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Resúmenes de revistas
Abril – Junio 2024

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THE AMERICAN STATISTICIAN
A PUBLICATION OF THE AMERICAN STATISTICAL ASSOCIATION
VOLUME 73 · NUMBER 1 · FEBRUARY 2019

Likelihood-Free Parameter Estimation with Neural Bayes Estimators

Matthew Sainsbury-Dale, Andrew Zammit-Mangion & Raphaël Huser

Abstract

Neural Bayes estimators are neural networks that approximate Bayes estimators. They are fast, likelihood-free, and amenable to rapid bootstrap-based uncertainty quantification. In this article, we aim to increase the awareness of statisticians to this relatively new inferential tool, and to facilitate its adoption by providing user-friendly open-source software. We also give attention to the ubiquitous problem of estimating parameters from replicated data, which we address using permutation-invariant neural networks. Through extensive simulation studies we demonstrate that neural Bayes estimators can be used to quickly estimate parameters in weakly identified and highly parameterized models with relative ease. We illustrate their applicability through an analysis of extreme sea-surface temperature in the Red Sea where, after training, we obtain parameter estimates and bootstrap-based confidence intervals from hundreds of spatial fields in a fraction of a second.

Out-of-Sample R^2: Estimation and Inference

Stijn Hawinkel, Willem Waegeman & Steven Maere

Abstract

Out-of-sample prediction is the acid test of predictive models, yet an independent test dataset is often not available for assessment of the prediction error. For this reason, out-of-sample performance is commonly estimated using data splitting algorithms such as cross-validation or the bootstrap. For quantitative outcomes, the ratio of variance explained to total variance can be summarized by the coefficient of determination or in-sample R^2, which is easy to interpret and to compare across different outcome variables. As opposed to in-sample R^2, out-of-sample R^2 has not been well defined and the variability on out-of-sample R̂2 has been largely ignored. Usually only its point estimate is reported, hampering formal comparison of predictability of different outcome variables. Here we explicitly define out-of-sample R^2 as a comparison of two predictive models, provide an unbiased estimator and exploit recent theoretical advances on uncertainty of data splitting estimates to provide a standard error for R̂2. The performance of the estimators for R^2 and its standard error are investigated in a simulation study. We demonstrate our new method by constructing confidence intervals and comparing models for prediction of quantitative *Brassica napus* and *Zea mays* phenotypes based on gene expression data. Our method is available in the R-package *oosse*.

Inverse Probability Weighting Estimation in Completely Randomized Experiments

Biao Zhang

Abstract

In addition to treatment assignments and observed outcomes, covariate information is often available prior to randomization in completely randomized experiments that compare an active treatment versus control. The analysis of covariance (ANCOVA) method is commonly applied to adjust for baseline covariates in order to improve precision.

We focus on making propensity score-based adjustment to covariates under the completely randomized design in a finite population of experimental units with two treatment groups. We study inverse probability weighting (IPW) estimation of the finite-population average treatment effect for a general class of working propensity score models, which includes generalized linear models for binary data. We provide randomization-based asymptotic analysis of the propensity score approach and explore the finite-population asymptotic behaviors of two IPW estimators of the average treatment effect. We identify a condition under which propensity score-based covariate adjustment is asymptotically equivalent to an ANCOVA-based covariate adjustment and improves precision compared with a simple unadjusted comparison between treatment and control arms. In particular, when the working propensity score is fitted by a generalized linear model for binary data with an intercept term, the asymptotic variance of the IPW estimators is the same for any link function, including identity link, logit link, probit link, and complementary log-log link. We demonstrate these methods using an HIV clinical trial and a post-traumatic stress disorder study. Finally, we present a simulation study comparing the finite-sample performance of IPW and other methods for both continuous and binary outcomes.

A Characterization of Most(More) Powerful Test Statistics with Simple Nonparametric Applications

Albert Vexler & Alan D. Hutson

Abstract

Data-driven most powerful tests are statistical hypothesis decision-making tools that deliver the greatest power against a fixed null hypothesis among all corresponding data-based tests of a given size. When the underlying data distributions are known, the likelihood ratio principle can be applied to conduct most powerful tests. Reversing this notion, we consider the following questions. (a) Assuming a test statistic, say T, is given, how can we transform T to improve the power of the test? (b) Can T be used to generate the most powerful test? (c) How does one compare test statistics with respect to an attribute of the desired most powerful decision-making procedure? To examine these questions, we propose one-to-one mapping of the term "most powerful" to the distribution properties of a given test statistic via matching characterization. This form of characterization has practical applicability and aligns well with the general principle of sufficiency. Findings indicate that to improve a given test, we can employ relevant ancillary statistics that do not have changes in their distributions with respect to tested hypotheses. As an example, the present method is illustrated by modifying the usual t-test under nonparametric settings. Numerical studies based on generated data and a real-data set confirm that the proposed approach can be useful in practice.

Evidential Calibration of Confidence Intervals

Samuel Pawel, Alexander Ly & Eric-Jan Wagenmakers

Abstract

We present a novel and easy-to-use method for calibrating error-rate based confidence intervals to evidence-based support intervals. Support intervals are obtained from inverting Bayes factors based on a parameter estimate and its standard error. A k support interval can be interpreted as "the observed data are at least k times more likely under the included parameter values than under a specified alternative." Support intervals depend on the specification of prior distributions for the parameter under the alternative, and we present several types that allow different forms of external knowledge to be encoded. We also show how prior specification can to some extent be avoided by considering a class of prior distributions and then computing so-called minimum support intervals which, for a given class of priors, have a one-to-one mapping with confidence intervals. We also illustrate how the sample size of a future study can be determined based on the concept of support. Finally, we show how the bound for the Type I error rate of Bayes factors leads to a bound for the coverage of support intervals. An application to data from a clinical trial illustrates how support intervals can lead to inferences that are both intuitive and informative.

