SCIENCE*SPRING*DAY

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FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA
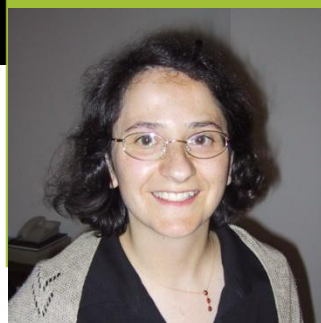
Mathematics department

Statistics – some case studies

CEAUL/Statistical Modelling in Environmental and Life Sciences

CEAUL

FCt Departamento de Matemática
FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

IST INSTITUTO SUPERIOR TÉCNICO

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CALOUSTE GULBENKIAN FOUNDATION

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Ph.D. and M.Sc. in **Probability and Statistics (FCUL, 2005;1999)**

Degree in **Applied Maths & Computation (IST-UTL, 1995)**

Objectives

Modeling the risk of urban road accidents in Lisbon: identification of factors associated with a high number of road accidents, including demographic and urban characteristics, taking into account accidents spatial nature – Fig. 1

Estimation of black scabbardfish abundance in Atlantic waters: difficult problem (deepwater species), but very important when it comes to establish its EU fishing quotas – only sustainable fisheries can be allowed – Fig. 2

Influenza epidemic short term estimation using incomplete information on influenza-like illness (ILI), from surveillance systems (*nowcasting*) – Fig. 3

Methodology

Urban accidents in Lisbon: Lisbon injury road accident occurrences (2004-07) were geo-referenced & taken as an observed pattern of a spatial point process, with marks for their severity. An inhomogeneous Poisson model with spatial covariates was used

Black scabbardfish: a dynamic model for the black scabbardfish abundance was proposed, which has the flexibility to incorporate all the prior existing biological information (scarce), estimating the resource abundance based on landings data

Nowcasting an influenza epidemic: a non-homogeneous hidden Markov model uses, weekly, as covariates an early estimate of ILI incidence rate and the number of ILI cases tested positive to *nowcast* the current week ILI rate and the probability that the influenza activity is in an epidemic state (Bayesian framework)
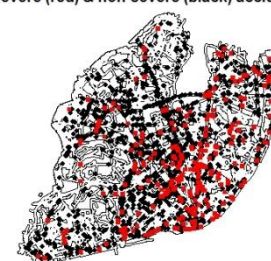
Expected Results

Urban accidents in Lisbon: the covariate traffic revealed to be important in explaining the inhomogeneity of the accidents pattern. Conditional on the locations of the accidents, their severity was considered to be independent.

Black scabbardfish: with the proposed model it was possible not only the abundance estimation but also the prediction of the abundance in several scenarios concerning different exploitation patterns of the resource.

Nowcasting an influenza epidemic: the results show the additional value of using a non-homogeneous HMM, improving the surveillance systems timeliness

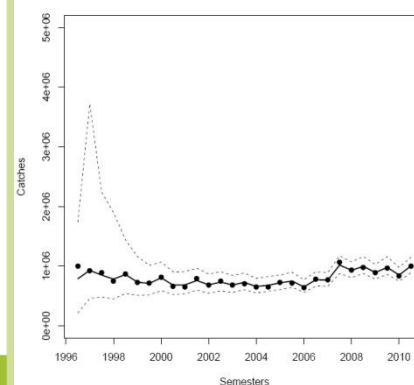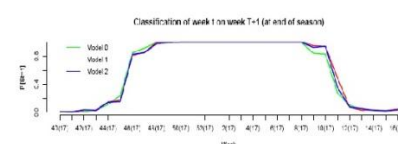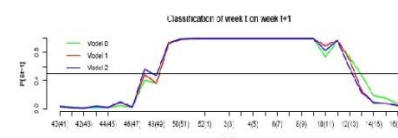Severe (red) & non-severe (black) accidents
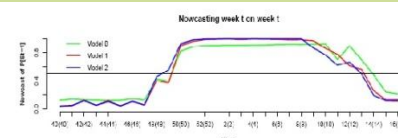
Lisbon, 2005

Fig. 1

Fig. 2

Fig. 3