Dobrovidov, A. V.; **Ruds'ko, I. M.**

Bandwidth selection in nonparametric estimator of density derivative by smoothed cross-validation method. (English. Russian original) Zbl 05790879

Autom. Remote Control 71, No. 2, 209-224 (2010); translation from Avtom. Telemekh. 2010, No. 2, 42-58 (2010).

Summary: In the nonparametric kernel estimation of the unknown probability densities and their derivatives there exist several methods for estimation of the kernel function bandwidth of which the CV and SCV methods of cross-validation are most simple and suitable. The former method was developed both for the density itself and its derivatives; the latter one, for density only. Yet it generates estimates with a higher rate of convergence and substantially smaller scatter. For the problem of nonparametric restoration of the density derivative from an independent sample, a data-based estimate of the kernel function bandwidth was constructed.

MSC:

62 Statistics

Software:

pyuvdata

Full Text: DOI

References:

[1] Opsomer, J., Wang, Y., and Yang, Y., Nonparametric Regression with Correlated Errors, Stat. Sci., 2001, vol. 16, no. 2, pp. 134–153. · Zbl 1059.62537 · doi:10.1214/ss/1009213287

[2] Vasils'ev, V.A., Dobrovidov, A.V., and Koshkin, G.M., Neparametricheskoe otsenivanie funktsionalov ot raspredelenii statsionarnykh posledovatels'nostei (Nonparametric Estimation of the Functionals of the Distributions of Stationary Sequences), Moscow: Nauka, 2004. · Zbl 1068.62042

[3] Nemirovskii, A.S. and Tsypkin, Ya.Z., Optimal Adaptive Control Algorithms, Autom. Remote Control, 1984, no. 12, pp. 1589–1600. · Zbl 0573.93035

[4] Härdle, W., Hart, J., Marron, J.S., and Tsybakov, A.B., Bandwidth Choice for Average Derivative Estimation, J. Am. Statist. Assoc., 1992, vol. 87, no. 417, pp. 218–226. · Zbl 0781.62044

[5] Bowman, A., An Alternative Method of Cross-validation for the Smoothing of Density Estimates, Bio-metrica, 1984, vol. 71, pp. 353–360.

[6] Rudemo, M., Empirical Choice of Histograms and Kernel Density Estimators, Scand. J. Statist., 1982, vol. 9, pp. 65–78. · Zbl 0501.62028

[7] Hall, P., Marron, J., and Park, B., Smoothed Cross-validation, Prob. Theory Related Fields, 1992, vol. 90, pp. 1–20. · Zbl 0742.62042 · doi:10.1007/BF01205233

[8] Park, B. and Marron, J., Comparison of Data-driven Bandwidth Selectors, J. Am. Statist. Assoc., 1990, vol. 85, pp. 66–72. · doi:10.1080/01621459.1990.10475307

[9] Duong, T. and Hazelton, M.L., Cross-validation Bandwidth Matrices for Multivariate Kernel Density Estimation, Scand. J. Statist., 2005, vol. 32, pp. 485–506. · Zbl 1089.62035 · doi:10.1111/j.1467-9469.2005.00445.x

[10] Devroye, L. and Györfi, L., Nonparametric Density Estimation. The L1 View., New York: Wiley, 1985. Translated under the title Neparametricheskoe otsenivanie plotnosti. L1-podkhod, Moscow: Mir, 1988. · Zbl 0546.62015

[11] Marron, J.S. and Wand, M.P., Exact Mean Integrated Squared Errors, Ann. Statist., 1992, vol. 20, pp. 712–736. · Zbl 0746.62040 · doi:10.1214/aos/1176348653

[12] Härdl, W., Marron, J.S., and Wand, M.P., Bandwidth Choice for Density Derivatives, J. Royal Statist. Soc., 1990, vol. 52, no. 1, pp. 223–232. · Zbl 0699.62036

[13] Jones, M., Marron, J., and Park, B., A Simple Root n Bandwidth Selector, Ann. Statist., 1991, vol. 19, pp. 1919–1932. · Zbl 0745.62033 · doi:10.1214/aos/1176348378

[14] Duong, T. and Hazelton, M.L., Convergence Rates for Unconstrained Bandwidth Matrix Selectors in Multivariate Kernel Density Estimation, J. Multivariate Anal., 2005, vol. 93(2), pp. 417–433. · Zbl 1066.62059 · doi:10.1016/j.jmva.2004.04.004

[15] Cramer, H., Mathematical Methods of Statistics, Princeton: Princeton Univ. Press, 1937. Translated under the title Matem-

aticheskie metody statistiki, Moscow: Mir, 1975.