

# Lecture 11 – Testing in R

## Learning Objectives:

**3. Learn the basic principles of software design.**

**3.3. Learn the basic of unit testing.**

**Announcement: Midterm project handout on Github!**

# Why create tests?

- Create robust code!
- Make sure code still works after changes (like refactoring)!
- Fewer bugs!

## How much code should you test at once?

- Unit testing
- Units are smallest chunks of code that can't be further divided.
- Will mean different things to different people.

## What code should you test?

- Focus on external interfaces
- Test each behavior in one test
- Always write a test when you find a bug!

# Unit Testing in R with `testthat`

## Testing code in R – There's a package for that!

- Write your functions in R scripts.
- Use a test script in the test directory. Must begin with “test\_”. Write test here.
- Run tests using:

```
> testthat::test_dir("dirname")
```

## Key features of `testthat`:

- **Expectation:** describes expected result.
- **Test:** groups together multiple expectations to test output of single function.
- **File:** groups together multiple tests, given readable name with `context ( )`.

# Group work: Write Unit Tests

AdvDiff in the 11-TestinginR folder is a simple advection-diffusion model. Points begin at a single source and move according to the flow field ( $U_x$  - the x-component of fluid velocity,  $U_y$  - the y-component of velocity) within a fixed domain  $(x, y)$ . They diffuse based on a pseudo-random number generated by R and the root mean square distance, calculated with the diffusion coefficient  $D$ .

**To run, open the R Studio project and source `simulate_advdiff.R`**

**Create Unit tests with `testthat` that:**

1. Ensures that points with no diffusion move together.
2. Ensures that points that are in zero velocity flow fields spread out to create an area equal to  $D \cdot \text{end.time}$ .

# More Information

**<http://bioconductor.org/developers/how-to/unitTesting-guidelines/#choosingTestFramework>** – Choosing a Unit Testing Framework in R

**<https://r-pkgs.org/tests.html>** – Unit Testing in *R Packages*