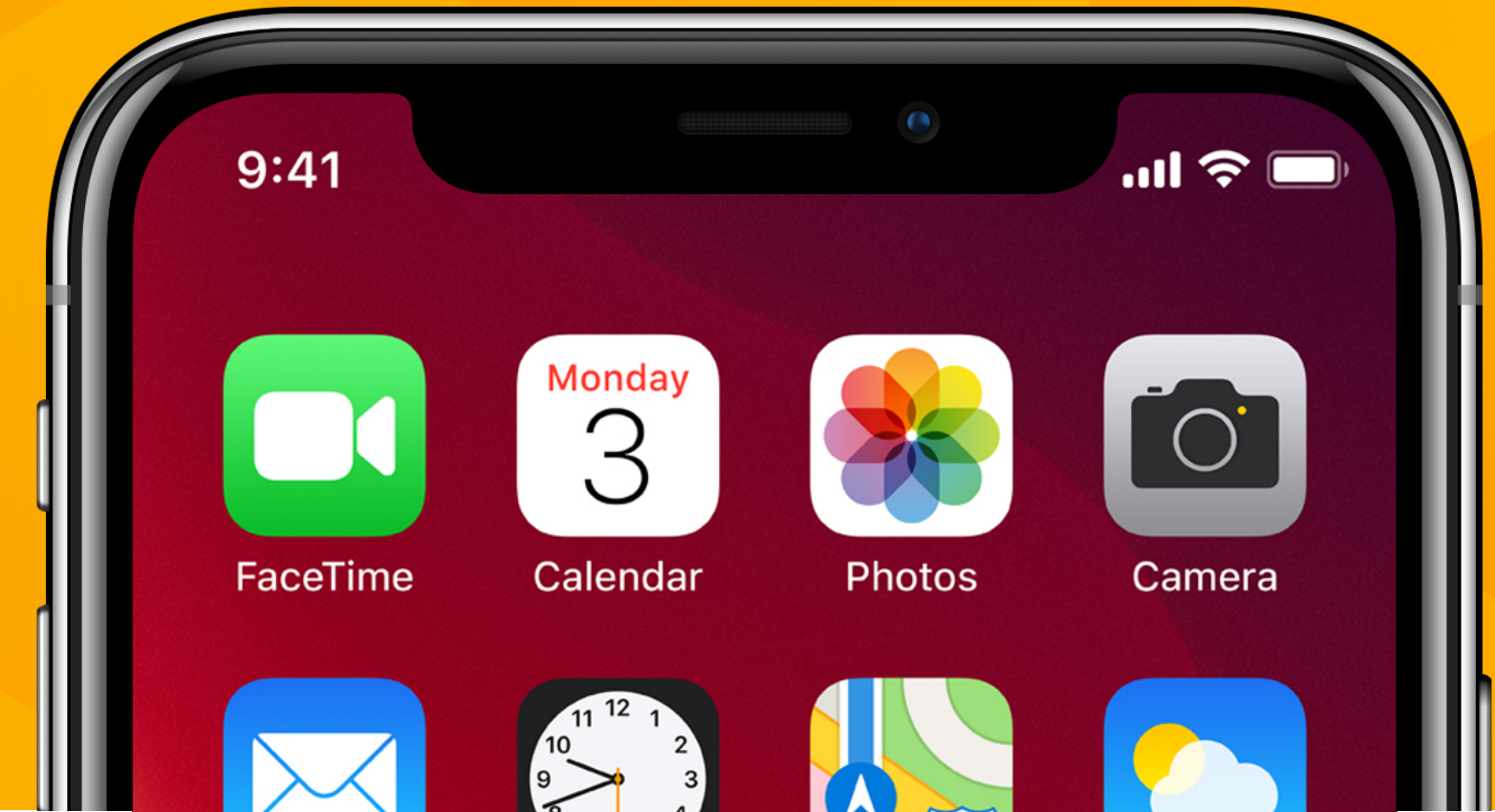




iOS Application Development

Lecture 1: Introduction

Prof. Dr. Jan Borchers
Media Computing Group
RWTH Aachen University

Winter Semester '25/'26

hci.rwth-aachen.de/ios



RWTHAACHEN
UNIVERSITY

Team



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Class Goals

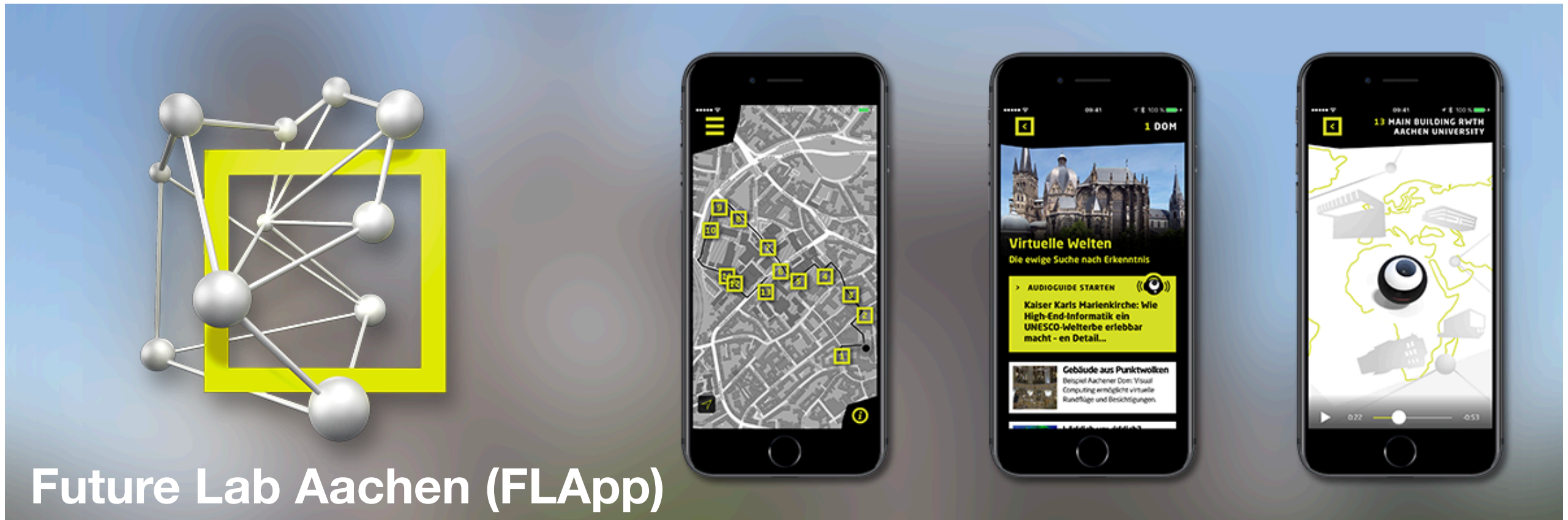
- Understand the differences between desktop and mobile development
- Learn to write iOS Apps (UIKit & SwiftUI)
- Learn how to use advanced iOS frameworks