Confidence Distributions for the Autoregressive Parameter

Rolf Larsson

Abstract

The notion of confidence distributions is applied to inference about the parameter in a simple autoregressive model, allowing the parameter to take the value one. This makes it possible to compare to asymptotic approximations in both the stationary and the nonstationary cases at the same time. The main point, however, is to compare to a Bayesian analysis of the same problem. A noninformative prior for a parameter, in the sense of Jeffreys, is given as the ratio of the confidence density and the likelihood. In this way, the similarity between the confidence and noninformative Bayesian frameworks is exploited. It is shown that, in the stationary case, asymptotically the so induced prior is flat. However, if a unit parameter is allowed, the induced prior has to have a spike at one of some size. Simulation studies and two empirical examples illustrate the ideas.

Play Call Strategies and Modeling for Target Outcomes in Football

Preston Biro & Stephen G. Walker

Abstract

This article considers one-off actions for a football coach who is asking for a specific outcome from a play. This will be in the form of a minimum gain in yards, usually in order to gain a first down. Using a random utility model approach we propose the play to be called is the one which maximizes the probability of the desired outcome. We specifically focus on pass plays, which requires the modeling of outcomes in terms of yards gained, for which we use the family of generalized gamma distributions. The data and results relate to the Fall 2021 Presbyterian College football team, in which we leverage specific information pertaining to the offensive playbook.

Sensitivity Analyses of Clinical Trial Designs: Selecting Scenarios and Summarizing Operating Characteristics

Larry Han, Andrea Arfè & Lorenzo Trippa

Abstract

The use of simulation-based sensitivity analyses is fundamental for evaluating and comparing candidate designs of future clinical trials. In this context, sensitivity analyses are especially useful to assess the dependence of important design operating characteristics with respect to various unknown parameters. Typical examples of operating characteristics include the likelihood of detecting treatment effects and the average study duration, which depend on parameters that are unknown until after the onset of the clinical study, such as the distributions of the primary outcomes and patient profiles. Two crucial components of sensitivity analyses are (i) the choice of a set of plausible simulation scenarios and (ii) the list of operating characteristics of interest. We propose a new approach for choosing the set of scenarios to be included in a sensitivity analysis. We maximize a utility criterion that formalizes whether a specific set of sensitivity scenarios is adequate to summarize how the operating characteristics of the trial design vary across plausible values of the unknown parameters. Then, we use optimization techniques to select the best set of simulation scenarios (according to the criteria specified by the investigator) to exemplify the operating characteristics of the trial design. We illustrate our proposal in three trial designs.

Semi-Structured Distributional Regression

David Rügamer, Chris Kolb & Nadja Klein

Abstract

Combining additive models and neural networks allows to broaden the scope of statistical regression and extend deep learning-based approaches by interpretable structured additive predictors at the same time. Existing attempts uniting the two modeling approaches are, however, limited to very specific combinations and, more importantly, involve an identifiability issue. As a consequence, interpretability and stable estimation are typically lost. We propose a general

framework to combine structured regression models and deep neural networks into a unifying network architecture. To overcome the inherent identifiability issues between different model parts, we construct an orthogonalization cell that projects the deep neural network into the orthogonal complement of the statistical model predictor. This enables proper estimation of structured model parts and thereby interpretability. We demonstrate the framework's efficacy in numerical experiments and illustrate its special merits in benchmarks and real-world applications.

Hidden Markov Models for Low-Frequency Earthquake Recurrence

Jessica Allen & Ting Wang

Abstract

Low-frequency earthquakes (LFEs) are small magnitude earthquakes with frequencies of 1–10 Hertz which often occur in overlapping sequence forming persistent seismic tremors. They provide insights into large earthquake processes along plate boundaries. LFEs occur stochastically in time, often forming temporally recurring clusters. The occurrence times are typically modeled using point processes and their intensity functions. We demonstrate how to use hidden Markov models coupled with visualization techniques to model inter-arrival times directly, classify LFE occurrence patterns along the San Andreas Fault, and perform model selection. We highlight two subsystems of LFE activity corresponding to periods of alternating episodic and quiescent behavior.

First-Passage Times for Random Partial Sums: Yadrenko's Model for e and Beyond

Joel E. Cohen

Abstract

M. I. Yadrenko discovered that the expectation of the minimum number N_1 of independent and identically distributed uniform random variables on (0, 1) that have to be added to exceed 1 is e. For any threshold $a > 0$, K. G. Russell found the distribution, mean, and variance of the minimum number N_a of independent and identically distributed uniform random summands required to exceed a. Here we calculate the distribution and moments of N_a when the summands obey the negative exponential and Lévy distributions. The Lévy distribution has infinite mean. We compare these results with the results of Yadrenko and Russell for uniform random summands to see how the expected first-passage time E(Na),a>0, and other moments of N_a depend on the distribution of the summand.

Learning to Forecast: The Probabilistic Time Series Forecasting Challenge

Johannes Bracher, Nils Koster, Fabian Krüger & Sebastian Lerch

Abstract

We report on a course project in which students submit weekly probabilistic forecasts of two weather variables and one financial variable. This real-time format allows students to engage in practical forecasting, which requires a diverse set of skills in data science and applied statistics. We describe the context and aims of the course, and discuss design parameters like the selection of target variables, the forecast submission process, the evaluation of forecast performance, and the feedback provided to students. Furthermore, we describe empirical properties of students' probabilistic forecasts, as well as some lessons learned on our part.

