Overview of software requirements

Analysis of Ecological and Environmental Data

QERM 514

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Goals for today

- Identify the software requirements for the course

- Verify that you have the software installed and working

R Software

An environment for statistical computing and graphics

- It's FREE!

- Enormous developer & support communities

- [Learn more here](#)

R Software

- Most of R's current capabilities come from *packages*

- We will use several different packages for fitting statistical models (eg, `nlme`, `lme4`)

RStudio

An integrated development environment (IDE) for R

Go to file/function Addins ▾

willamette ▾

final_report.Rmd | App_3_Summarize_results.Rmd | App_2_Model_fitting.Rmd | chin_cov

Environment | History | Connections | Git

Diff Commit master ▾

Staged | Status | Path

```r
69
70   We also need a couple of helper functions.
71
72 ▾ ```{r define_funcs}
73   ## better round
74 ▾ Re2prec <- function(x, map = "round", prec = 1) {
75     ## 'fun' can be "round", "floor", or "ceiling"
76     ## 'prec' is nearest value
77     ## (eg, 0.1 is to nearest tenth; 1 is to nearest integer)
78     if(prec<=0) { stop("\"prec\" cannot be less than or equal to 0") }
79     do.call(map,list(x/prec))*prec
80   }
81
82   ## wrapper function to fit a JAGS model
83 ▾ fit_jags <- function(model, data, params, inits, ctrl, dir = jagsdir) {
84     jm <- jags.model(file.path(jagsdir, model),
85                      data,
86                      inits,
87                      n.chains = ctrl$chains,
88                      n.adapt = 0,
89                      quiet = TRUE)
90     adp <- FALSE
91 ▾   while(!adp) {
92       adp <- adapt(jm, n.iter = 1000)
93     }
94     update(jm, ctrl$burn, progress.bar = "none")
95     return(coda.samples(jm, params, ctrl$length, ctrl$thin))
96   }
97
```

689:1 # Convergence checks ▾   R Markdown ▾

Title
set_options
  chunk
Background
  load_pkgs
  define_funcs
    Re2prec
    fit_jags
    init_vals_AR
    init_vals_cov
    looic
User inputs
  get_user_inputs
  get_filenames
Loading the fish data
  get_escapement_data
  get_age_data
  get_harvest
Loading the covariates
  get_cov_meta
  get_flow_cov
Specifying the models i...
  Ricker model without ...
    JAGS_RK_AR
  Ricker model with cov...
    JAGS_RK_cov_AR
Fitting the models
  jags_setup
  start_timer
  fit_models
  stop_timer

Files | Plots | Packages | Help | Viewer

New Folder Delete Rename More ▾

Home > Documents > GitHub > willamette > data

	Name	Size	Modified
	..		
	Willamette_Chin_SR_mainstem_...	3.1 KB	Mar 27, 2019, 3:02 PM
	chin_agecomp.csv	374 B	Mar 27, 2019, 11:52 Al
	chin_esc.csv	964 B	Mar 27, 2019, 11:52 Al
	chin_harv.csv	332 B	Mar 27, 2019, 11:52 Al
	chin_cov_metadata.csv	4.2 KB	Dec 13, 2017, 2:41 PM
	sthd_agecomp.csv	523 B	Dec 13, 2017, 2:41 PM
	sthd_cov_metadata.csv	1.9 KB	Dec 13, 2017, 2:41 PM
	sthd_esc.csv	474 B	Dec 13, 2017, 2:41 PM
	sthd_harv.csv	442 B	Dec 13, 2017, 2:41 PM

Console | Terminal | Jobs

~/Documents/GitHub/willamette/

```
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> options(width = 100)
> knitr::opts_chunk$set(message = FALSE)
> ## for figure captions
> library("captioner")
> ## set default caption options
> fig_cap <- captioner(suffix = ".", style = "b", style_prefix = TRUE)
> tbl_cap <- captioner(prefix = "Table", suffix = ".",
+                      style = "b", style_prefix = TRUE)
> ## for tables
> library(kableExtra)
> ## jags dir
> jagsdir <- here::here("jags")
> 
```

RStudio highlights

- Syntax highlighting, code completion, smart indentation

- Easily manage multiple working directories using projects

- Interactive debugger to diagnose and fix errors quickly

- Extensive package development tools

- Built-in tools & GUIs for git & Markdown

RStudio benefits

Cheat sheets

Webinars, links, etc

RStudio IDE :: CHEAT SHEET

Documents and Apps

Open Shiny, R Markdown, knitr, Sweave, LaTeX, .Rd files and more in Source Pane

Check spelling | Render output | Choose output format | Choose output location | Insert code chunk

Jump to previous chunk | Jump to next chunk | Run selected lines | Publish to server | Show file outline

Access markdown guide at **Help > Markdown Quick Reference**

Jump to chunk | Set knitr chunk options | Run this and all previous code chunks | Run this code chunk

```
# Good Start...
```

RStudio recognizes that files named **app.R**, **server.R**, **ui.R**, and **global.R** belong to a shiny app

Run app | Choose location to view app | Publish to shinyapps.io or server | Manage publish accounts

Write Code

Navigate tabs | Open in new window | Save | Find and replace | Compile as notebook | Run selected code

Cursors of shared users | Re-run previous code | Source with or without Echo | Show file outline

Multiple cursors/column selection with **Alt + mouse drag**.

Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.

Syntax highlighting based on your file's extension

Tab completion to finish function names, file paths, arguments, and more.

