

# Testing (Flutter) Apps

CS 442: Mobile App Development

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**Why should we write tests?**

# Types of tests

- Unit tests
- Component/Widget tests
- Integration tests

# Unit test

- Tests a single function or class (“unit”)
- Verify correct behavior with different input and conditions/state
  - May depend on external dependencies (e.g., file data, database)
- External dependencies may be problematic!
  - Slow down testing (e.g., http, remote database servers)
  - External exceptions may break tests (but units are not at fault)

# “Mock” dependencies

- Instead of using real/live external dependencies, create **mock** versions
  - Emulate the live version, but without risk of slowdown/flakiness

# Component/Widget test

- Tests a single UI component (Flutter Widget)
- Very correct visual and interactive aspects
- Requires simulating “lifecycle” events (e.g., building widget tree, performing layout) and user input / asynchronous events
- Flutter has comprehensive widget-testing facilities

# Integration test

- Tests large portions of or the entire app
- Verify that all widgets, underlying logic, and external dependencies work together (integrate) correctly
- Recording behavior over test may be used to profile app performance
- Typically run in an emulator

# Trade-offs

	<b>Unit</b>	<b>Widget</b>	<b>Integration</b>
<b>Confidence</b>	Low	Higher	Highest
<b>Maintenance cost</b>	Low	Higher	Highest
<b>Dependencies</b>	Few	More	Most
<b>Execution speed</b>	Quick	Quick	Slow



# Continuous Integration (CI)

- Service that runs tests automatically after each substantial code update
  - Typically on new commits/pushes/merges
- Critical part of DevOps!

# Flutter testing packages

- **flutter\_test**: the official testing library from Flutter
  - Unit and Widget testing utilities
- **test**: general-purpose Dart testing library
  - Unit tests for both pure Dart & Flutter
- **mockito**: object mocking library
- **integration\_test**: for app-level testing
  - Multi-widget/screen tests; can also be used for profiling