Statistical Challenges in Online Controlled Experiments: A Review of A/B Testing Methodology

Nicholas Larsen, Jonathan Stallrich, Srijan Sengupta, Alex Deng, Ron Kohavi & Nathaniel T. Stevens

Abstract

The rise of internet-based services and products in the late 1990s brought about an unprecedented opportunity for online businesses to engage in large scale data-driven decision making. Over the past two decades, organizations such as Airbnb, Alibaba, Amazon, Baidu, Booking.com, Alphabet's Google, LinkedIn, Lyft, Meta's Facebook, Microsoft, Netflix, Twitter, Uber, and Yandex have invested tremendous resources in *online controlled experiments* (OCEs) to assess the impact of innovation on their customers and businesses. Running OCEs at scale has presented a host of challenges requiring solutions from many domains. In this article we review challenges that require new statistical methodologies to address them. In particular, we discuss the practice and culture of online experimentation, as well as its statistics literature, placing the current methodologies within their relevant statistical lineages and providing illustrative examples of OCE applications. Our goal is to raise academic statisticians' awareness of these new research opportunities to increase collaboration between academia and the online industry.

Multiple-Model-based Robust Estimation of Causal Treatment Effect on a Binary Outcome with Integrated Information from Secondary Outcomes

Chixiang Chen, Shuo Chen, Qi Long, Sudeshna Das & Ming Wang

Abstract

An assessment of the causal treatment effect in the development and progression of certain diseases is important in clinical trials and biomedical studies. However, it is not possible to infer a causal relationship when the treatment assignment is imbalanced and confounded by other mechanisms. Specifically, when the treatment assignment is not randomized and the primary outcome is binary, a conventional logistic regression may not be valid to elucidate any causal inference. Moreover, exclusively capturing all confounders is extremely difficult and even impossible in large-scale observational studies. We propose a multiple-model-based robust (MultiMR) estimator for estimating the causal effect with a binary outcome, where multiple propensity score models and conditional mean imputation models are used to ensure estimation robustness. Furthermore, we propose an enhanced MultiMR (eMultiMR) estimator that reduces the estimation variability of MultiMR estimates by incorporating secondary outcomes that are highly correlated with the primary binary outcome. The resulting estimates are less sensitive to model mis-specification compared to those based on state-of-the-art doubly-robust methods. These estimates are verified through both theoretical and numerical assessments. The utility of (e)MultiMR estimation is illustrated using the Uniform Data Set (UDS) from the National Alzheimer's Coordinating Center with the objective of detecting the causal effect of the short-term use of antihypertensive medications on the development of dementia or mild cognitive impairment.

Counting the Unseen: Estimation of Susceptibility Proportions in Zero-Inflated Models Using a Conditional Likelihood Approach

P. 161-170

Wen-Han Hwang, Lu-Fang Chen & Jakub Stoklosa

Abstract

Zero-inflated count data models are widely used in various fields such as ecology, epidemiology, and transportation, where count data with a large proportion of zeros is prevalent. Despite their widespread use, their theoretical properties have not been extensively studied. This study aims to investigate the impact of ignoring heterogeneity in event count intensity and susceptibility probability on zero-inflated count data analysis within the zero-inflated Poisson framework. To address this issue, we propose a novel conditional likelihood approach that uses positive count data only to estimate event count intensity parameters and develop a consistent estimator for estimating the average susceptibility probability. Our approach is compared with the maximum likelihood approach, and we demonstrate our findings through a comprehensive simulation study and real data analysis. The results can also be extended to zero-inflated binomial and geometric models with similar conclusions. These findings contribute to the understanding of the theoretical properties of zero-inflated count data models and provide a practical approach to handling heterogeneity in such models.

Bivariate Analysis of Distribution Functions Under Biased Sampling

P. 171-179

Hsin-wen Chang & Shu-Hsiang Wang

Abstract

This article compares distribution functions among pairs of locations in their domains, in contrast to the typical approach of univariate comparison across individual locations. This bivariate approach is studied in the presence of sampling bias, which has been gaining attention in COVID-19 studies that over-represent more symptomatic people. In cases with either known or unknown sampling bias, we introduce Anderson–Darling-type tests based on both the univariate and bivariate formulation. A simulation study shows the superior performance of the bivariate approach over the univariate one. We illustrate the proposed methods using real data on the distribution of the number of symptoms suggestive of COVID-19.

Differentially Private Methods for Releasing Results of Stability Analyses

P. 180-191

Chengxin Yang & Jerome P. Reiter

Abstract

Data stewards and analysts can promote transparent and trustworthy science and policy-making by facilitating assessments of the sensitivity of published results to alternate analysis choices. For example, researchers may want to assess whether the results change substantially when different subsets of data points (e.g., sets formed by demographic characteristics) are used in the analysis, or when different models (e.g., with or without log transformations) are estimated on the data. Releasing the results of such stability analyses leaks information about the data subjects. When the underlying data are confidential, the data stewards and analysts may seek to bound this information leakage. We present methods for stability analyses that can satisfy differential privacy, a definition of data confidentiality providing such bounds. We use regression modeling as the motivating example. The basic idea is to split the data into disjoint subsets, compute a measure summarizing the difference between the published and alternative analysis on each subset, aggregate these subset estimates, and add noise to the aggregated value to satisfy differential privacy. We illustrate the methods using regressions in which an analyst compares coefficient estimates for different groups in the data, and in which analysts fit two different models on the data.

Enhanced Inference for Finite Population Sampling-Based Prevalence Estimation with Misclassification Errors

Lin Ge, Yuzi Zhang, Lance A. Waller & Robert H. Lyles

Abstract

Epidemiologic screening programs often make use of tests with small, but nonzero probabilities of misdiagnosis. In this article, we assume the target population is finite with a fixed number of true cases, and that we apply an imperfect test with known sensitivity and specificity to a sample of individuals from the population. In this setting, we propose an enhanced inferential approach for use in conjunction with sampling-based bias-corrected prevalence estimation. While ignoring the finite nature of the population can yield markedly conservative estimates, direct application of a standard finite population correction (FPC) conversely leads to underestimation of variance. We uncover a way to leverage the typical FPC indirectly toward valid statistical inference. In particular, we derive a readily estimable extra variance component induced by misclassification in this specific but arguably common diagnostic testing scenario. Our approach yields a standard error estimate that properly captures the sampling variability of the usual bias-corrected maximum likelihood estimator of disease prevalence. Finally, we develop an adapted Bayesian credible interval for the true prevalence that offers improved frequentist properties (i.e., coverage and width) relative to a Wald-type confidence interval. We report the simulation results to demonstrate the enhanced performance of the proposed inferential methods.

