

REFERENCES

- [1] V. N. Vapnik, *Statistical Learning Theory*. New York: Wiley, 1998.
- [2] V. N. Vapnik, *The Nature of Statistical Learning Theory*, 2nd ed. New York, NY: Springer-Verlag New York, 2000.
- [3] J. J. DiCarlo, D. Zoccolan, and N. C. Rust, “How does the brain solve visual object recognition?,” *Neuron*, vol. 73, no. 3, pp. 415–434, 2012.
- [4] Anders Hald, *A History of Parametric Statistical Inference from Bernoulli to Fisher, 1713–1935*. New York, NY: Springer New York, 2007.
- [5] R. A. Fisher, “The use of multiple measurements in taxonomic problems,” *Ann. Eugen.*, vol. 7, no. 2, pp. 179–188, 1936.
- [6] F. Rosenblatt, “The perceptron: A probabilistic model for information storage and organization in the brain,” *Psychol. Rev.*, vol. 65, no. 6, pp. 386–408, 1958.
- [7] V. N. Vapnik, *Estimation of Dependences Based on Empirical Data*. New York, NY: Springer Science+Business Media Inc., 2006.
- [8] K. Popper, *The Logic of Scientific Discovery*. Routledge, 2005.
- [9] C. Cortes and V. Vapnik, “Support-vector networks,” *Mach. Learn.*, vol. 20, no. 3, pp. 273–297, 1995.
- [10] Jayadeva, R. Khemchandani, and S. Chandra, “Twin support vector machines for pattern classification,” *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 29, no. 5, pp. 905–910, May 2007.
- [11] B. Schölkopf, J. C. Platt, J. Shawe-Taylor, A. J. Smola, and R. C. Williamson, “Estimating the support of a high-dimensional distribution,” *Neural Comput.*, vol. 13, no. 7, pp. 1443–1471, Jul. 2001.
- [12] D. M. J. Tax and R. P. W. Duin, “Support vector domain description,” *Pattern Recognit. Lett.*, vol. 20, no. 11–13, pp. 1191–1199, Nov. 1999.

- [13] G. Calafiore, "Approximation of n-dimensional data using spherical and ellipsoidal primitives," *IEEE Trans. Syst. Man, Cybern.—Part A Syst. Humans*, vol. 32, no. 2, pp. 269–278, Mar. 2002.
- [14] J. Rosen, "Pattern separation by convex programming," *J. Math. Anal. Appl.*, vol. 10, no. 1, pp. 123–134, Feb. 1965.
- [15] B. Schölkopf and A. J. Smola, *Learning with Kernels: Support Vector Machines, Regularization, Optimization, and Beyond*. Cambridge, MA: MIT Press, 2001.
- [16] J. Mercer, "Functions of positive and negative type, and their connection with the theory of integral equations," *Philos. Trans. R. Soc. A Math. Phys. Eng. Sci.*, vol. 209, no. 441–458, pp. 415–446, Jan. 1909.
- [17] A. Bordes, S. Ertekin, J. Weston, and L. Bottou, "Fast kernel classifiers with online and active learning," *J. Mach. Learn. Res.*, vol. 6, no. Sep, pp. 1579–1619, 2005.
- [18] M. Aizerman, "Theoretical foundations of the potential function method in pattern recognition learning," *Autom. Remote Control*, vol. 25, pp. 821–837, 1964.
- [19] X. Peng and D. Xu, "A twin-hypersphere support vector machine classifier and the fast learning algorithm," *Inf. Sci.*, vol. 221, pp. 12–27, Feb. 2013.
- [20] V. Vapnik and A. Chervonenkis, "On the uniform convergence of relative frequencies of events to their probabilities," *Theory of Probability & Its Applications*, vol. 16, no. 2, pp. 264–280, 1971.
- [21] O. Mangasarian and E. Wild, "Multisurface proximal support vector machine classification via generalized eigenvalues," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 28, no. 1, pp. 69–74, 2006.
- [22] J. Suykens and J. Vandewalle, "Least squares support vector machine classifiers," *Neural Processing Letters*, vol. 9, no. 3, pp. 293–300, 1999.