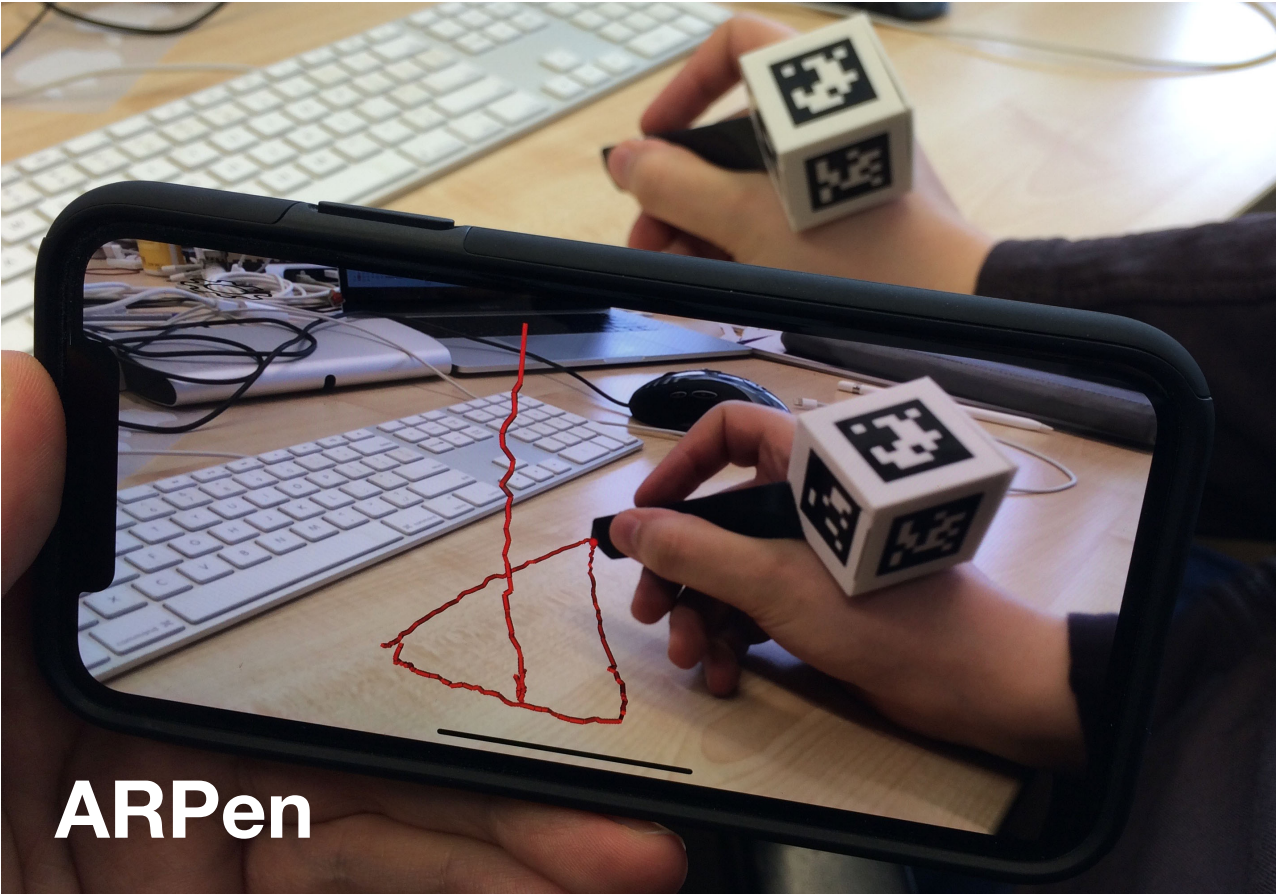
- During your project: extra focus on UX and usability
- Do lots of coding!



Some of our iOS Projects



Future Lab Aachen (FLApp)