Here Comes the STRAIN: Analyzing Defensive Pass Rush in American Football with Player Tracking Data

Quang Nguyen, Ronald Yurko & Gregory J. Matthews

Abstract

In American football, a pass rush is an attempt by the defensive team to disrupt the offense and prevent the quarterback (QB) from completing a pass. Existing metrics for assessing pass rush performance are either discrete-time quantities or based on subjective judgment. Using player tracking data, we propose STRAIN, a novel metric for evaluating pass rushers in the National Football League (NFL) at the continuous-time within-play level. Inspired by the concept of strain rate in materials science, STRAIN is a simple and interpretable means for measuring defensive pressure in football. It is a directly observed statistic as a function of two features: the distance between the pass rusher and QB, and the rate at which this distance is being reduced. Our metric possesses great predictability of pressure and stability over time. We also fit a multilevel model for STRAIN to understand the defensive pressure contribution of every pass rusher at the play-level. We apply our approach to NFL data and present results for the first eight weeks of the 2021 regular season. In particular, we provide comparisons of STRAIN for different defensive positions and play outcomes, and rankings of the NFL's best pass rushers according to our metric.

Bayesian Detection of Bias in Peremptory Challenges Using Historical Strike Data

Sachin S. Pandya, Xiaomeng Li, Eric Barón & Timothy E. Moore

Abstract

United States law bars using peremptory strikes during jury selection because of prospective juror race, ethnicity, sex, or membership in certain other cognizable classes. Here, we extend a Bayesian approach for detecting such illegal strike bias by showing how to incorporate historical data on an attorney's use of peremptory strikes in past cases. In so doing, we use the power prior to adjust the weight of such historical information in the analysis. Using simulations, we show how the choice of the power prior's discounting parameter influences bias detection (how likely the credible interval for the bias parameter excludes zero), depending on the degree of incompatibility between current and historical trial data. Finally, we extend this approach with a prototype software application that lawyers could use to detect strike bias in real time during jury-selection. We illustrate this application's use with real historical strike data from a convenience sample of cases from one court.

Anne Helby Petersen & Claus Ekstrøm

Abstract

When does inspecting a certain graphical plot allow for an investigator to reach the right statistical conclusion? Visualizations are commonly used for various tasks in statistics—including model diagnostics and exploratory data analysis—and though attractive due to its intuitive nature, the lack of available methods for validating plots is a major drawback. We propose a new technical validation method for visual reasoning. Our method trains deep neural networks to distinguish between plots simulated under two different data generating mechanisms (null or alternative), and we use the classification accuracy as a technical validation score (TVS). The TVS measures the information content in the plots, and TVS values can be used to compare different plots or different choices of data generating mechanisms, thereby providing a meaningful scale that new visual reasoning procedures can be validated against. We apply the method to three popular diagnostic plots for linear regression, namely scatterplots, quantile-quantile plots and residual plots. We consider various types and degrees of misspecification, as well as different within-plot sample sizes. Our method produces TVSs that increase with increasing sample size and decrease with increasing difficulty, and hence the TVS is a meaningful measure of validity.

Adriana Verónica Blanc

Abstract

This article introduces a new kind of histogram-based representation for univariate random variables, named the *phistogram* because of its perceptual qualities. The technique relies on shifted groupings of data, creating a color-gradient zone that evidences the uncertainty from smoothing and highlights sampling issues. In this way, the phistogram offers a deep and visually appealing perspective on the finite sample peculiarities, being capable of depicting the underlying distribution as well, thus, becoming an useful complement to histograms and other statistical summaries. Although not limited to it, the present construction is derived from the equal-area histogram, a variant that differs conceptually from the traditional one. As such a distinction is not greatly emphasized in the literature, the graphical fundamentals are described in detail, and an alternative terminology is proposed to separate some concepts. Additionally, a compact notation is adopted to integrate the representation's metadata into the graphic itself.

Alberto Brini & Edwin R. van den Heuvel

Abstract

Imputation of missing data in high-dimensional datasets with more variables P than samples N, $P \gg N$, is hampered by the data dimensionality. For multivariate imputation, the covariance matrix is ill conditioned and cannot be properly estimated. For fully conditional imputation, the regression models for imputation cannot include all the variables. Thus, the high dimension requires special imputation approaches. In this article, we provide an overview and realistic comparisons of imputation approaches for high-dimensional data when applied to a linear mixed modeling (LMM) framework. We examine approaches from three different classes using simulation studies: multiple imputation with penalized regression, multiple imputation with recursive partitioning and predictive mean matching; and multiple imputation with Principal Component Analysis (PCA). We illustrate the methods on a real case study where a multivariate outcome (i.e., an extracted set of correlated biomarkers from human urine samples) was collected and monitored over time and we discuss the proposed methods with more standard imputation techniques that could be applied by ignoring either the multivariate or the longitudinal dimension. Our simulations demonstrate the superiority of the recursive partitioning and predictive mean matching algorithm over the other methods in terms of bias, mean squared error and coverage of the LMM parameter estimates when compared to those obtained from a data analysis without missingness, although it comes at the expense of high computational costs. It is worthwhile reconsidering much faster methodologies like the one relying on PCA.