- [23] M. A. Kumar and M. Gopal, "Least squares twin support vector machines for pattern classification," *Expert Systems with Applications*, vol. 36, no. 4, pp. 7535-7543, 2009.
- [24] Y.-H. Shao, C.-H. Zhang, X.-B. Wang, and N.-Y. Deng, "Improvements on twin support vector machines," *IEEE Trans. Neural Networks*, vol. 22, no. 6, pp. 962–968, Jun. 2011.
- [25] S. Ding, J. Yu, B. Qi, and H. Huang, "An overview on twin support vector machines," *Artif. Intell. Rev.*, vol. 42, no. 2, pp. 245–252, 2014.
- [26] D. Tomar and S. Agarwal, "Twin support vector machine: A review from 2007 to 2014," *Egypt. Informatics J.*, vol. 16, no. 1, pp. 55–69, Mar. 2015.
- [27] S. Ghorai, A. Mukherjee, and P. K. Dutta, "Nonparallel plane proximal classifier," *Signal Processing*, vol. 89, no. 4, pp. 510–522, 2009.
- [28] H. Cevikalp, "Best fitting hyperplanes for Classification," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 6, no. 1, pp. 1–1, 2016.
- [29] J. J. Sylvester, "A question in the geometry of situation," *Q. J. Pure Appl. Math.*, vol. 1, p. 79, 1857.
- [30] D. J. Elzinga and D. W. Hearn, "The minimum covering sphere problem," *Manage. Sci.*, vol. 19, no. 1, pp. 96–104, 1972.
- [31] D. M. J. Tax and R. P. W. Duin, "Support vector data description," *Mach. Learn.*, vol. 54, no. 1, pp. 45–66, Jan. 2004.
- [32] G. Huang, H. Chen, Z. Zhou, F. Yin, and K. Guo, "Two-class support vector data description," *Pattern Recognit.*, vol. 44, no. 2, pp. 320–329, Feb. 2011.
- [33] T. Mu and A. K. Nandi, "Multiclass classification based on extended support vector data description," *IEEE Trans. Syst. Man, Cybern.—Part B*, vol. 39, no. 5, pp. 1206–1216, Oct. 2009.
- [34] M. Henk, "Löwner-John ellipsoids," *Doc. Math. (Extra Vol. Optim. Stories)*, pp. 95–106, 2012.
- [35] H.-P. Schröcker, "Uniqueness results for minimal enclosing ellipsoids," *Computer Aided Geometric Design*, vol. 25, no. 9, pp. 756-762, 2008

- [36] F. John, “Extremum problems with inequalities as subsidiary Conditions,” in *Traces and Emergence of Nonlinear Programming*, G. Giorgi and T. H. Kjeldsen, Eds. Basel: Springer Basel, 2014, pp. 197–215.
- [37] L. G. Khachiyan, “Rounding of polytopes in the real number model of computation,” *Math. Oper. Res.*, vol. 21, no. 2, pp. 307–320, May 1996.
- [38] M. J. Todd and E. A. Yildirim, “On Khachiyan’s algorithm for the computation of minimum-volume enclosing ellipsoids,” *Discret. Appl. Math.*, vol. 155, no. 13, pp. 1731–1744, Aug. 2007.
- [39] P. Kumar and E. Yildirim, “Minimum-volume enclosing ellipsoids and core sets,” *J. Optim. Theory Appl.*, vol. 126, no. 1, pp. 1–21, Jul. 2005.
- [40] S. D. Ahipasaoglu, “Fast algorithms for the minimum volume estimator,” *J. Glob. Optim.*, vol. 62, no. 2, pp. 351–370, Jun. 2015.
- [41] P. Sun and R. M. Freund, “Computation of minimum-volume covering ellipsoids,” *Oper. Res.*, vol. 52, no. 5, pp. 690–706, Oct. 2004.
- [42] Y. Nesterov and A. Nemirovskii, *Interior-Point Polynomial Algorithms in Convex Programming*, Society for Industrial and Applied Mathematics, 1994.
- [43] K.-C. Toh, “Primal-dual path-following algorithms for determinant maximization problems with linear matrix inequalities,” *Comput. Optim. Appl.*, vol. 14, no. 3, pp. 309–330, 1999.
- [44] L. Vandenberghe, S. Boyd, and S.-P. Wu, “Determinant maximization with linear matrix inequality constraints,” *SIAM J. Matrix Anal. Appl.*, vol. 19, pp. 499–533, 1998.
- [45] B. W. Silverman and D. M. Titterton, “Minimum covering ellipses,” *SIAM J. Sci. Stat. Comput.*, vol. 1, no. 4, pp. 401–409, Dec. 1980.
- [46] R. Shioda and L. Tunçel, “Clustering via minimum volume ellipsoids,” *Comput. Optim. Appl.*, vol. 37, no. 3, pp. 247–295, Jun. 2007.
- [47] E. Rimon and S. P. Boyd, “Obstacle collision detection using best ellipsoid fit,” *J. Intell. Robot. Syst.*, vol. 18, no. 2, pp. 105–126, 1997.

