Lecture 08 – Testing in R

Learning Objectives:

3. Learn the basic principles of software design.

    3.3. Learn the basic of unit testing.

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()`.

Example of Unit Testing in R

1. **Clone this repo: https://github.com/lindsaywaldrop/dotwalkR**
2. **Open R Project File**
3. **Install by sourcing: `source(install_dotwalkr.R)`**
4. **Check out the testing file: `tests/test_dotwalkr.R`**

Group work: Write Unit Tests

AdvDiff in the 08-TestinginR folder is a simple advection-diffusion model. Points begin at a single source and move according to the flow field (Ux - the x-component of fluid velocity, Uy - the y-component of velocity) within a fixed a 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, see the README file.

Create Unit tests with `testthat` that:

1. Ensures that points with no diffusion move together.

2. The square of the mean displacement of molecules diffusing without advection is close to 4*D*delta.t.

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*