The Application of the Likelihood Ratio Test and the Cochran-Mantel-Haenszel Test to Discrimination Cases

Weiwen Miao & Joseph L. Gastwirth

Abstract

In practice, the ultimate outcome of many important discrimination cases, for example, the *Wal-Mart*, *Nike* and *Goldman-Sachs* equal pay cases, is determined at the stage when the plaintiffs request that the case be certified as a class action. The primary statistical issue at this time is whether the employment practice in question leads to a *common pattern* of outcomes disadvantaging most plaintiffs. However, there are no formal procedures or government guidelines for checking whether an employment practice results in a common pattern of disparity. This article proposes using the slightly modified likelihood ratio test and the one-sided Cochran-Mantel-Haenszel (CMH) test to examine data relevant to deciding whether this commonality requirement is satisfied. Data considered at the class certification stage from several actual cases are analyzed by the proposed procedures. The results often show that the employment practice at issue created a common pattern of disparity, however, based on the evidence presented to the courts, the class action requests were denied.

United Kingdom National Report to the ICA 2019–2023   P. 85-153

Abstract

This report provides a summary of cartographic activities within the United Kingdom of Great Britain and Northern Ireland from 2019 to 2023 and a directory of higher education courses, institutions, organizations and companies associated with cartography and the mapping industry. It is presented by the UK Cartography Committee to the 19th General Assembly of the International Cartographic Association (ICA) at the 31st International Cartographic Conference, held in Cape Town, South Africa, from 13th to 18th August 2023.

Combining Historical Maps, Travel Itineraries and Least-Cost Path Modelling to Reconstruct Pre-Modern Travel Routes and Locations in Northern Tigray (Ethiopia)

Jacob Hardt, Nadav Nir & Brigitta Schütt

Abstract

Investigating long-distance travelling routes is crucial for understanding both historical decision-making processes as well as possible regional points of interest that may have been lost in the course of time. Located in the northern Ethiopian highlands, the city of Aksum was the starting and return point for both, Ethiopian, Arabian, and European travellers on the north-south passage to Cairo, Jerusalem or Europe, at least from the fifteenth century onwards. We extracted locations from travel itineraries from the fifteenth and sixteenth centuries and analysed historical maps from the fifteenth to the twentieth centuries. This data was used to calculate several least-cost paths (LCPs). Results suggest that route planning in historical times was in some cases very cost effective, while in others, visiting specific locations may have played a major role in path selection. Additionally, LCPs based on historical waypoints reveal several remarkable historical locations along their way.

The Polar Chart of Pedro Reinel (c. 1521–1524): A Diplomatic Tool or a Scientific Argument?

Joaquim Alves Gaspar

Abstract

A chart of the sixteenth century is extant, depicting the southern hemisphere and containing the earliest known representation of the southeast coast of South America, in the wake of Magellan and Elcano's circum navigation. In this paper, it is argued that astronomical observations of longitude were accommodated in the representation, and that the chart was produced in the specific context of the *Juntas* of Badajoz-Elvas, held between the representatives of the Spanish and Portuguese Crowns, to discuss the location and possession of the Spice Islands. It is further shown that the chart was produced using the information brought to Seville by the ship San Antonio, which had deserted the fleet in October 1520, before the passage to the Pacific Ocean was found. It is concluded that this chart presents a unique historical milestone in the history of cartography, containing the earliest material evidence of the effective use of astronomical methods to determine longitude in a nautical context.

From Historical Maps to Remote Sensing: Reconstructing Land Use Changes on Norfolk Island over the Past 250 Years

Noam Levin & Salit Kark

Abstract

This paper aims to quantify land cover and vegetation changes over the past 250 years on Norfolk Island, Australia, a remote island important for its cultural heritage and biodiversity. We collated over 130 historical maps and aerial photos from various archives, of which we georeferenced 80. Supervised classification and manual digitization were used to

extract detailed land cover information on vegetation cover from 10 historical maps and datasets. While the classification and symbology used to represent vegetation on the different maps varied over time, we were able to track changes in vegetation cover on the island. We found that after the first (colonial) settlement, non-agricultural vegetation cover was at its lowest during the 1940s, and has since then expanded. We found high constancy of land cover patterns on the island since 1840 onwards. Historical maps thus provide an understanding of the dynamics that shape the present landscape.

Geometric Stalemate and De-Evolution of Adriatic Sea Representations on Early Modern Age Nautical Charts

Tome Marelić

Abstract

Cartographic representations of the Adriatic Sea basin on 11 (manuscript and printed) Early Modern Age nautical charts, made between 1538 and 1771, were subjected to a cartometric analysis in which their geometrical features were inspected. Additionally, four of them on which the graticules were plotted and were subjected to the analysis of their spherical coordinates, which was conducted in parallel. The results show that cartographers who produced printed charts in seventeenth and eighteenth centuries, never succeeded in surpassing the geometric accuracy of manuscript portolan charts from the sixteenth century, regardless of whether their charts contained graticules or not. According to the results and the historical context of contemporary technological development, it appears that in the era that preceded systematic hydrographic surveys, their authors had no other choice but to (partially) copy the inherited 'framework' of portolan charts as a reference model, and to implement certain localized trial and error modifications.

Building the Great Chain, Expanding the Empire: Triangulation in the Time of Napoleon

Mirela Altić

Abstract

This paper analyses the development of a triangulation network in the time of Napoleon I, when, due to imperial expansion, the extension of the existing triangulation network was necessary to extend Cassini's original map of France to the newly conquered territories of the French Empire. For this purpose, triangulators had to connect the already existing regional networks with the basic French network, as well as establish completely new ones in regions where they had not existed until then. Connecting various networks into a single chain was not only aimed at improving the accuracy of maps; it was also a clear reflection of a new understanding of territorial sovereignty. This paper examines which networks were established within modern-day northern Italy and maritime Croatia, and how they were mutually harmonized and interconnected, as well as what kind of repercussions this had on the development of mapping and map standardization.