- [48] M. GhasemiGol, R. Monsefi and H. Sadoghi-Yazdi, "Intrusion detection by ellipsoid boundary," *Journal of Network and Systems Management*, vol. 18, no. 3, pp. 265-282, 2010.
- [49] V. V. Fedorov, *Theory of Optimal Experiments*. New York: Academic Press, 1972.
- [50] S. D. Ahipasaoglu, "A first-order algorithm for the A-optimal experimental design problem: a mathematical programming approach," *Stat. Comput.*, vol. 25, no. 6, pp. 1113–1127, Nov. 2015.
- [51] E. Barnes, "An algorithm for separating patterns by ellipsoids," *IBM Journal of Research and Development*, vol. 26, no. 6, pp. 759-764, 1982.
- [52] F. Glineur, "Pattern separation via ellipsoids and conic programming," M.S. Thesis, Faculté Polytechnique de Mons, Belgium, 1998.
- [53] A. Kharechko, "Linear and ellipsoidal pattern separation: theoretical aspects and experimental analysis", Ph.D. Dissertation, Univ. Southampton, Electronics and Computer Science: Comms, Signal Processing & Control, UK, 2009.
- [54] D. M. Titterington, "Estimation of correlation coefficients by ellipsoidal trimming," *Appl. Stat.*, vol. 27, no. 3, pp. 227–234, 1978.
- [55] J. Gotoh and A. Takeda, "Conditional minimum volume ellipsoid with application to multiclass discrimination," *Comput. Optim. Appl.*, vol. 41, no. 1, pp. 27–51, Sep. 2008.
- [56] R. T. Rockafellar and S. Uryasev, "Conditional value-at-risk for general loss distributions," *J. Bank. Financ.*, vol. 26, pp. 1443–1471, 2002.
- [57] A. N. Dolia, C. J. Harris, J. S. Shawe-Taylor, and D. M. Titterington, "Kernel ellipsoidal trimming," *Comput. Stat. Data Anal.*, vol. 52, no. 1, pp. 309–324, Sep. 2007.
- [58] A. Dolia, T. Bie, C. Harris, J. Shawe-Taylor, and D. M. Titterington, "The minimum volume covering ellipsoid estimation in kernel-defined feature

spaces,” in *Machine Learning: ECML 2006*, vol. 4212, Springer Berlin Heidelberg, 2006, pp. 630–637.

- [59] X. Wei, J. Löfberg, Y. Feng, and Y. Li, “Enclosing machine learning for class description,” in *Lecture Notes in Computer Science*, vol. 4491, D. Liu, S. Fei, Z. Hou, H. Zhang, C. Sun, Eds. Springer Berlin Heidelberg, 2007, pp. 424–433.
- [60] X.-K. Wei, Y.-H. Li, Y.-F. Li, and D.-F. Zhang, “Enclosing machine learning: concepts and algorithms,” *Neural Comput. Appl.*, vol. 17, no. 3, pp. 237–243, Jun. 2008.
- [61] K. Teeyapan, N. Theera-Umpon, and S. Auephanwiriyaikul, “Ellipsoidal support vector data description,” *Neural Comput. Appl.*, vol. 28 (Suppl 1), pp. 337–347, Dec. 2017.
- [62] K. Wang, H. Xiao and Y. Fu, “Ellipsoidal support vector data description in kernel PCA subspace,” in *2016 Third International Conference on Digital Information Processing, Data Mining, and Wireless Communications (DIPDMWC)*, Moscow, 2016, pp. 13-18.
- [63] K. Wang and H. Xiao, “Ellipsoidal data description,” *Neurocomputing*, vol. 238, pp. 328–339, 2017.
- [64] P. Shivaswamy and T. Jebara, “Ellipsoidal kernel machines,” *Journal of Machine Learning Research*, vol. 2, pp. 484-491, 2007.
- [65] C.-C. Yao, “Utilizing ellipsoid on support vector machines,” in *2008 International Conference on Machine Learning and Cybernetics*, Kunming, 2008, pp. 3373-3378.
- [66] Y. Forghani, S. Effati, H. S. Yazdi and R. S. Tabrizi, “Support vector data description by using hyper-ellipse instead of hyper-sphere,” in *2011 1st International eConference on Computer and Knowledge Engineering (ICCCKE)*, Mashhad, 2011, pp. 22–27.
- [67] D. M. J. Tax and P. Juszczak, “Kernel whitening for one-class classification,” *Lect. Notes Comput. Sci.* (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics), vol. 2388, no. 3, pp. 40–52, 2002.

