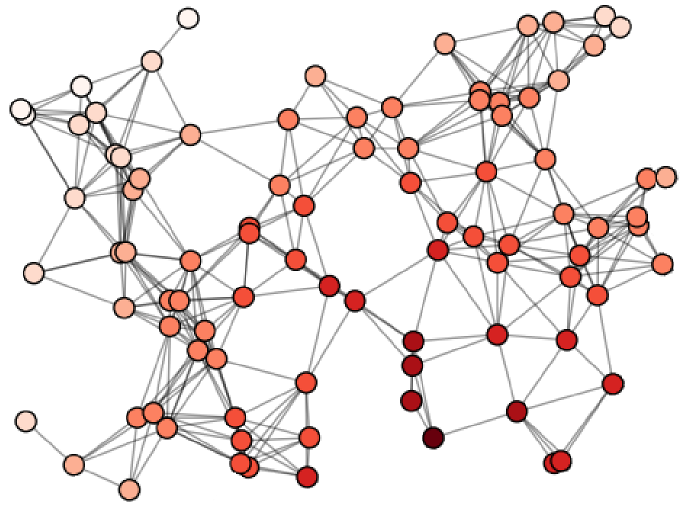

Mathematical Methods of Modern Statistics

Luminy

10^{th} to 14^{th} July 2017

In this step, under some assumptions, we select s variables such that, with high probability $s \leq n$. In the next step we apply a stepdown multiple testing procedure based on the OLS estimators in linear model, where p-value for a single hypothesis

$$H_i : \beta_i = 0 \text{ versus } H_i^{'} : \beta_i \neq 0, \text{ for } i \in S,$$

has the form $\pi_i = 2\left(1 - \Phi\left(|t_i|\right)\right)$, where Φ is the cumulative distribution function of the standard normal distribution and $t_i = \frac{\hat{\beta}_{OLS,i}}{se\left(\hat{\beta}_{OLS,i}\right)}$. As a result, we obtain correct selection in linear model with high probability. Our theoretical results are supported by simulation study which confirmed practical applications of our a two step LSD procedure. Joint work with Wojciech Rejchel (Nicolaus Copernicus University).

[1] Furmańczyk K. *On some stepdown procedures with application to consistent variable selection in linear regression.* Statistics. 49, 614–628, 2015.

[2] Furmańczyk K and Rejchel W. *Stepdown procedures with Lasso for high dimensional parametric model selection.* Preprint. 2017.

[3] Tibshirani R. *Regression shrinkage and selection via the lasso.* J. Roy. Statist. Soc. Ser. B. 58, 267–288, 1996.

[4] Ye F. and Zhang C.H. *Rate minimaxity of the Lasso and Dantzig selector for the q loss in r balls.* J. Mach. Learn. Res. 11, 3519–3540, 2010.

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Title. Risk propagation in large-scale graphs.

Abstract. A problem of risk propagation in large-scale graphs describing resource transfer is considered. The problem is simplified to a weighted, personalized PageRank algorithm, implemented using GraphX Pregel API of Apache Spark Big-Data platform. Propagation properties are numerically evaluated for sample random graphs. Special attention is paid to possible applications in finance, logistics and epidemiology.

Kulishov Sergii (Ukrainian Medical Stomatologic Academy, Poltava, Ukraine)
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Title. Creative solutions as derivatives of selective multiple testing.

Abstract. Algorithm of creative solutions as derivatives of selective multiple testing : A. Initial selection of multiple testing methods. A1. Selection of independent and dependent variability ; Calculating the of mean, standard error of mean, standard deviation, 95% confidence interval for mean, median, minimum, maximum, range, quartiles ; Determination of the variabilities distribution – parametric or nonparametric by single-factor the Kolmogorov-Smirnov test ; Shapiro-Wilk W test and graphical methods : frequency distribution histograms stem & leaf plots ; scatter plots ; box & whisker plots ; normal probability plots : PP and QQ plots ; graphs with error bars (Graphs : Error Bar). A2. ANOVA (Analysis of Variance) test is used for parametric variabilities distribution. If

deviations are homogeneous by Levene test would used the method of multiple comparison groups by Tukey HSD, Scheffe, Bonferroni, and in the cases without homogeneity we must use the criteria Tamhane's T2, Games-Howell ; Kruskal-Wallis test, nonparametric equivalent of the ANOVA, is used for nonparametric variabilities distribution. A3. The selection of variabilities, as criteria for making decisions, with $P = .05$ or less, and / or minimal false discovery rate, q-value (Gyorffy B, Gyorffy A, Tulassay Z :. The problem of multiple testing and its solutions for genom-wide studies. Orv Hetil, 2005 ;146(12) :559-563) Determination of the sensitivity and specificity of these variabilities. B. Secondary screening the variabilities for multiple test methods. B1. These numerical dependent variabilities with $P = .05$ or less, and / or minimal false discovery rate, with high sensitivity and specificity by diagnostic capabilities must use for formation of new variabilities as descendants of $2, 3, 4, \ldots, n$ numerical dependent variabilities as the derivatives of various mathematical transformations as Cantor, Sierpinski, von Koch sets, etc., anti-fractal sets ; Moebius strip like aggregates, oxymoron combinations (Kulishov S.K., Iakovenko O.M. : Fractal and antifractal oxymorons, Moebius strip like transformations of biomedical data as basis for exploratory subgroup analysis. Book of abstract of International Conference on Trends and Perspective in Linear Statistical Inference ; LinStat, 2014, Linkoping, Sweden, August 24-28, 2014 ; 2014, 58) ; and others mathematical transformations derivatives. C. Check the newly formed variabilities similar to step A to estimate the effectiveness of such changes. D. Comparison of multiple testing of more informative primary and secondary variabilities by accuracy, sensitivity and specificity of diagnostic possibilities. E. If it's necessary, the search of new selection principles of variabilities for multiple testing must be continued.

☞ **Masmoudi Khalil** (University of Sfax, Sfax, Tunisia)
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Title. An EM algorithm for learning mixtures of Gaussian Markov random fields.
Abstract. In this talk, we introduce a new algorithm, for parameters' estimation and data clustering, suitable for mixtures of Gaussian Markov Random fields. This algorithm called Graphical Expectation Maximization (GEM) extends the classical EM algorithm by taking into account several graphs' structures and by using an original initialization technique. The performances of the proposed algorithm are compared to those of the classical EM algorithm on the ground of a simulation study.

☞ **Nakashima Hideto** (Kyūshū University, Fukuoka, Japan)
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Title. An explicit formula of the basic relative invariants of homogeneous cones.
Abstract. Open convex cones are fundamental objects in many areas such as statistics and analysis, and among them, homogeneous cones form a good class. In fact, their group actions enable us to deal with many things systematically ; for example, Laplace transforms of relatively invariant functions can be computed explicitly. Homogeneous cones are described as the positivity sets of the basic relative invariants, which are irreducible relatively invariant polynomials, so that they play