Digitizing Early Postwar Canadian Census Tract Maps: Sources, Methods and Challenges

Christopher Macdonald Hewitt & Zack Taylor

Abstract

At present, Canadian census tract boundaries are available in digital form for 1951 and at 5-year intervals for the 1976–2021 period; the 1956–66 census boundary files have not been digitized and associated data are not readily available for the pre-1971 period. This inhibits the mapping and analysis of neighbourhood change for a period of rapid urban and social transformation. To fill this gap, we digitized 1956–66 census tract boundaries from paper maps for all cities for which such data were disseminated. We adjusted 2006 boundaries to match georeferenced historical maps in concert with ancillary data, including topographic and cadastral maps. All decisions are documented in the files. Finally, printed profile tables for 1951 and 1956 were digitized for joining the boundary files. Researchers may use these datasets to explore, analyse and map geospatial trends in the Canadian population at the neighbourhood scale back to 1951.
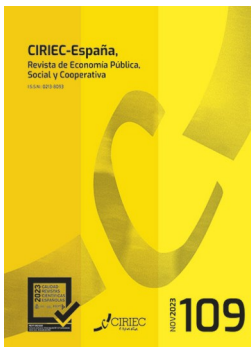
Resumen

La contingencia de COVID 19 ha cambiado drásticamente la economía, las familias, la manera de relacionarse entre personas y en general la sociedad. Las organizaciones, entre estas las de carácter sociales, han tenido que adaptarse a las nuevas maneras de interactuar, para poder sobrevivir, y existen importantes ejemplos de cómo estas organizaciones sociales han enfrentado la crisis actual. En este artículo, se busca analizar las estrategias que implementan las cooperativas para asegurar la continuación de sus actividades económicas y sociales frente a la contingencia sanitaria del COVID-19. Para ello, a través del análisis de 5 casos ubicados en la Ciudad de México, se explican las estrategias implementadas por las mismas: adopción de nuevas tecnologías, desarrollo de nuevos conocimientos, redistribución del trabajo, promociones y compras anticipadas y las alianzas con otras cooperativas. Algunos de los hallazgos de esta investigación muestran la relación que existe entre las estrategias implementadas y los principios y valores que caracterizan a estas organizaciones, tales como la solidaridad, ayuda mutua, responsabilidad y la intercooperación. La principal contribución radica en la discusión de cómo las cooperativas son más resilientes ante la crisis, debido a su capacidad de adaptación, más aún aquellas que tienen que ver con la producción y venta de alimentos sanos y agroecológicos, que las organizaciones ubicadas en el giro textil, cultural y de capacitación, a las que les fue más complicado enfrentar esta crisis.

Resumen

La literatura previa se ha centrado casi exclusivamente en comprender la degeneración cooperativa, prestando escasa atención al fenómeno de la regeneración, que ha sido abordado fundamentalmente desde un punto de vista teórico. Este artículo proporciona un análisis longitudinal de un proceso regenerativo acometido en el grupo Mondragon, uno de los grupos cooperativos más relevantes e influyentes del mundo. La gran dimensión organizacional y dispersión geográfica que caracterizan a la mayoría de cooperativas de este grupo implica un proceso de regeneración mucho más complejo que el que cabe esperar en cooperativas pequeñas y medianas que operan exclusivamente a nivel local. El marco teórico de la investigación se basa en las tesis de la degeneración y regeneración cooperativa, así como en recientes contribuciones surgidas en torno a la teoría del ciclo de vida de las cooperativas. El estudio muestra los desafíos para reintroducir mecanismos de gobernanza democrática en organizaciones cooperativas de gran tamaño que compiten en mercados globales, así como el efecto de la dispersión geográfica en el declive del sentimiento de pertenencia entre los socios de las cooperativas matrices. Con todo ello, el artículo contribuye a una línea de investigación fundamental centrada en la evolución organizacional de las cooperativas ante un contexto de mercado muy cambiante, competitivo y

globalizado.

Close to me. Intercooperation between Cooperative Retailers, Local Food Suppliers and Public Institutions to boost Regional Agrifood Systems. The case of Eroski

Josu Santos-Larrazabal, Imanol Basterretxea

Resumen

Este trabajo analiza la intercooperación entre la administración pública, los pequeños productores agrarios y la cooperativa de supermercados Eroski en el País Vasco y Navarra para promover un sistema agroalimentario de proximidad. A través de un estudio de caso con 22 entrevistas a diferentes miembros del sistema, se identifican ciertas ventajas y limitaciones de esta intercooperación. El minorista emerge como el principal agente con potencial para impulsar la oferta del sector agroganadero local y promover su profesionalización a través de la formación de cooperativas agrarias y otras redes asociativas. Se destaca la relevancia y necesidad de un correcto alineamiento entre la cultura organizativa de los minoristas y la de sus proveedores y la influencia de la codependencia y los desequilibrios de poder entre ambas partes. El caso ofrece pautas a otros minoristas interesados en mejorar su posicionamiento local, a pequeños productores locales que deseen desarrollar su negocio de forma sostenible con la gran distribución y a instituciones públicas que deseen promover sistemas agroalimentarios locales en colaboración con la gran distribución.

La cooperativa como alternativa de emprendimiento colectivo. Su presencia y fomento en las universidades públicas andaluzas

Antonio Manuel Ciruela-Lorenzo, Juan José Plaza-Angulo, Samuel Medina Claros

Resumen:

La universidad juega un papel fundamental en el desarrollo del espíritu emprendedor de una sociedad. De las distintas alternativas vehiculares de emprendimiento, existe una con características singulares que es la cooperativa. Sin embargo, muy pocas de las nuevas empresas creadas en el ámbito universitario son cooperativas, entidades que deben ser promovidas por los poderes públicos, según establece la propia Constitución Española, y que constituyen una herramienta eficaz de emprendimiento que sitúa a la persona en el centro de su estructura para conjugar intereses económicos y sociales. El presente trabajo analiza la presencia del cooperativismo en la realidad académica y emprendedora de las universidades públicas de Andalucía, una de las regiones con mayor número de emprendedores y de estudiantes universitarios, y donde más se ha fomentado el cooperativismo por parte de las instituciones políticas. Para ello, implementando metodologías inductivas y cualitativas, se ha estudiado la oferta académica de las titulaciones de grado y posgrado de nueve universidades públicas de esta región y se han llevado a cabo entrevistas en profundidad con responsables y personal técnico de los servicios de emprendimiento y empleabilidad de estas universidades. Los resultados muestran una escasa y mejorable presencia del cooperativismo en los planes de estudio de las titulaciones analizadas, así como una gestión por parte de los servicios de emprendimiento no orientada hacia las iniciativas colectivas ni hacia el cooperativismo, del que no existe, además, una comprensión clara. Esta circunstancia revierte en un desconocimiento previo por parte de los potenciales emprendedores universitarios, tanto del propio modelo de gestión cooperativo como de los valores y principios que lo diferencian. Ante esta situación, se propone un plan integral basado en la interacción de los servicios universitarios de emprendimiento con el profesorado y con las instituciones que fomentan y promueven el cooperativismo en nuestra sociedad.

Economía Social, Estudios Críticos de Gestión y Universidad: Un estudio de caso del Laboratorio de Economía Social

Ignacio Bretos, Millán Díaz-Foncea, Carmen Marcuello

Resumen

Una línea de investigación fundamental y apenas explorada reside en comprender cómo fomentar la performatividad crítica de los Estudios Críticos de Gestión (ECG) desde los espacios e instituciones de educación superior. Para abordar esta cuestión, este artículo presenta un estudio de caso del Laboratorio de Economía Social (LAB_ES), un espacio creado en la Universidad de Zaragoza para que la comunidad universitaria experimente con iniciativas y proyectos organizados en torno a los principios y valores de la Economía Social. En concreto, el artículo identifica y profundiza en tres líneas clave de acción para promover la performatividad crítica de los ECG desde los espacios universitarios: (i) visibilizar entre la comunidad universitaria formas alternativas de organización y gestión más democráticas, humanistas, emancipadoras y socialmente responsables; (ii) desarrollar una colaboración más estrecha entre la comunidad universitaria y otros agentes sociales para generar colectivamente conocimiento relevante y útil para la transformación social del entorno; y (iii) facilitar la participación directa del alumnado en proyectos de organización y gestión alternativos. En un contexto de infra-representación de la Economía Social en los planes de estudios y estructuras de investigación de las instituciones de educación superior españolas, el artículo también extrae algunas implicaciones prácticas orientadas a promover la formación y divulgación en Economía Social desde espacios creados dentro de los muros de la Universidad, pero organizados al margen de su rigidez institucional y burocrática.

Corporate Social Responsibility in Credit Unions seen from Carroll Pyramid Model: A qualitative study in Colombia

Mónica López-Santamaría, Merlin Patricia Grueso Hinestroza, Juan Fernando Álvarez Rodríguez

Resumen

Una de las principales limitaciones del Modelo de la Pirámide de Carroll es que no considera las diferencias en la dinámica propia de cada sector empresarial y la definición del orden entre las cuatro dimensiones que lo componen no cuenta con una adecuada justificación teórica. Este estudio explora las prácticas de Responsabilidad Social reportadas por las Cooperativas de Ahorro y Crédito desde la perspectiva de la Pirámide de Carroll para a) establecer qué tipo de información (económica, legal, ética o discrecional) están privilegiando en sus reportes de Balance Social y b) reconocer en qué medida existen diferencias en la forma en que se expresa el modelo en el sector de la economía social y solidaria. Para lograrlo, se realizó un estudio de investigación cualitativa a través de un análisis de contenido de los Informes de Balance Social de 20 Cooperativas de Ahorro y Crédito colombianas. Los resultados muestran que la Pirámide de Carroll puede adoptar otro tipo de orden en las dimensiones que la componen (económica, legal, ética y discrecional), dependiendo del sector económico que se estudie o del tipo de organización que se explore, sin embargo, las diferencias encontradas con respecto al modelo de Carroll no fueron tan radicales como las diferencias encontradas en otras investigaciones que encontraron una pirámide completamente invertida. Estos hallazgos plantean desafíos a las organizaciones cooperativas en cuanto al cumplimiento de la agenda 2030 y el informe anual obligatorio de Balance Social en Colombia.

Sustainable Development Goals in the beekeeping sector and its cooperative network

Jimena Andrieu, Enrique Bernal-Jurado, Adoración Mozas-Moral, Domingo Fernández-Uclés

Resumen

Los Objetivos de Desarrollo Sostenible (ODS) son una prioridad a nivel mundial en términos de compromiso por un desarrollo responsable de la sociedad. Este trabajo se centra en la apicultura por ser un sector estratégico de la economía argentina por sus importantes impactos socio-económicos y ambientales. El objetivo de esta investigación

es analizar las prácticas de las entidades apícolas en su alineación con la consecución de los ODS (con foco en los ODS 5, 8, 9, 12 y 17), prestando especial atención a la contribución diferencial de las empresas con fórmula cooperativa. Se focaliza en las acciones vinculadas con la organización del trabajo, la producción, la innovación y su inserción en los mercados. Para ello, se trabaja con un análisis de significatividad de variables de las matrices 2×2 y con un análisis factorial multivariado de correspondencias múltiples. Los resultados obtenidos ponen de relevancia que existe una alineación positiva entre las prácticas de las entidades del sector apícola y los ODS 5, ODS 12 y ODS 17, con una tendencia también diferencial y positiva para las organizaciones con fórmula cooperativa. No obstante, los resultados dan cuenta también de los desafíos a futuro que enfrenta el sector, especialmente en materia de los ODS 8 y 9.