Multi-language code snippets to quickly use common blocks of code.

```
# Good Start...
"P0030001"
"P0030002"
"P0030003"
"P0030004"

get_digit <-function() {
    ("num" %% (10 ^ n))
    %/% (10 ^ (n - 1))
}}

fo
  for          {snippet}
  foo          (.GlobalEnv)
  force        {base}
```

Jump to function in file | Change file type

Working Directory | Maximize, minimize panes

Press ⬆ to see command history | Drag pane boundaries

R Support

Import data with wizard | History of past commands to run/copy | Display .RPres slideshows **File > New File > R Presentation**

Load workspace | Save workspace | Delete all saved objects | Search inside environment

Choose environment to display from list of parent environments | Display objects as list or grid

Data
- iris   150 obs. of 5 variables

Values
- 0   1

Functions
- foo   function (x)

Displays saved objects by type with short description | View in data viewer | View function source code

Create folder | Upload file | Delete file | Rename file | Change directory

Path to displayed directory

A File browser keyed to your working directory. Click on file or directory name to open.

Version Control with Git or SVN

Turn on at **Tools > Project Options > Git/SVN**

Stage files: | Show file diff | Commit staged files | Push/Pull to remote | View History

- 🟢 Added
- 🔴 Deleted
- 🔵 Modified
- 🟣 Renamed
- 🟡 Untracked

Open shell to type commands | current branch

Package Writing

File > New Project > New Directory > R Package

Turn project into package, Enable roxygen documentation with **Tools > Project Options > Build Tools**

Roxygen guide at **Help > Roxygen Quick Reference**

Debug Mode

Open with **debug(), browser()**, or a breakpoint. RStudio will open the debugger mode when it encounters a breakpoint while executing code.

Click next to line number to add/remove a breakpoint.

Highlighted line shows where execution has paused

Launch debugger mode from origin of error | Open traceback to examine the functions that R called before the error occurred

```
> foo()
Error in get_digit(num, x)
Error!
```
- Show Traceback
- Rerun with Debug

```
Console  ~/IDEcheatsheet/
Next | Continue | Stop
```

Run commands in environment where execution has paused | Examine variables in executing environment | Select function in traceback to debug

Step through code one line at a time | Step into and out of functions to run | Resume execution | Quit debug mode

Pro Features

Share Project with Collaborators | Active shared collaborators

Start **new R Session** in current project

Close R Session in project

Select **R Version**

- New Project...
- Open Project...
- Close Project
- Share Project...
- Clear Project List
- Project Options...

- R version 3.2.2
- R version 3.1.3
- R version 3.0.3
- R version 2.15.3

PROJECT SYSTEM
File > New Project

RStudio saves the call history, workspace, and working directory associated with a project. It reloads each when you re-open a project.

Name of current project

RStudio opens plots in a dedicated Plots pane

Navigate recent plots | Open in window | **Export plot** | Delete plot | Delete all plots

GUI Package manager lists every installed package

Install Packages | Update Packages | Create reproducible package library for your project

- scales   Scale Functions for Visualization   0.5.0
- shiny   Web Application Framework for R   0.12.2
- shinydashboard   Create Dashboards with 'Shiny'   0.5.1

Click to load package with **library()**. Unclick to detach package with **detach()** | Package version installed | Delete from library

RStudio opens documentation in a dedicated Help pane

Home page of helpful links | Search within help file | Search for help file

Viewer Pane displays HTML content, such as Shiny apps, RMarkdown reports, and interactive visualizations

Stop Shiny app | Publish to shinyapps.io, rpubs, RSConnect, ... | Refresh

View(<data>) opens spreadsheet like view of data set

Filter rows by value or value range | Sort by values | Search for value

R Markdown

Notebook interface to weave together text, equations, and code into nicely formatted output

Allows you to create and document fully reproducible workflows

Ideal framework for homework assignments!

R Markdown

Supports dozens of static and dynamic output formats

- HTML
- PDF
- MS Word
- HTML5 slides
- Books
- Shiny apps
- Scientific articles
- websites

Gallery here

GitHub

A website & cloud-based service that helps developers

- Store & manage their code

- Track & control changes to their code

- Communicate with other members

GitHub

Its central focus is version control via **git**

but that's not our focus in this course

QERM 514 - Analysis of Ecological and Environmental Data

Course materials for "Analysis of Ecological and Environmental Data" (QERM 514) offered at the University of Washington

⊙ University of Washington

📖 **Repositories** 3   📦 Packages   👤 People 1   🗂 Teams   📋 Projects   ⚙ Settings

| Find a repository... | Type: All ▾ | Language: All ▾ | Customize pins | 📑 New |

assistance

This repository is for giving and receiving assistance with course logistics and content.

⚖ MPL-2.0   ⑂ 0   ★ 0   ⓘ 1   ⑂ 0   Updated 2 hours ago

website

Website for QERM 514 at the University of Washington

🔴 HTML   ⚖ MPL-2.0   ⑂ 0   ★ 0   ⓘ 0   ⑂ 0   Updated 4 hours ago

development Private

Development repo for course materials

⚖ MPL-2.0   ⑂ 0   ★ 0   ⓘ 0   ⑂ 0   Updated 4 hours ago

Finish setting up QERM 514 - Analysis of Ecological and Environmental Data

✓ 4 of 4

✓ Create your organization

✓ Invite your team

✓ Set up your profile

✓ Set up your first repository

Top languages

🔴 HTML

Intro to GitHub issues