ARPen



CENTRE CHARLEMAGNE
Neues Stadtmuseum Aachen

Centre Guide



Corona



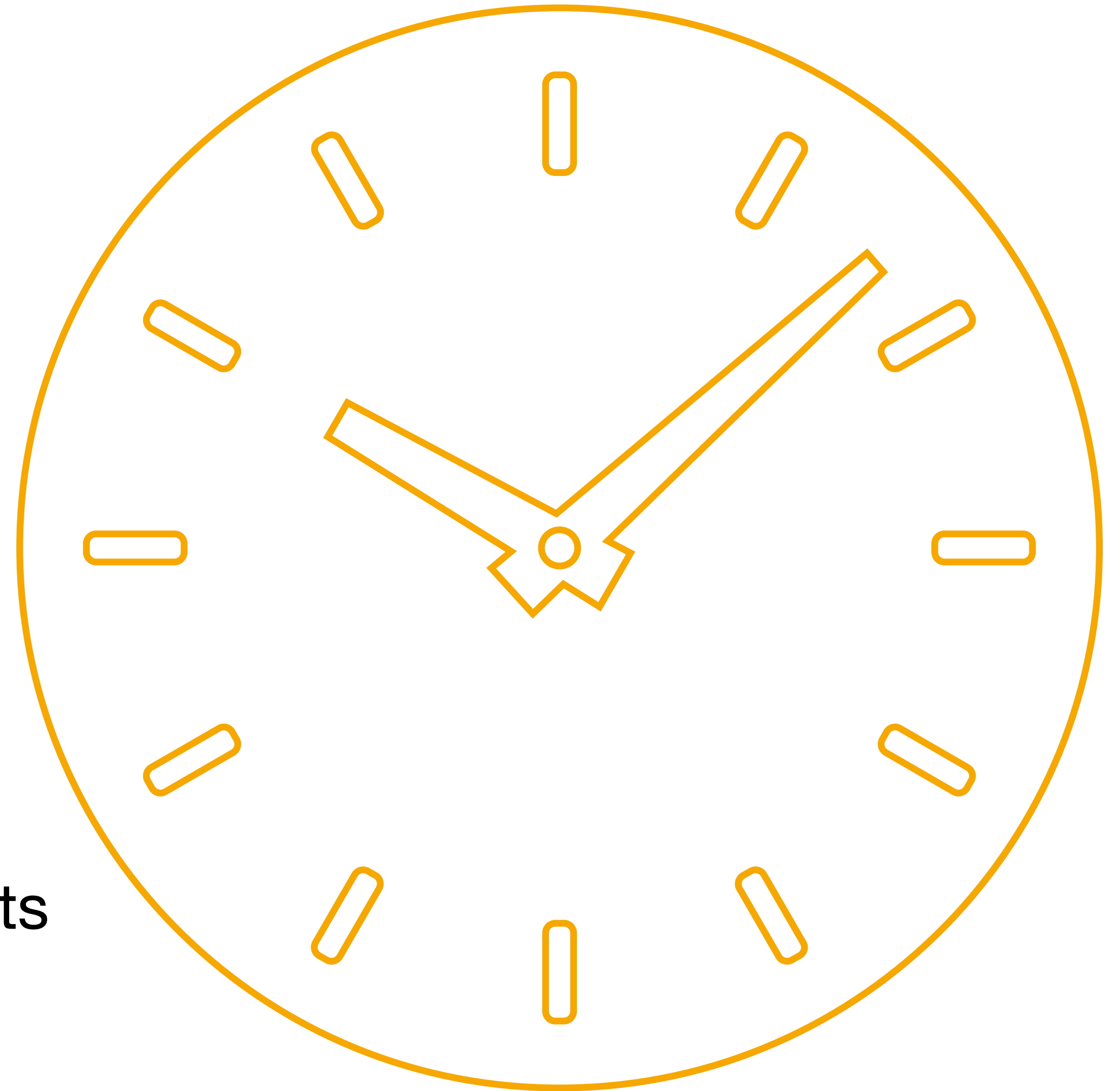
ForcePicker



Aixplorer

Administrivia

- 6 credit points
- Class times
 - Mondays (12:30–14:00), i10 seminar room 2.73
 - Tuesday (10:00–11:30), i10 seminar room 2.73
 - Already over 120 registrations, but 42 seats
- hci.rwth-aachen.de/ios

