

process-models-workshop

The RoLE Team

5/2/2023

Table of contents

1	Introduction	5
2	Planned sections	6
3	Day 1	7
4	Day 2	8
5	Lesson template	9
5.1	Section title:	9
5.2	Key questions	9
5.3	Lesson objectives	9
5.4	Planned exercises	9
5.5	Supporting materials	9
5.5.1	Extant	10
5.5.2	To create	10
5.6	Key points	10
6	Theory and motivation of process modeling	11
6.1	Key questions	11
6.2	Lesson objectives	11
6.3	Planned exercises	11
6.4	Supporting materials	11
6.4.1	Extant	12
6.4.2	To create	12
6.5	Key points	12
7	Introduction to the RoLE Model	13
7.1	Key questions	13
7.2	Lesson objectives	13
7.3	Planned exercises	13
7.4	Supporting materials	13
7.4.1	Extant	14
7.4.2	To create	14
7.5	Key points	14

8	How a RoLE model works	15
8.1	Key questions	15
8.2	Lesson objectives	15
8.3	Planned exercises	15
8.4	Supporting materials	15
8.4.1	Extant	16
8.4.2	To create	16
8.5	Key points	16
9	Getting started: roleR	17
9.1	Key questions	17
9.2	Lesson objectives	17
9.3	Planned exercises	17
9.4	Supporting materials	17
9.4.1	Extant	18
9.4.2	To create	18
9.5	Key points	18
10	Using RoLE to explore hypotheses	19
10.1	Key questions	19
10.2	Lesson objectives	19
10.3	Planned exercises	19
10.4	Supporting materials	19
10.4.1	Extant	20
10.4.2	To create	20
10.5	Key points	20
11	Comparing simulations to empirical data	21
11.1	Key questions	21
11.2	Lesson objectives	21
11.3	Planned exercises	21
11.4	Supporting materials	21
11.4.1	Extant	21
11.4.2	To create	21
11.5	Key points	22
12	Process inference using roleR	23
12.1	Key questions	23
12.2	Lesson objectives	23
12.3	Planned exercises	23
12.4	Supporting materials	23
12.4.1	Extant	23
12.4.2	To create	23

12.5 Key points	24
13 roleR and Reproducibility	25
13.1 Key questions	25
13.2 Lesson objectives	25
13.3 Planned exercises	25
13.4 Supporting materials	25
13.4.1 Extant	25
13.4.2 To create	25
13.5 Key points	26
14 Wrap-up	27
14.1 Key questions	27
14.2 Lesson objectives	27
14.3 Planned exercises	27
14.4 Supporting materials	27
14.4.1 Extant	27
14.4.2 To create	27
14.5 Key points	28

1 Introduction

This is a quarto book project for creating materials for the second half of the MDBD workshop.

There is a list of planned sections in the “List of sections” chapter.

To add a new section, start from the “Template section”. Open `template_section.qmd`, save-as, and populate it; then add it to the list of sections in `_quarto.yml`.

To update the Pages site, run `quarto render` from a local terminal. This will render the files to the `docs` directory. Then push, and GitHub pages will serve the site from `docs`.

2 Planned sections

3 Day 1

1. Theory/conceptual motivation for process models
2. Introduction to RoLE
3. Getting started running simulations with RoLE
4. Using RoLE to develop and test theoretical intuition

4 Day 2

1. Process models for inference
2. Inference on empirical data
3. Reproducibility (sharing and archiving)
4. Wrap-up

5 Lesson template

5.1 Section title:

5.2 Key questions

List 1-3 key questions to motivate this section of the workshop.

5.3 Lesson objectives

List 1-3 lesson objectives, filling in the prompt “After this section of the workshop, participants should be able to...”

5.4 Planned exercises

List planned activities for this section of the workshop. Examples could include (but not limited to) lectures, live-coding demos, breakout sessions, group discussions, etc.

5.5 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

5.5.1 Extant

5.5.2 To create

5.6 Key points

List 1-3 key takeaways from this section of the workshop.

6 Theory and motivation of process modeling

6.1 Key questions

1. What is a process modeling approach?
2. What kinds of questions can process models explore (that other methods cannot)?
3. What are the limitations or constraints of process modeling?

6.2 Lesson objectives

After this lesson, learners should be able to...

1. Describe what defines a process model.
2. Evaluate the pros and cons of a process modeling approach.
3. Generate questions in ecology and evolution that could be addressed using process modeling.

6.3 Planned exercises

List planned activities for this section of the workshop. Examples could include (but not limited to) lectures, live-coding demos, breakout sessions, group discussions, etc.

6.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

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6.4.1 Extant

6.4.2 To create

6.5 Key points

List 1-3 key takeaways from this section of the workshop.

7 Introduction to the RoLE Model

7.1 Key questions

1. What is the RoLE Model?
2. What are some of the possible applications of the RoLE Model?
3. How do I learn more?

7.2 Lesson objectives

After this lesson, learners should be able to...