Análisis del voluntariado corporativo a través de un modelo DAFO

Ana Lor Serrano, Mª Luisa Esteban Salvador

Resumen

El voluntariado corporativo está cobrando fuerza en el marco de la responsabilidad social corporativa y en su aplicación por algunas empresas. A través de un análisis de las debilidades, amenazas, fortalezas y oportunidades (DAFO) se pretende ahondar en los diversos aspectos de carácter negativo que pueden asociarse a este tipo de prácticas para atenuarlos, e incluso eliminarlos, así como del mismo modo proponer cómo impulsar los aspectos positivos: utilizar las oportunidades y dar a conocer las fortalezas, para potenciarlas, permitiendo a este tipo de políticas alcanzar su máximo desarrollo. Asimismo, se presenta un análisis comparativo para corregir, afrontar, mantener y explotar (CAME) los resultados, y de este modo proponer mejoras en el voluntariado de empresa o corporativo y facilitar la implementación de este tipo de políticas por las organizaciones empresariales. Desde el marco legislativo español el voluntariado corporativo se presenta como una práctica escasamente desarrollada, sin embargo, cuenta con importantes oportunidades y fortalezas que justifican el impulso para su implantación y puesta en práctica por parte de las empresas, dados sus beneficios contrastados, aunque no hay que obviar los posibles efectos adversos que podrían generar como consecuencia de su mal uso, no sólo para las empresas, sino también para las personas trabajadoras y en general todos los stakeholders implicados.

El capital social de organizaciones productivas rurales de la economía social

Juanita Salinas Vásquez, María Urgilés Salinas, Susana Sastre-Merino

Resumen

El enfoque constructivista de desarrollo comunitario reconoce el rol transformador e innovador del tejido social (capital social) de las organizaciones de la economía social para promover procesos incluyentes de movilización de recursos y gestión de lo común. La investigación identifica fortalezas y debilidades relacionales en organizaciones productivas rurales de la economía social de la provincia de Manabí-Ecuador, mediante la valoración del capital social. La metodología aplicada para valorar el capital social incorpora componentes de la dimensión institucional, cognitiva y estructural en tres ámbitos de análisis: contexto territorial, perfil de la organización y relación entre miembros. En el ámbito territorial, la limitada cobertura de servicios públicos afecta a todas las organizaciones, precariza las condiciones de vida, dificulta las relaciones y restringe las oportunidades de desarrollo. La valoración del perfil organizativo evidencia fortalezas para establecer roles, reglas y procedimientos y debilidad en la construcción de redes con actores externos. Para el ámbito de relación entre miembros, la dificultad se ubica en mantener visión compartida y sancionar comportamientos oportunistas. De esta manera, identificar las diferencias en las condiciones relacionales de las organizaciones, según el nivel de dotación de capital social, resulta útil para guiar la formulación de estrategias prácticas de intervención que promuevan el desarrollo local a través del fortalecimiento de las asociaciones y cooperativas.

La transformación de las entidades asociativas en empresas sociales en su proceso de scaling up. La perspectiva financiera del tercer sector deportivo

Antonio González-Rojas, Rafael Chaves Ávila

Resumen

Este trabajo analiza la relación entre el tamaño, la antigüedad y los procesos de scaling up en las entidades del tercer sector deportivo valenciano para hallar las pautas que los llevan a crecer y convertirse en empresas sociales. El estudio está basado en una encuesta de campo realizada a 520 organizaciones. Los resultados muestran que la mayoría de entidades mantienen modelos organizativos simples y estructuras financieras rudimentarias que no les permiten iniciar procesos de crecimiento, manteniendo su tamaño original. Sin embargo, un porcentaje menor de organizaciones (aproximadamente el 25%) sí entran en procesos de expansión, desarrollando estructuras financieras más complejas, diversificando sus fuentes de financiación, aglutinando la mayoría de generación de empleo del sector y aumentando su impacto socioeconómico. Dentro de estas organizaciones se han hallado un total de tres modelos diferenciados, el primero surge de la alianza con administraciones públicas, obteniendo una parte importante de financiación del sector público y centrando sus actividades en la oferta de servicios deportivos a los ciudadanos; el segundo se orienta hacia la comercialización de bienes y servicios deportivos, logrando gran parte de sus fondos del mercado; en tercer lugar, existen organizaciones con un equilibrio entre la financiación propia, pública y de mercado, que muestran una mayor robustez al evitar dependencias excesivas de fuentes específicas. Por último, se ha identificado la presencia de un mecanismo híbrido de crecimiento que se apoya inicialmente en recursos públicos para tomar impulso y permitir el desarrollo interno necesario para lograr la conversión de estas organizaciones en empresas sociales.

El gasto social y la pobreza multidimensional en Ecuador

Diego García-Vélez, José Javier Núñez-Velázquez

Resumen

Uno de los principales instrumentos de política para el combate a la pobreza, principalmente en los países en vías de desarrollo, es el gasto social destinado a servicios como la educación, la salud y el bienestar social. En Ecuador, el monto total destinado a estos tres servicios ha experimentado una tendencia creciente a partir de 2008. En consecuencia, nuestro objetivo es identificar el efecto del gasto social sobre la pobreza multidimensional en Ecuador, para lo cual aplicamos un índice de pobreza multidimensional con base en la teoría de conjuntos difusos, abordándola como un grado de privación en lugar de un atributo de presencia o ausencia, construimos un perfil de pobreza y estimamos un modelo probit multinomial con un pool de datos provinciales para el periodo 2009-2017. Nuestros principales resultados indican que la pobreza se reduce en el periodo de estudio, pero que no todos los grupos poblacionales se han beneficiado en la misma medida, además que el gasto en bienestar social tiene efectos significativos sobre la pobreza multidimensional, pero que el gasto en educación y en salud no son significativos. Esto sugiere que las políticas públicas deben aplicarse en dos vías, una para combatir la pobreza y otra para cerrar las brechas, lo cual conlleva a la ejecución de más y mejor gasto social en los servicios de bienestar social.