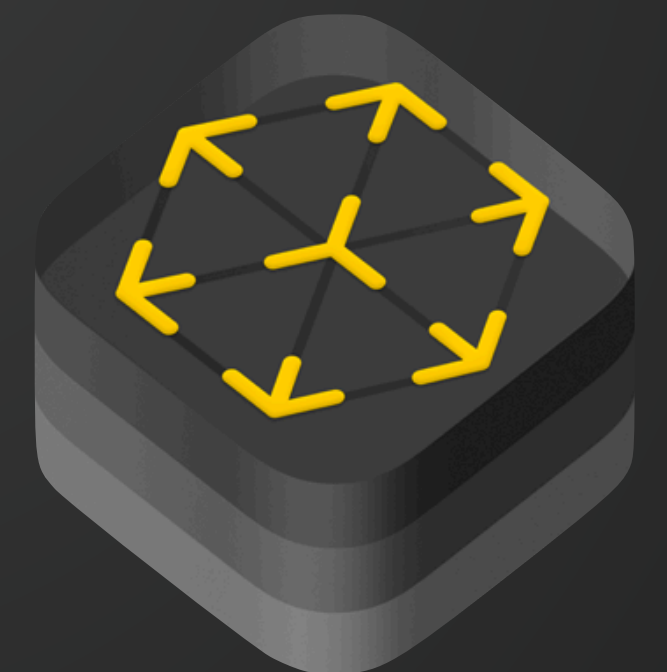


Course Requirements

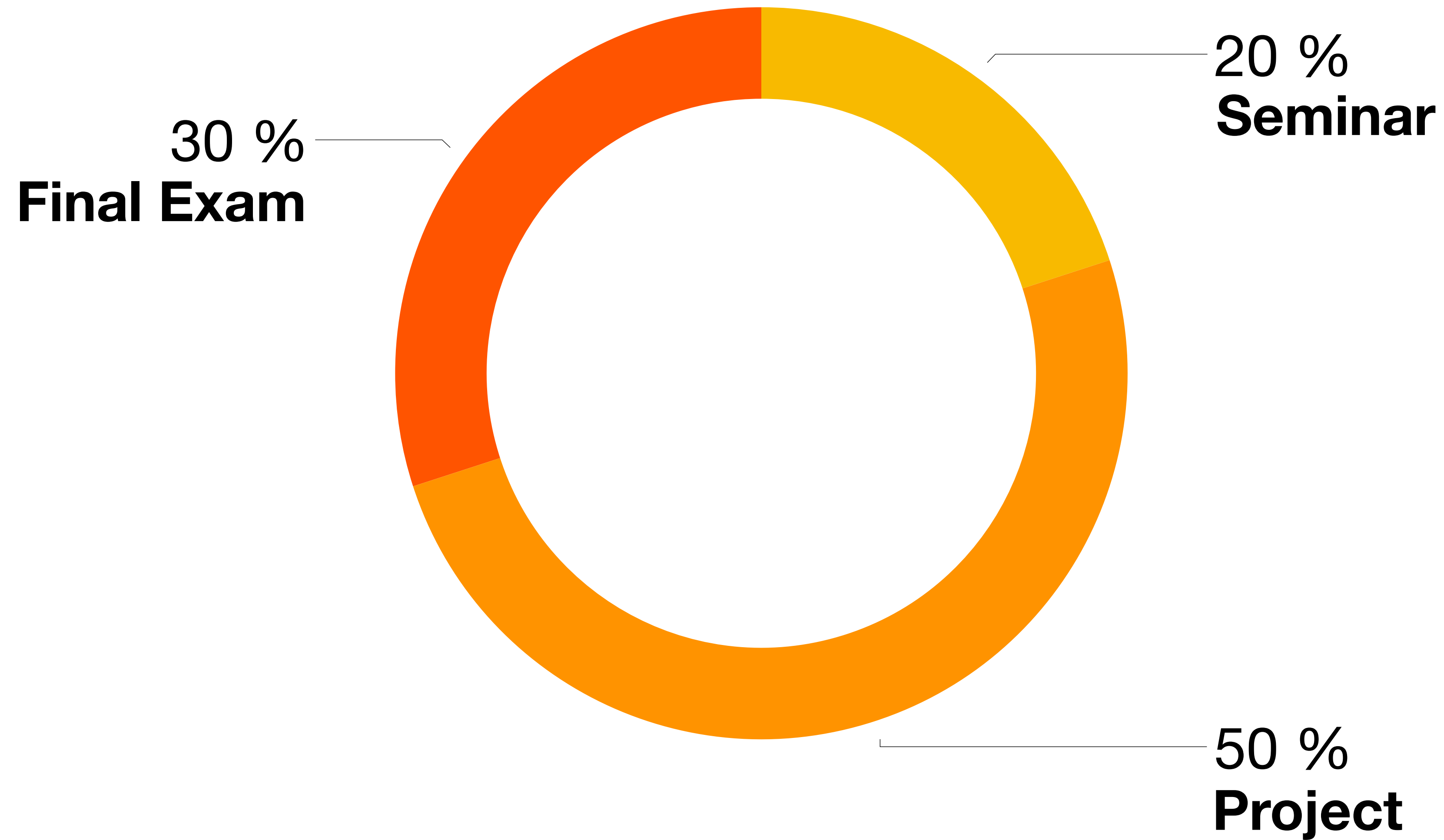
- Required
 - OOP experience
 - Apple Developer ID
 - You must be registered for this course in RWTHonline
 - Mac capable of running Xcode 26*
 - Optional (but helpful)
 - iOS device running iOS 26*
(simulator sufficient for many tasks)
 - Previous experience with Swift or Objective-C
 - This course is only for students of:
 - B.Sc. and M.Sc. Computer Science
 - SSE / MI / DS / MTIK (TK)
- * We have a **FEW** time-share devices

Class Syllabus

- Part 1
Lectures (Online Only): Introduction into Swift and iOS
- Part 2
Seminars: iOS Frameworks
- Part 3
Project: App Development



Your Final Grade (6 ECTS)



Lectures



- Topics:
 - Swift
 - Xcode
 - UIKit
 - SwiftUI
- Weekly Moodle quizzes (90% required for exam admission)

Textbooks



Available for free on Apple Books

Seminar

Sample Topics:

- CoreAnimation
- Haptics and Sounds
- SpriteKit
- Working with Files
- Combine
- Debugging in Xcode
- ...

- 15-minute presentations
- 17.11.2025–8.12.2025
- Overview of the framework
- Example applications
- Attendance is mandatory
- Missing 1 seminar day (>10%) is a 5.0

Project

- Kickoff: 8.12.2025
- Topic announced at kickoff date
- Presentations: 02.02.2026
- 2h slot instead of 1.5h

- Submittable app
- Final presentation with live demo
- Code documentation!
- Attendance on Presentation Day is mandatory
- Missing Presentation Day (>10%) is a 5.0

Written Exam

- Questions about:
 - Lecture content
 - All seminars

- Exam dates:
 - 1st exam: 10.02.2026
 - 2nd exam: 12.03.2026
- 60 minutes

Limited Seating

- We only have **42 seats** available
- Attending the seminar and project presentations is **mandatory**
- **Only take this class if you are sure you can attend all mandatory lectures**

How to Get a Seat

- **Register** in RWTOnline & send the **Declaration of Compliance** before **Wednesday (15.10.2025) 13:00**
- We will invite everyone who did this to **Moodle** to **form groups**
- Form groups of **3 students** in Moodle (“Seminar Groups”)
 - There should be at least **2 students with a Mac** per group
- On **Friday 17.10.2025 13:00**, we will randomly select 14 **full** groups
 - Everyone else will be removed from RWTmoodle

Lecture Slides and Videos

- All slides and lecture videos will be available on RWTHmoodle
- Self-study until the seminars start
- Weekly Moodle quizzes (90% required for exam admission)

Seminar: Schedule

- 2 presentations per session
 - Attendance is **mandatory**
 - Missing 1 time will lead to a 5.0 for the seminar (10% Rule) and thus the class
 - 15 min presentation, ~10 min discussion
 - 3 people per group
 - Dates:
 - 17.+18.11., 24.+25.11., 1.+2.12., 8.12.
 - Order is not fixed yet
- 15 min slide and content discussions one week before your presentation
 - Final version due 4 days before your presentation

Seminar: What to Present

- Framework overview, conceptional structure
- Demo (small Playground app for Moodle)
 - Show how a problem can be solved elegantly using the framework
 - For most topics, your demo can be in either UIKit or SwiftUI
- Not a list of APIs;
instead problem–solution oriented

- Structure:
 - Brief introduction & motivation
 - Basic steps to use framework
 - Explain 1–2 advanced features, show how to use them
 - Code demo
- Deliverables: slides and demo code
- Slides+audio are recorded

1. Core Animation

- **Drawing and animating what's on the screen**
- What to look at:
Layers, paths, shapes, clipping, rasterization, keyframe animations, CALayerLink



2. Haptics and Sound

- **Enriching interaction with sound and haptic feedback**
- What to look at:
AVAudioPlayer, AVAudioSession, MPNowPlayingInfoCenter, UIFeedbackGenerator



