# INLABRU **WORKSHOP**

ICES 2025, Copenhagen

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# 1  Welcome to the course!

- Welcome to the `inlabru` workshop!
- The aim of this workshop is to introduce you to a range of statistical modelling approaches, in particular the temporal, spatial and spatio-temporal modelling as implemented in the `inlabru` package.
- Workshop materials are available in the github repository inlabru-workshop

# 2  Learning Objectives for the workshop

At the end of the workshop, participants will have an understanding of:

- the motivation for and the challenges of analysing and modelling spatial data
- statistical models used to analyse spatial and spatio-temporal data
- the implementation of these models in the `inlabru` package
- how to independently analyse spatial data with `inlabru`

# 3  Intended audience

The workshop aims to cater for participants with a range of different backgrounds, who is interested in analysing data with modern spatial and spatio-temporal statistical modelling approaches.

# 4  Prerequisites

Participants should be familiar with the `R` environment, and general statistical approaches for modelling such as regression, analysis of (co)variance, and generalized linear models.

No knowledge of `R-INLA` or `inlabru` is required.

# 5  Schedule

### 5.0.1  Day 1

| Time | Topic |
|---|---|
| 10:00 - 10:30 | ICES information session |
| 10:30 - 11:30 | **Session 1**: Introduction to `inlabru` |
| 11:30 - 13:00 | Practical Session 1 |
| 13:00 - 14:30 | Lunch break 🍴 |
| 14:30 - 15:30 | **Session 2**: Latent Gaussian Models and INLA |
| 15:30 - 15:45 | Coffee Break ☕ |
| 15:45 - 16:45 | Practical Session 2 |

| Time | Topic |
|---|---|
| 16:45 - 17:00 | wrap-up and outlook |

### 5.0.2 Day 2

| Time | Topic |
|---|---|
| 9:00 - 10:00 | **Session 3**: Temporal modelling and smoothing part 1 |
| 10:00 - 10:30 | Snack |
| 10:30 - 11:30 | Temporal modelling and smoothing part 2 |
| 11:30 - 13:00 | Practical Session 3 |
| 13:00 - 14:30 | Lunch break |
| 14:30 - 15:30 | **Session 5**: Introduction to Spatial Statistics |
| 15:35 - 15:45 | Coffee Break |
| 15:45 - 16:45 | Practical Session 4 |
| 16:45 - 17:00 | wrap-up and outlook |

### 5.0.3 Day 3

| Time | Topic |
|---|---|
| 9:00 - 10:00 | **Session 6**: Areal Processes |
| 10:00 - 10:30 | Snack |
| 10:30 - 11:30 | **Session 7**: Geostatistics |
| 11:30 - 13:00 | Practical Session 5 |
| 13:00 - 14:30 | Lunch break |
| 14:30 - 15:30 | **Session 8**: Spatial Point processes |
| 15:35 - 15:45 | Coffee Break |
| 15:45 - 16:45 | Practical Session 5 continued |
| 16:45 - 17:00 | wrap-up and outlook |

### 5.0.4 Day 4

| Time | Topic |
|---|---|
| 9:00 - 10:00 | **Session 9**: Spatiotemporal models |
| 10:00 - 10:30 | Snack |
| 10:30 - 11:30 | **Session 10**: Model comparison and evaluation |
| 11:30 - 13:00 | Practical Session 6 |
| 13:00 - 14:30 | Lunch break |
| 14:30 - 15:30 | **Session 11**: Multi-likelihood/joint likelihood models |
| 15:35 - 15:45 | Coffee Break |
| 15:45 - 16:45 | Practical Session 7 |
| 16:45 - 17:00 | wrap-up and outlook |

**5.0.5 Day 5**

| Time | Topic |
|---|---|
| 9:00 - 10:00 | **Session 12**: Zero inflated models |
| 10:00 - 10:30 | Snack 🍴 |
| 10:30 - 11:30 | **Session 13**: Complex observational processes: Distance Sampling |
| 11:30 - 13:00 | Practical Session 8: Zero Inflated models - Distance sampling |
| 13:00 - 13:15 | Coffee Break ☕ |
| 13:15 - 14:00 | Closing session |

# 6 In preparation for the workshop

Participants are required to follow the below steps ahead of the first day of the workshop:

1. Check your `R` version, it should be at least 4.3.*

2. Install R-INLA

3. Install `inlabru` (available from CRAN)

```
# Enable universe(s) by inlabru-org
options(repos = c(
  inlabruorg = "https://inlabru-org.r-universe.dev",
  INLA = "https://inla.r-inla-download.org/R/testing",
  CRAN = "https://cloud.r-project.org"
))

# Install some packages
install.packages("inlabru")
```

3. Make sure you have the latest `R-INLA`, `inlabru` and `R` versions installed.
4. Install the following libraries:

```
install.packages(c(
  "CARBayesdata",
  "DAAG",
  "dplyr",
  "FSAdata",
  "ggplot2",
  "gt",
  "lubridate",
  "magrittr",
  "mapview",
  "patchwork",
  "scico",
  "sdmTMB",
  "sf",
  "spatstat",
  "spdep",
  "terra",
  "tidyr",
  "tidyterra",
  "tidyverse"
))
```