



Grupo de Probabilidades e Estatística
CENTRO DE INVESTIGAÇÃO E DESENVOLVIMENTO EM MATEMÁTICA E APLICAÇÕES
Departamento de Matemática
Universidade de Aveiro



III Workshop of Probability and Statistics group — Interdisciplinarity and applications —
Department of Mathematics, University of Aveiro
27th - May - 2015

Motivated by the success of the early workshops, the group of Probability and Statistics (P&S) of the CIDMA research unit promotes the organization of this third workshop focused on applications of Statistics in different scientific research areas. In this edition, the interdisciplinarity with Statistical Science is emphasized with talks on Environment, Genomic and Tourism. The main purpose is to strengthen links among researchers of the P&S group and participants who apply, or intent to apply, probability and statistical methods in their research works. It is desirable that members of the group and invited speakers present a short talk, which may include open problems, followed by discussion in view of exchanging ideas and fomenting further research plans.

This workshop is free for anyone who is interested in applied statistics. Only a quick registration is required. For registration please send an email to adelaide@ua.pt providing your name and filiation.

Official languages: English and Portuguese (all slides will be in English)

FCT Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

Workshop supported by Portuguese funds through the CIDMA - Center for Research and Development in Mathematics and Applications and by the Portuguese Foundation for Science and Technology ("FCT-Fundação para a Ciência e a Tecnologia"), within project UID/MAT/04106/2013.



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III Workshop of Probability and Statistics group — Interdisciplinarity and applications —
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Program:

14:00 – 14:40 **Looking for statistical analyses to improve research on competitiveness of tourism destinations**

Maria João Carneiro

Department of Economics, Management and Industrial Engineering & GOVCOPP, University of Aveiro,



14:40 – 15:20 **Predicting air pollution levels and trends in Portugal with statistical methods**

Célia Alves

CESAM, University of Aveiro



15:20 – 15:40 Coffee break

15:40 – 16:20 **Exceptional DNA symmetry**

Vera Afreixo

Department of Mathematics & iBi-MED, CIDMA, IEETA University of Aveiro



16:20 – 17:00 **Wavelets-based clustering of air quality monitoring sites**

Manuel Scotto

Department of Mathematics & CIDMA, University of Aveiro



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Looking for statistical analyses to improve research on competitiveness of tourism destinations

Maria João Carneiro

Abstract

The huge growth of tourism demand and of competition among destinations led to an increasing interest in the competitiveness of tourism destinations. In the last decades several studies have been developed based on indicators of objective and subjective nature. The wide range of factors that may influence the competitiveness of tourism destinations and the specific characteristics of data available in this context lead to difficulties in the evaluation of the destinations' competitiveness. Moreover, the creation of measures to assess the overall competitiveness of destinations, the selection of approaches to identify the major determinants of that competitiveness and the identification of statistical analyses to compare destinations are other challenges of the complex process of assessing the competitiveness of tourism destinations.

Maria João Carneiro is Assistant Professor of the Department of Economics, Management and Industrial Engineering of the University of Aveiro and researcher of the Governance, Competitiveness and Public Policies research unit (UA). She holds a degree in Tourism Management and Planning (UA), an MBA (Univ.Nova de Lisboa) and a PhD in Tourism (UA). In the scope of the master and PhD theses she developed research in the competitive positioning of hotels and tourism destinations. Her current research interests include consumer behavior in tourism, competitiveness of tourism destinations, and the marketing of tourism destinations. In the scope of the competitiveness of tourism destinations she is interested in methods for assessing the destinations' competitiveness and to identify the main determinants of that competitiveness.