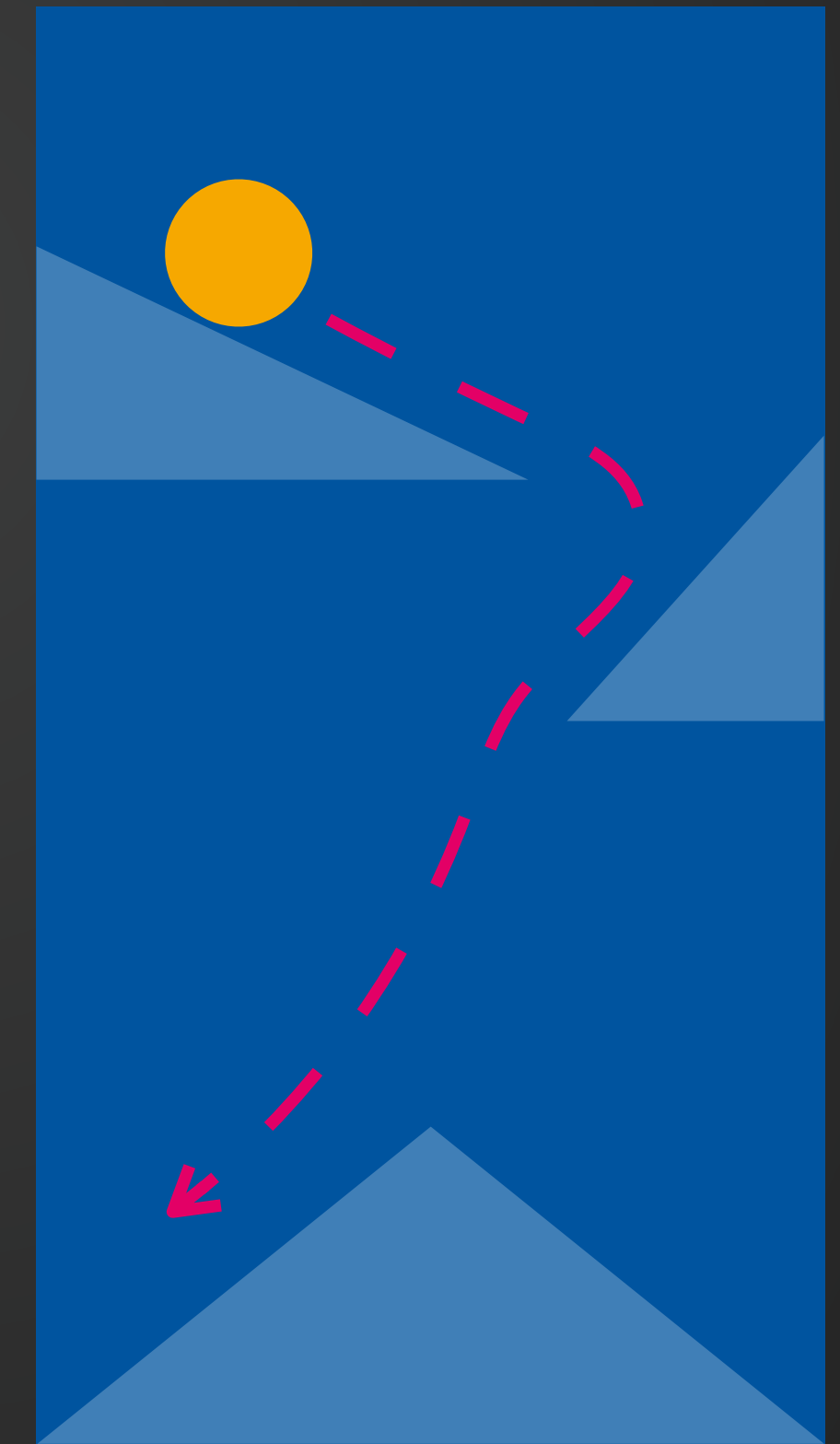
3. Core Image + CI Filters

- **Fast image processing and analysis**
- What to look at:
Automatic Enhancements, CIDetector



