Introduction

August 14, 2017

UNIVERSITÉ DE SHERBROOKE

Langue

Même si l'école d'été est chapeautée par l'Université de Sherbrooke, la partie magistrale de l'école (y compris les notes de cours) et les discussions avec l'ensemble du groupe seront en anglais.

Par contre, les intéractions un à un peuvent se faire autant en anglais qu'en français; c'est comme vous le souhaitez.

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Eventhough the summer school is officially under Université de Sherbrooke, the lectures (including class notes) and discussion with all the group will be in English.

However, one-on-one interactions can be either in French or in English, whatever is easier for you.

The main reason for this choice is that some of the students do not speak French

Round table

Who are you and who is your neighbour?

Who are you?

Who are we?

Where are you from?

What are your interests?

Round table

Why are you here?

Forced ? ;o)

Why Bayesian statistics?

What do you know about Bayesian statistics?

What did you think of the papers we asked you to read?

Objectives

We are aware that the background, expertise and interest of everyone is different. So, our general goal is that everyone learns and make some progress in their understanding of Bayesian statistics.

What we want expect from you

- Use probability theory to construct statistical models
- Write the likelihood of a model and find its maximum through different optimization techniques
- Understand the fondamental aspects of Bayesian statistics
- Estimate the parameter of a Bayesian model using different approaches
- Understand the rudiment of hierarchical models
- Compare models through the Bayesian paradigm

Evaluation

Presentation 25%

Project report 75%

Course project

Step 1: Design the project (Friday) - Approx. 10 min

Introduction Briefly give some background to the project and explain the problem that will be approached

Why Bayes Discuss why Bayesian statistics would be appropriate

Data Present the data used to investigate the problem

Model Describe the model and formulate the likelihood function

Priors Discuss how you will find appropriate priors

Issues Try to anticipate potential problems, in particular for parameterization

Course project

Step 2: Project report

The project should be writen according to the guidelines of a Nature paper, with methods in Supplementary Material

It needs to be sent to us by **Friday August 17th 2018**

It can be done in French or English

It can be a solo or team (of at most **3 students**) project

Typical day

7h30 - 8h30	Breakfast
8h30 - 10h00	Lecture on theory & exercises
10h00 - 10h15	Break
10h15 - 12h00	Practice
12h00 - 13h30	Lunch
13h30 - 15h00	Lecture on an application & exercises
15h00 - 15h15	Break
15h15 - 16h30	Work on a problem
17h30 - 18h00	Work on the project
18h00 - 19h00	Free time
19h00 - 20h00	Supper
After 20h00	Work on the project

This is not meant to be followed strickly and will likely vary depending on the topic of the day

Schedule of the week

Day 1 **Theory** Probability Theory

Discussion Defining the prior for the problem of ecological interactions

Application Understanding co-distribution

Day 2 **Theory** Likelihood estimation

Discussion Code a simulated annealing function to model tree distribution

Application Fitting a probabilistic method to presence-only data

Day 3 **Theory** Monte Carlo Markov Chains (MCMC)

Discussion Code different types of MCMC algorithm (Metropolis-Hastings and Gibbs sampler) to model the distribution of the sugar maple on mount Sutton

Application Modelling range dynamics

Schedule of the week

Day 4 **Theory** Hierarchical models

Discussion Code Gibbs samplers to construct a univariate mixed model and a multivariate model to model the distribution of the sugar maple and the american beech on mont Sutton

Application Hierarchical modelling of species community

Day 5 **Theory** miscellaneous interesting things about Bayesian modelling (model comparison, different ways to estimate models,. . .)

Discussion

Presentation

Logistics

Alcohol everywhere but in the lunchroom

Fire place there

hicking trails all around

Wednesday longer lunch time (from 12h00 to 15h00)

No on-site security Tuesday and Wednesday evening (from 17h00)