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Predicting air pollution levels and trends in Portugal with statistical methods

Célia Alves

Abstract

Air pollutants such as nitric oxide (NO), nitrogen dioxide (NO₂), and ozone (O₃) are particularly important because they are capable of causing adverse effects on human health. The Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC) requires member states to undertake air quality assessments, and to report the findings of these assessments to the European Commission on an annual basis. This study provides an analysis of the spatial distribution and trends of NO, NO₂ and O₃ concentrations in Portugal during the period 1995-2010. Statistically significant trends and its slopes were evaluated with Mann-Kendall sequential test and Sen's estimator, respectively. Furthermore, the contribution of several pollutants and meteorological variables to the variation of ozone concentration for the period 2004-2010 was evaluated with a stepwise multiple regression analysis in an urban and a rural site. A prediction model for ozone concentrations was developed for both sites based on a generalized linear model with a log-link function.

This is joint work with J.M. Fernández-Guisuraga, A. Castro, A. Calvo, E. Alonso-Blanco e R. Fraile

Célia Alves is Principal Researcher at the Centre for Environmental and Marine Studies (CESAM), one of the research units of the University of Aveiro, where she is a member of the Atmospheric Quality group since 2005. She holds a PhD in Environmental Applied Sciences and is currently coordinating research projects related to monitoring of air pollution, source apportionment and health effects.

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Exceptional DNA symmetry

Vera Afreixo

Abstract:

In single-stranded DNA, the frequency of one word and the correspondent inverted complement word tend to be the same, for almost all living organisms. This phenomenon is usually known as the Chargaff's second parity rule and its extensions, or simply by DNA symmetry phenomenon. We developed methods to measure and characterize the DNA symmetry (locally and globally), the exceptional symmetry has been proposed as a meaningful measure of this phenomenon, able to identify the symmetry above than expected in random contexts. To explore the exceptional symmetry along the genome sequences, we proposed a sliding window method to extract the values of exceptional symmetry (for all words or by word groups). With our study we concluded that the exceptional symmetry is a local phenomenon in genome sequences, with specific profiles characteristics by species and by chromosome.

In this seminar will be presented the developed procedures two preform the exceptional DNA symmetry among region and globally. Several results will be discussed using real genomes and control scenarios.

Vera Afreixo is Assistant Professor at the Department of Mathematics of the University of Aveiro, She is a researcher at the Institute for Biomedicine - Aveiro (iBi-MED), CIDMA and IEETA. She received the B.Sc. and M.Sc. both in Mathematics from University of Aveiro, Portugal and the Ph.D. in Electrical Engineering from the University of Aveiro, in 2008. Her research interests include Biostatistics (Statistical Genomics), Bioinformatics and Systems Biology.

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Wavelets-based clustering of air quality monitoring sites

Manuel Scotto

Abstract

This work aims at providing a variance/covariance profile of a set of 36 monitoring stations measuring ozone (O_3) and nitrogen dioxide (NO_2) hourly concentrations, collected over the period 2005-2013, in Portugal mainland. The resulting individual profiles are embedded in a wavelet decomposition-based clustering algorithm in order to identify groups of stations exhibiting similar profiles. The results of the cluster analysis identify three groups of stations, namely urban, suburban/urban/rural, and a third group containing all, but one, rural stations. The results clearly indicate a geographical pattern among urban stations, distinguishing those located in Lisbon area from those located in Oporto/North. Furthermore, for urban stations, intra-diurnal and daily time scales exhibit the highest variance. This is due to the more relevant chemical activity occurring in high NO_2 emissions areas which are responsible for high variability on daily profiles. These chemical processes also explain the reason for NO_2 and O_3 being highly negatively cross-correlated in suburban and urban sites as compared with rural stations. Finally, the clustering analysis also identifies sites which need revision concerning classification according to environment/influence type.

This is joint work with Sónia Gouveia, Alexandra Monteiro and Andrés Alonso

Manuel Scotto is currently Assistant Professor with Agregação at the Math Department (UA). He completed a Ph.D. in Statistics in 2001 under the supervision of Professor Feridun Turkman (University of Lisbon, Portugal) and Professor Clive W. Anderson (University of Sheffield, UK). His dissertation was on the extremes of certain transformations of time series. His research interests center in applied probability and sometimes cross the boundary into statistics. Current topics of research gravitate towards problems in integer-valued time series analysis, forecasting, mathematical economics, classification, extreme value theory and in applied statistics.

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