1. Situate RoLE in the wider process modeling state space.
2. Describe the (high-level) concept for RoLE.
3. Formulate scientific questions and decide if/how RoLE can be used to explore them.

7.3 Planned exercises

- Lecture/visuals
- Discussion/breakout groups

7.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

7.4.1 Extant

7.4.2 To create

7.5 Key points

List 1-3 key takeaways from this section of the workshop.

8 How a RoLE model works

8.1 Key questions

1. What are the inputs and outputs of a RoLE model?
2. What happens when a RoLE model runs?

8.2 Lesson objectives

After this lesson, learners should be able to...

1. Describe the structure of a RoLE model.
2. Describe the rules of a RoLE simulation.
3. Describe the outputs of a RoLE model and what they say about the system.
4. Describe some of the “special cases”/RoLE “flavors” (neutral, LV, etc)

8.3 Planned exercises

- Whiteboard demo/lecture

8.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

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8.4.1 Extant

8.4.2 To create

- Relevant chapters of user guide.

8.5 Key points

List 1-3 key takeaways from this section of the workshop.

9 Getting started: roleR

9.1 Key questions

1. How do I set up and run a RoLE model in R?
2. How do I access and visualize the results of a RoLE simulation?
3. How can I store the outputs of a RoLE model?

9.2 Lesson objectives

After this lesson, learners should be able to...

1. Use roleR to run a basic RoLE model.
2. Extract summary statistics from a RoLE model, plot them, and relate the visuals to ecological/evolutionary processes.
3. Save RoLE models to disc.

9.3 Planned exercises

- Code-along demo
- Experimentation time (set a challenge and report back?)

9.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

9.4.1 Extant

9.4.2 To create

- Relevant chapters of user guide.

9.5 Key points

List 1-3 key takeaways from this section of the workshop.

10 Using RoLE to explore hypotheses

10.1 Key questions

1. How do I use RoLE to explore/generate theoretical predictions

10.2 Lesson objectives

After this lesson, learners should be able to...

1. Formulate hypotheses for how tweaking parameters will affect model outputs
2. Use RoLE to test these hypotheses in silico
3. Synthesize the outcomes

10.3 Planned exercises

- Group brainstorming of params to tweak
- Breakout to test them
- Come together to debrief/synthesize

10.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

10.4.1 Extant

10.4.2 To create

- Relevant chapters of user guide.

10.5 Key points

List 1-3 key takeaways from this section of the workshop.

11 Comparing simulations to empirical data

11.1 Key questions

1. What kinds of empirical data can we leverage using process modeling?
2. How can we infer process from empirical data using simulation models?
3. What are the challenges associated with this and how do we escape them?

11.2 Lesson objectives

After this lesson, learners should be able to...

1. Articulate ways in which empirical data could be elucidated using sim models
2. Describe the conceptual framework for going data-to-process
3. Describe the many-to-one/model identifiability problems and how to break them

11.3 Planned exercises

11.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

11.4.1 Extant

11.4.2 To create

- Relevant chapters of user guide.

11.5 Key points

List 1-3 key takeaways from this section of the workshop.

12 Process inference using roleR

12.1 Key questions

1. How do I perform a process-inference using RoLE simulations in R?

12.2 Lesson objectives

After this lesson, learners should be able to...

1. Use RoLE simulations, caret/parsnip/???, and (simulated?) data to do the ML inference
2. Interpret results in terms of story
3. Brainstorm applications to real data

12.3 Planned exercises

12.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

12.4.1 Extant

12.4.2 To create

- Relevant chapters of user guide.

12.5 Key points

List 1-3 key takeaways from this section of the workshop.

13 roleR and Reproducibility

13.1 Key questions

1. How do I set up my workflow for reproducible research?
2. How do I store and share RoLE simulations?

13.2 Lesson objectives

After this lesson, learners should be able to...

1. Describe best-practices for reproducible simulations
2. Explain why RoLE is not generally *numerically* reproducible (yes?)
3. Describe strategies for storing and sharing code and models for works-in-progress
4. Explain the importance of and appropriate repositories for long-term archiving

13.3 Planned exercises

13.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

13.4.1 Extant

13.4.2 To create

- Relevant chapters of user guide.

13.5 Key points

List 1-3 key takeaways from this section of the workshop.

14 Wrap-up

14.1 Key questions

1. What have we covered?
2. Where can I find information and support post-workshop?
3. How can I submit feedback on this workshop?

14.2 Lesson objectives

After this lesson, learners should be able to...

1. Identify (personal) takeaways from the workshop
2. Know where to look for help from the instructors and the internet post-workshop
3. Send us feedback!

14.3 Planned exercises

14.4 Supporting materials

Describe, and where possible link to, lesson materials that will be needed for this section of the workshop. These could include code for live coding, code documentation, book chapters, videos/animations, etc.

For bonus points organize these according to whether they already exist or we need to create them!

14.4.1 Extant

14.4.2 To create

- Relevant chapters of user guide.

14.5 Key points

List 1-3 key takeaways from this section of the workshop.