4. SpriteKit

- **2D games**
- What to look at:
Nodes, scenes, actions, constraints, physics



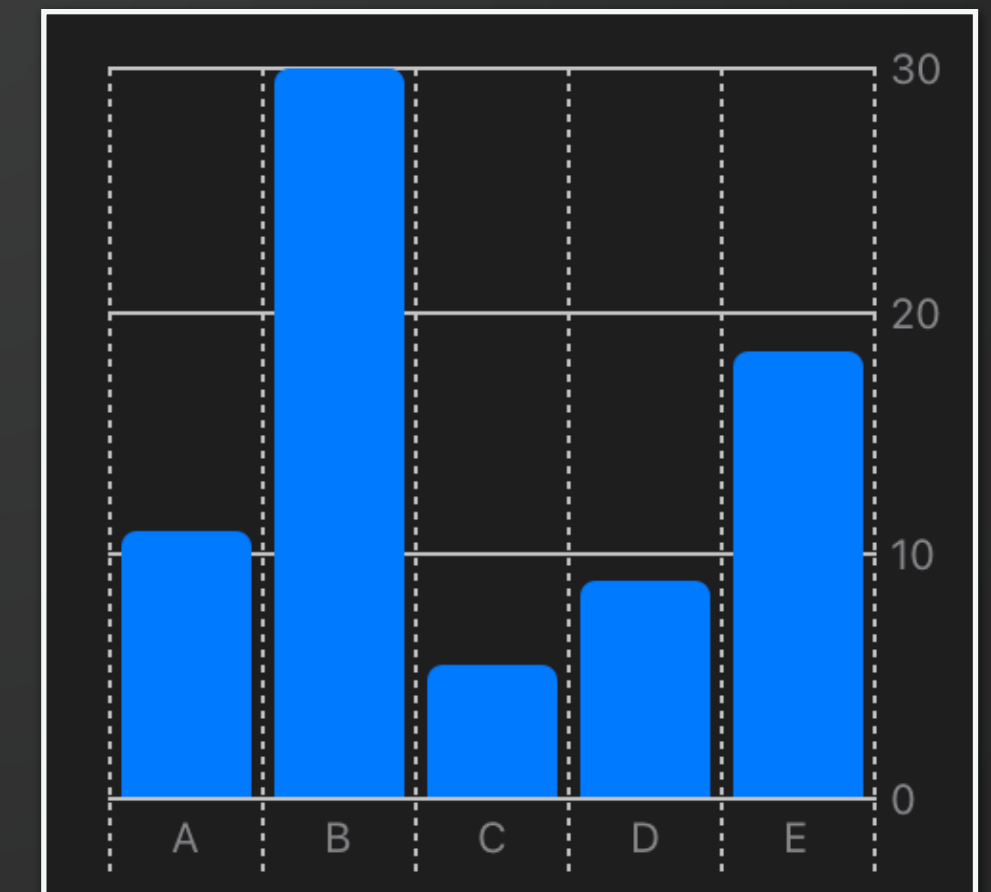
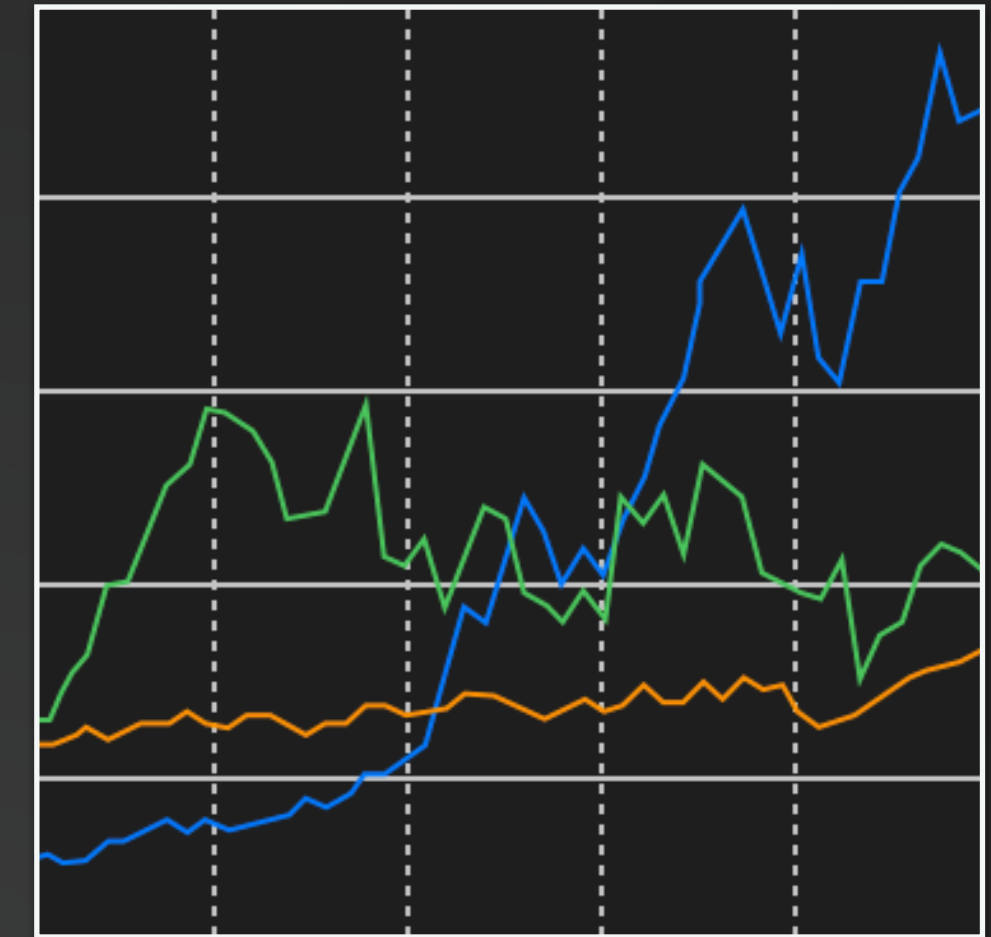
5. Working with Files

- **How to save data to a file and find it in the Files app**
- What to look at:
FileManager, FileHandle, DocumentBrowser,
Files app integration



6. Swift Charts

- **Design beautiful charts in SwiftUI**
- What to look at:
Charts, plots, animations of data.



7. Debugging in Xcode

- **Using the debugger and Instruments**
- What to look at:
print out, View Debugger, exception breakpoints, memory leaks, ...



