

Statistics SEMINAR

Title:

Change-point detection on a tree to study evolutionary adaptation from present-day species

Speaker:

Paul Bastide, Applied Math PhD Candidate
Université Paris Sud
Fulbright Fellow, UW-Madison, Fall 15

**Time & Place:**

Wednesday, November 18, 2015, 4:00–5:00pm
Room 331 SMI (*Cookies and Coffee @ 3:30 in Rm 1210 MSC*)

Abstract:

Evolutionary biologists are interested in the distribution of one or several quantitative traits among related species. The classical framework consists of a random process running along the branches of the genealogical tree that describes how the species are related to each other, where nodes represent ancestral unobserved species. We consider shifts in the process parameters, that reveal fast adaptation to environmental changes, such as the adaptation of turtles to aquatic environment with increased body size. We show that these tree models with shifts are not identifiable in general. Constraining the models to be parsimonious in the number of shifts partially alleviates the problem but several evolutionary scenarios can still provide the same joint distribution for the extant, observed species. We introduce an incomplete-data framework and develop a maximum likelihood estimation procedure based on the EM algorithm. Finally, we propose a model selection procedure based on the cardinal of effective scenarios for a given number of shifts, to estimate this number of shifts and prove an oracle inequality in the univariate case.



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