DOI: 10.1111/sjos.12537

EDITORIAL

Scandinavian Journal of Statistics

4th Workshop on Goodness-of-Fit, Change-Point, and Related Problems, Trento, 2019

Natalie Neumeyer[1] | Miguel A. Delgado[2] | Lajos Horváth[3] | Simos Meintanis[4,5] | Emanuele Taufer[6] | Lixing Zhu[7]

[1]University of Hamburg, Hamburg, Germany

[2]University Carlos III de Madrid, Madrid, Spain

[3]University of Utah, Salt Lake City, Utah,

[4]National and Kapodistrian University of Athens, Athens, Greece

[5]North-West University, Potchefstroom, South Africa

[6]University of Trento, Trento, Italy

[7]Beijing Normal University and Hong Kong Baptist University, Zhuhai, China

The 4th workshop on *Goodness-of-fit, change-point, and related problems* was held at the Department of Economics and Management of the University of Trento, September 6–8, 2019. The workshop followed similar meetings in Sevilla (2012), Athens (2015), and Bad Herrenalb (2017), and now it has become an established tradition of reviewing modern developments of the relevant statistical theory and applications as well as of attracting talented researchers of all ages.

The workshop was also an occasion for a formal tribute to Marie Hušková and Winfried Stute in recognition of their leadership and significant contributions to statistical theory.

The program of the workshop included 35 talks delivered by senior statisticians, and nine poster presentations by younger researchers. This special issue of the *Scandinavian Journal of Statistics* contains a collection of papers presented at the event, subjected to the regular peer-reviewing process of the journal. Our special thanks go to the authors and to the reviewers for their excellent job, as well as to the Editors-in-Chief Håkon K. Gjessing and Hans J. Skaug for our opportunity to be Guest Editors of this special issue.

Recurring topics during the workshop were models with high-dimensional or functional data and with heteroscedasticity or specific dependence structures. To tackle the arising problems classical statistics, in particular CUSUM-statistics for change-point tests, have to be modified. We now list the contributions included in this special issue with a concise description of their content.

Zhong et al. (2021) consider the problem of testing temporal homogeneity of p-dimensional population mean vectors from repeated measurements on n subjects over T times. To cope with the challenges brought about by high-dimensional longitudinal data, a methodology that takes into account also the complex temporospatial dependence is considered. Both the multivariate analysis of variance problem and the change-point problem are considered.

Paindaveine et al. (2021) establish general results on the asymptotic behavior of preliminary test estimators. More precisely, it is shown that, in uniformly locally asymptotically normal (ULAN) models, a general asymptotic theory can be derived for preliminary test estimators based on estimators admitting generic Bahadur-type representations. This allows for a detailed comparison between classical estimators and preliminary test estimators in ULAN models.

Dörr et al. (2021) study a novel class of affine invariant and consistent tests for normality in any dimension in an i.i.d. setting. The tests are based on a characterization of the standard d-variate normal distribution as the unique solution of an initial value problem of a partial differential equation motivated by the harmonic oscillator, which is a special case of a Schrödinger operator.

Horváth et al. (2021) construct and study a test to detect possible change points in the regression parameters of a linear model when the model errors and covariates may exhibit heteroscedasticity. Being based on a new trimming scheme for the CUSUM process, this test is particularly well suited to detect changes that might occur near the endpoints of the sample.

García-Portugués et al. (2021) propose a novel goodness-of-fit test for the functional linear model with functional response (FLMFR) against a general, unspecified, alternative. The test statistic is formulated in terms of a Cramér–von Mises norm over a doubly projected empirical process which, using geometrical arguments, yields an easy-to-compute weighted quadratic norm.

Henze and Jiménez-Gamero (2021) propose and study a novel test of the null hypothesis that a random variable with values in a separable Hilbert space has some unspecified nondegenerate Gaussian distribution. The test statistic is based on a measure of deviation between the empirical characteristic functional of the sample and the characteristic functional of a suitable Gaussian random element.

Mohr and Neumeyer (2021) consider a nonparametric heteroscedastic time series regression model and suggest testing procedures to detect changes in the conditional variance function. The tests are based on a sequential marked empirical process and thus combine classical CUSUM tests from change-point analysis with marked empirical process approaches known from goodness-of-fit testing. The tests are consistent against general alternatives of a change in the conditional variance function, a feature that classical CUSUM tests are lacking.