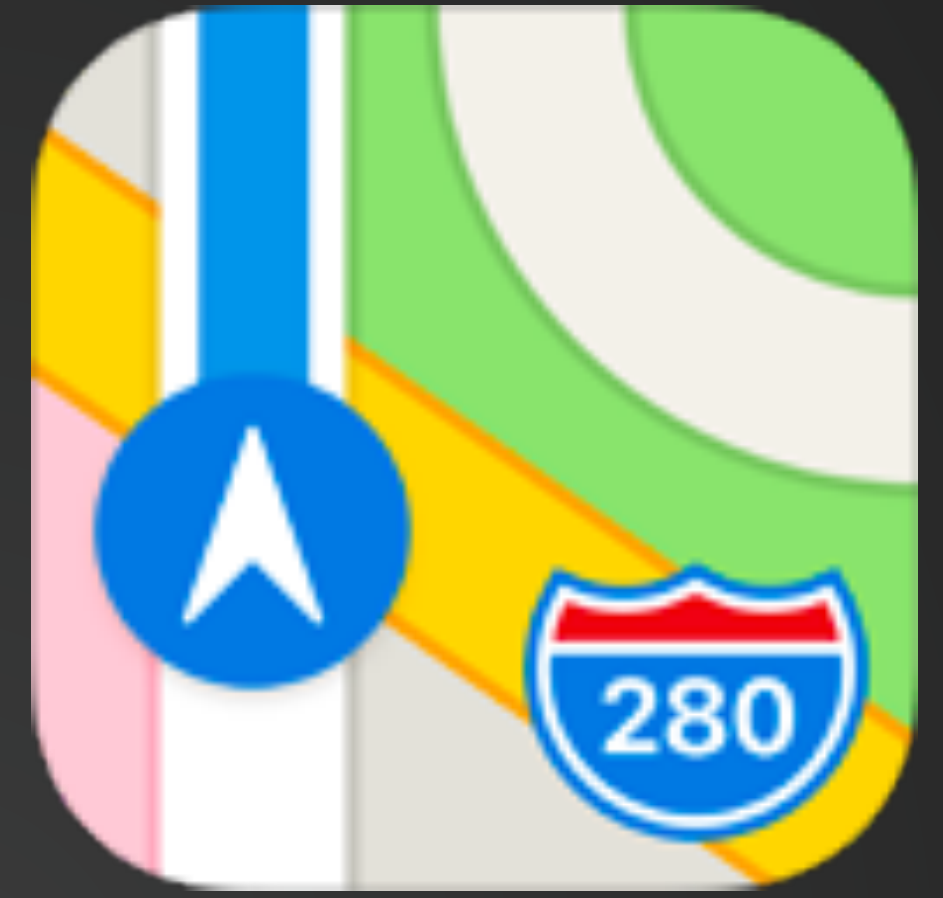
8. Displaying Rich Articles

- **Displaying HTML contents in your app**
- What to look at:
WKWebView, UITextView, NSParagraphStyle
- New implementation for NSAttributedString
 - Does support HTML but also markdown



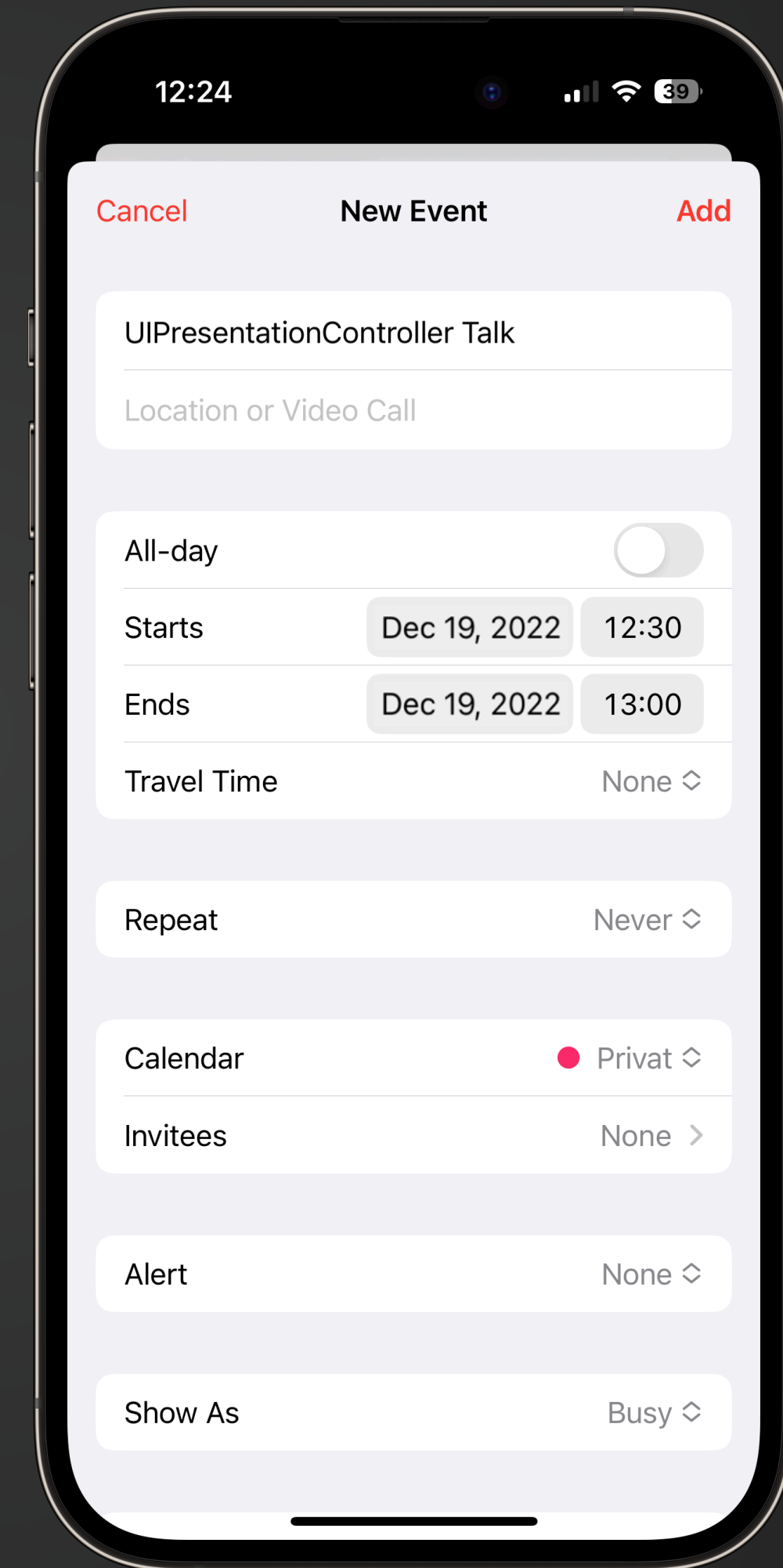
9. MapKit

- **Interactive maps and directions**
- What to look at:
MapKit, CLLocationManager, map styles, overlays, callouts, paths, ...