- [68] H. Hoffmann, "Kernel PCA for novelty detection," *Pattern Recognit.*, vol. 40, no. 3, pp. 863–874, 2007.
- [69] R. H. Tütüncü, K. C. Toh, and M. J. Todd, "Solving semidefinite-quadratic-linear programs using SDPT3," *Math. Program.*, vol. 95, no. 2, pp. 189–217, Feb. 2003.
- [70] J. Löfberg, "YALMIP : a toolbox for modeling and optimization in MATLAB," in *2004 IEEE International Symposium on Computer Aided Control Systems Design*, 2004, pp. 284–289.
- [71] M. Grötschel, L. Lovász, and A. Schrijver, *Geometric Algorithms and Combinatorial Optimization*, vol. 2. Berlin, Heidelberg: Springer Berlin Heidelberg, 1993.
- [72] Y. Zhang and L. Gao, "On numerical solution of the maximum volume ellipsoid problem," *SIAM J. Optim.*, vol. 14, no. 1, pp. 53–76, Jan. 2003.
- [73] M. E. Mavroforakis and S. Theodoridis, "A geometric approach to Support Vector Machine (SVM) classification," *IEEE Trans. Neural Networks*, vol. 17, no. 3, pp. 671–682, May 2006.
- [74] L. Vandenberghe and S. Boyd, "Semidefinite programming," *SIAM Rev.*, vol. 38, no. 1, pp. 49–95, Mar. 1996.
- [75] H. Xiong, M. N. S. Swamy, and M. O. Ahmad, "Optimizing the kernel in the empirical feature space," *IEEE Trans. Neural Networks*, vol. 16, no. 2, pp. 460–474, Mar. 2005.
- [76] B. Schölkopf, S. Mika, C. Burges, P. Knirsch, K. Müller, G. Rätsch, and A. Smola, "Input space versus feature space in kernel-based methods," *IEEE Trans. Neural Networks*, vol. 10, no. 5, pp. 1000–1017, 1999.
- [77] D. M. J. Tax. (2013). Data Description Toolbox dd_tools 2.0.0. [Online]. Available: http://homepage.tudelft.nl/n9d04/dd_manual.pdf, Accessed on: Dec. 22, 2017.
- [78] D. M. J. Tax. OC classifier results. (2015) [Online]. Available: <http://homepage.tudelft.nl/n9d04/occ/index.html>, Accessed on: Dec. 22, 2017.

- [79] R. P. W. Duin, P. Juszczak, P. Paclik, E. Pekalska, D. De Ridder, D. M. J. Tax, and S. Verzakov. (2000) PRTools: A Matlab Toolbox for Pattern Recognition Version 5.0. [Online]. Available: <http://www.37steps.com/PRTools>, Accessed on Dec. 22, 2017.
- [80] C.-C. Chang and C.-J. Lin, “LIBSVM: A library for support vector machines,” *ACM Trans. Intell. Syst. Technol.*, vol. 2, no. 3, pp. 1–27, Apr. 2011.
- [81] T. K. Ho and E. M. Kleinberg, Checkerboard dataset. [Online]. Available: <http://research.cs.wisc.edu/math-prog/mpml.html>, Accessed on Dec. 22, 2017.
- [82] M. Lichman. (2013) UCI Machine Learning Repository. [Online]. Available: <http://archive.ics.uci.edu/ml>, Accessed on Dec. 22, 2017.
- [83] T. Chankong, N. Theera-Umpon, and S. Auephanwiriyakul, “Automatic cervical cell segmentation and classification in Pap smears,” *Comput. Methods Programs Biomed.*, vol. 113, no. 2, pp. 539–556, Feb. 2014.
- [84] K. Teeyapan, N. Theera-Umpon, and S. Auephanwiriyakul, “Application of support vector based methods for cervical cancer cell classification,” in *2015 IEEE International Conference on Control System, Computing and Engineering (ICCSCE)*, Nov. 2015, pp. 514–519.
- [85] A. Yodjaiphet, “Data reduction in supervised training process using input-output clustering,” Ph.D. Dissertation, Chiang Mai University, 2015

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LIST OF PUBLICATIONS

- 1) K. Teeyapan, N. Theera-Umpon, and S. Auephanwiriyaikul, “A twin-hyperellipsoidal support vector classifier,” *Journal of Intelligent and Fuzzy Systems*, in press.
- 2) K. Teeyapan, N. Theera-Umpon, and S. Auephanwiriyaikul, “Ellipsoidal support vector data description,” *Neural Comput. Appl.*, vol. 28 (Suppl 1), pp. 337–347, Dec. 2017.
- 3) K. Teeyapan, N. Theera-Umpon, and S. Auephanwiriyaikul, “Application of support vector based methods for cervical cancer cell classification,” in *2015 IEEE International Conference on Control System, Computing and Engineering (ICCSCE)*, Nov. 2015, pp. 514–519.

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