Zhu et al. (2021) propose an adaptive-to-model test for conditional independence through groupwise dimension reduction developed in sufficient dimension reduction field. Although it is also based on nonparametric estimation like any local smoothing tests for conditional independence, its behavior is similar to existing local smoothing tests with only the number of covariates under the null hypothesis. Furthermore, it can detect local alternatives distinct from the null at the rate that is also related only to the number of covariates under the null hypothesis. Therefore, the curse of dimensionality is largely alleviated.

Beran and Telkmann (2021) consider inference for local maxima of the marginal density function of strongly dependent linear processes. Weak consistency of the estimated modular set and the number of modes is derived. A uniform reduction principle for kernel density estimators is used to obtain confidence sets for the set of modes.

Jammalamadaka et al. (2021), for any given multivariate distribution, provide explicit formulas for the asymptotic covariances of cumulant vectors of the third and the fourth order. Utilizing these formulas one can extend several results currently available in the literature, as well as obtain practically useful expressions in terms of population cumulants, and computational formulas in terms of commutator matrices. New measures of skewness and kurtosis based on distinct elements are discussed, and other applications to independent component analysis and testing are considered.

Conde-Amboage et al. (2021) present a new lack-of-fit test for quantile regression models for the case where the response variable is right-censored. The test is based on a CUSUM statistic of residuals, and it is shown that the empirical process associated with the test statistic converges to a Gaussian process under the null hypothesis and that the test is consistent. To approximate the critical values of the test, a bootstrap mechanism is used.

Bours and Steland (2021), extending previous works to a general high-dimensional multivariate linear process framework and factor models, establish distributional approximations for the associated bilinear form of the sample covariance matrix. These approximations hold for increasing dimension without any constraint relative to the sample size. The results are used to construct change-point tests for the covariance structure, especially in order to check the stability of a high-dimensional factor model. Tests based on the CUSUM, self-standardized CUSUM, and the CUSUM statistic maximized over all subsamples are considered.

[Colour figure can be viewed at wileyonlinelibrary.com]

REFERENCES

Beran, J., & Telkmann, K. (2021). On inference for modes under long memory. *Scandinavian Journal of Statistics*, *48*, 429–455.

Bours, M., & Steland, A. (2021). Large-sample approximations and change testing for high-dimensional covariance matrices of multivariate linear time series and factor models. *Scandinavian Journal of Statistics*, *48*, 610–654.

Conde-Amboage, M., Van Keilegom, I., & González-Manteiga, W. (2021). A new lack-of-fit test for quantile regression with censored data. *Scandinavian Journal of Statistics*, *48*, 655–688.

Dörr, P., Ebner, B., & Henze, N. (2021). Testing multivariate normality by zeros of the harmonic oscillator in characteristic function spaces. *Scandinavian Journal of Statistics*, *48*, 456–501.

García-Portugués, E., Álvarez-Liébana, J., Álvarez-Pérez, G., & González-Manteiga, W. (2021). A goodness-of-fit test for the functional linear model with functional response. *Scandinavian Journal of Statistics*, *48*, 502–528.

Henze, N., & Jiménez-Gamero, M. D. (2021). A test for Gaussianity in Hilbert spaces via the empirical characteristic functional. *Scandinavian Journal of Statistics*, *48*, 406–428.

Horváth, L., Miller, C., & Rice, G. (2021). Detecting early or late changes in linear models with heteroscedastic errors. *Scandinavian Journal of Statistics*, *48*, 577–609.

Mohr, M., & Neumeyer, N. (2021). Nonparametric volatility change detection. *Scandinavian Journal of Statistics*, *48*, 529–548.

Paindaveine, D., Rasoafaraniaina, J., & Verdebout, T. (2021). Preliminary test estimation in ULAN models. *Scandinavian Journal of Statistics*, *48*, 689–707.

Jammalamadaka, S. R., Taufer, E., & Terdik, G. H. (2021). Asymptotic theory for statistics based on cumulant vectors with applications. *Scandinavian Journal of Statistics*, *48*, 708–728.

Zhong, P.-S., Li, J., & Kokoszka, P. (2021). Multivariate analysis of variance and change points estimation for high-dimensional longitudinal data. *Scandinavian Journal of Statistics*, *48*, 375–405.

Zhu, X., Lu, J., Zhang, J., & Zhu, L. (2021). Testing for conditional independence: A groupwise dimension reduction-based adaptive-to-model approach. *Scandinavian Journal of Statistics*, *48*, 549–576.

How to cite this article: Neumeyer N, Delgado MA, Horváth L, Meintanis S, Taufer E, Zhu L. 4th Workshop on Goodness-of-Fit, Change-Point, and Related Problems, Trento, 2019. *Scand J Statist*. 2021;48:371–374. https://doi.org/10.1111/sjos.12537