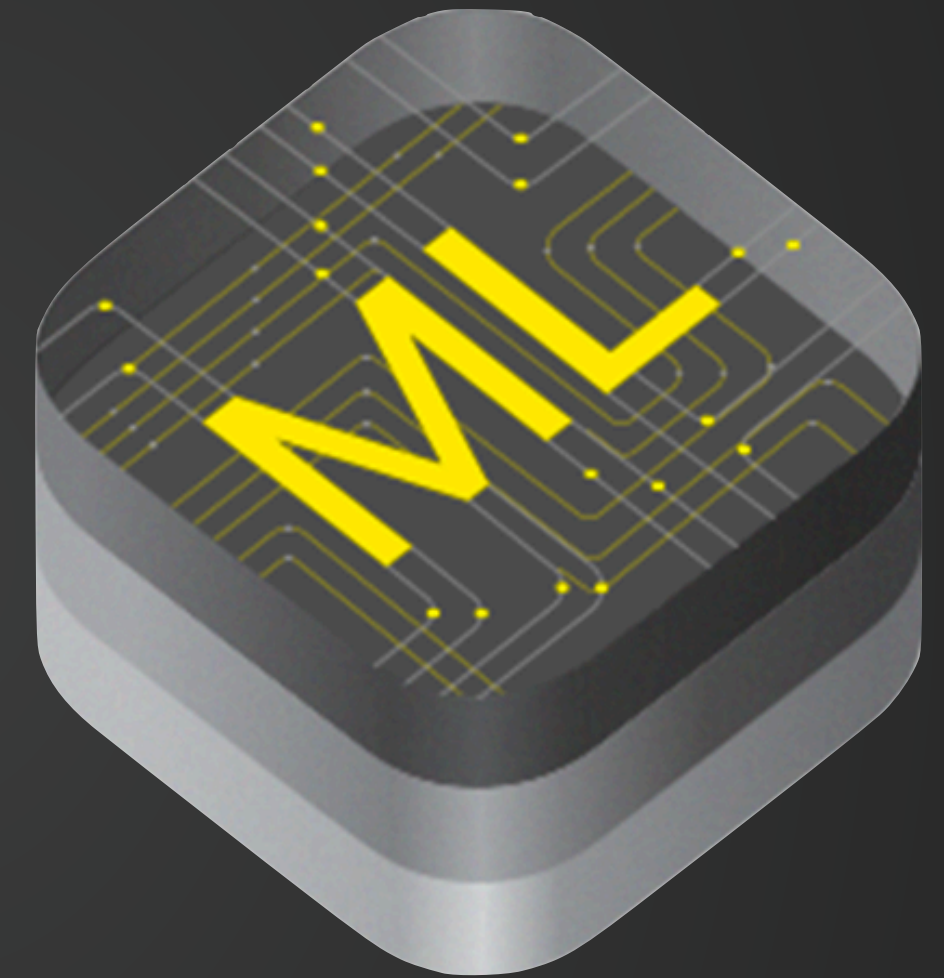
10. UIPresentationController

- **Create a custom view controller presentation style**
- What to look at:
UIPresentationController,
UIViewControllerAnimatedTransitioning,
UIViewControllerTransitioningDelegate



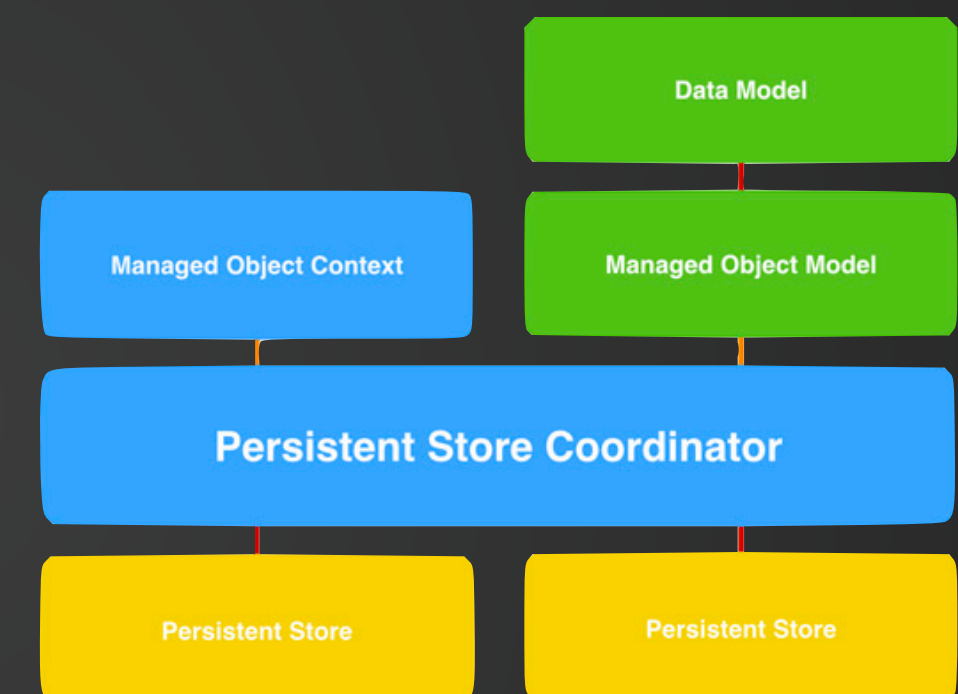
11. Core ML + Create ML

- **Machine Learning in iOS**
- What to look at:
Framework overview in general, but focus on image classification



12. Core Data & SwiftData

- **Persistent database**
- What to look at:
Managed objects, view context, fetch requests, predicates, entity relationship diagram in graphical model editor



13. watchOS

- **Designing native apps for the  Watch**
- What to look at:
 - Limitations of the UI toolkit
 - Communication between phone and watch
 - Layout in watch apps
 - Special widgets



14. ARKit

- **Showing AR content in a 3D graphics engine**
- What to look at:
Session and Configuration, AR anchors, AR onboarding,
plane detection, hit testing



15. RealityKit

- **Simulate and render 3D content in AR**
- What do look at:
Prototype AR scenes and apps, interaction with the environment, Reality Composer, developing for the Apple Vision Pro



16. Advanced SwiftUI Layout

- **Using GeometryReader, priorities, fixed dimensions, alignment guides and more to create great UIs.**
- What to look at:
Expressing relationships (e.g., resizing a view based on the contents of some other view), complex layering and scrolling (e.g., stretchy headers)



17. Foundation Models

- **Using Apple's Foundation Models to generate AI content for apps.**
- What to look at:
Creating custom data structures, generating content fitting those data structures, performing AI tasks



18. Bonus Topic: TabletopKit

- **Immersive remote Tabletop Gaming**
(requires access to an Apple Vision Pro)
- What to look at:
Creating a game table, seats, inviting other players.



How To Find Documentation

- WWDC Videos
- Apple's Developer App
- developer.apple.com: Apple's official developer resources
- Xcode's Quick Help feature

Summary

- Administrative information
- Seminar Topics



What's Next?

- Register, and sign the Declaration of Compliance and upload it to the sciebo folder.
 - Afterwards, form groups of three in Moodle
 - We will announce the seats on Friday Afternoon
- Next class: November 17th
- Remember the class page: hci.rwth-aachen.de/ios