

Publication List

Johannes Fürnkranz

The key publications can be categorized into **inductive rule learning** [4, 23, 28, 30, 39, 42, 45, 46, 48, 85, 92, 96, 229], **interpretable models** [132, 17, 258, 134, 135, 72, 80], **preference learning** [5, 13, 27, 29, 33, 35, 117, 139, 140], **multilabel classification** [36, 54, 67, 134, 69, 75, 81, 82, 84, ?], **reinforcement learning** [22, 26, 51, 62, 87, 88] **text mining** [52, 66, 76, 78, 91, 31, 32, 41, 124, 145, 144, 150], and **game playing** [6, 21, 24, 34, 37, 50, 99, 123, 149, 181, 260]. I have also frequently worked on real-world applications of machine learning and data mining, in areas like the **social sciences** [20, 38, 44, 49, 147, 148], **predictive maintenance** [68, 71, 79], or **behavior modeling** [59, 64, 70, 43]. Particularly noteworthy are a **monograph** on inductive rule learning [4], and two **edited collections** on preference learning [5] and machine learning for game playing [6].

As of **November 2019**, the **most cited publications** are [5, 35, 42, 45, 36], which all show more than 500 citations in Google Scholar, 16 additional papers are cited 100 times or more [129, 39, 253, 117, 4, 124, 86, 120, 48, 150, 110, 91, 115, 6, 104, 107]. My **most influential publication** is probably [35], which won the 2015 Prominent Paper Award of the *Artificial Intelligence* journal.¹ My **h-Index** in Google Scholar is **41**, i.e., 41 publications have received 41 or more citations.²

Academic Writings

- [1] Fürnkranz J. *Inductive Rule Learning for Data and Web Mining*. Habilitation thesis, Vienna University of Technology, 2001.
- [2] Fürnkranz J. *Efficient Pruning Methods for Relational Learning*. PhD thesis, Vienna University of Technology, 1994.
- [3] Fürnkranz J. *Induktives Lernen durch Generieren von Decision Trees*. Master's thesis, Vienna University of Technology, 1991. In German.

Monograph

- [4] Fürnkranz J., Lavrač N., and Gamberger D. *Foundations of Rule Learning*. Springer-Verlag, 2012.

Edited Books

- [5] Fürnkranz J. and Hüllermeier E. (eds.) *Preference Learning*. Springer-Verlag, 2010.
- [6] Fürnkranz J. and Kubat M. (eds.) *Machines that Learn to Play Games*. Nova Science Publishers, Huntington, NY, 2001.

Edited Conference Proceedings

- [7] Kern-Isberner G., Fürnkranz J., Thimm M. (eds.) *KI 2017: Advances in Artificial Intelligence – 40th Annual German Conference on AI*. Lecture Notes in Artificial Intelligence 10505, Dortmund, 2017. Springer-Verlag.
- [8] Fürnkranz J., Hüllermeier, E., and Higuchi, T. (eds.) *Discovery Science: DS 2013*, Lecture Notes in Artificial Intelligence 8140, Singapore, 2013. Springer-Verlag.
- [9] Fürnkranz J. and Joachims T. (eds.) *Proceedings of the 27th International Conference on Machine Learning (ICML 2010)*, Haifa, Israel, 2010. Omnipress.
- [10] Fürnkranz J., Scheffer T., and Spiliopoulou M. (eds.) *Machine Learning: ECML 2006*, Lecture Notes in Artificial Intelligence 4212, Berlin Germany, September 2006. Springer-Verlag.

¹<https://www.journals.elsevier.com/artificial-intelligence/awards/the-2015-classic-and-prominent-paper-award-winners>

²<http://scholar.google.de/citations?user=sfTn4wEAAAAJ>

- [11] Fürnkranz J., Scheffer T., and Spiliopoulou M. (eds.) *Knowledge Discovery in Databases: PKDD 2006*, Lecture Notes in Artificial Intelligence 4213, Berlin Germany, September 2006. Springer-Verlag.

Edited Special Issues

- [12] Fürnkranz J. and Hüllermeier E. (eds.) Special Issue on Discovery Science. *Information Sciences*, 329, 2016.
- [13] Hüllermeier E. and Fürnkranz J. (eds.) Special Issue on Preference Learning and Ranking. *Machine Learning*, 93(2-3), 2013.
- [14] Fürnkranz J., and Knobbe A. (eds.) Special Issue on Global Modeling using Local Models. *Data Mining and Knowledge Discovery*, 21(1), 2010.
- [15] Bowling M., Fürnkranz J., Graepel T., and Musick R. (eds.) Special Issue on Machine Learning and Games. *Machine Learning*, 63(3), June 2006.
- [16] Fürnkranz J. and Pfahringer B. (eds.) Special Issue on First-order Knowledge Discovery in Databases. *Applied Artificial Intelligence*, 12(5), 1998.

Journal Articles

- [17] Fürnkranz J., Kliegr T., and Paulheim H. On cognitive preferences and the interpretability of rule-based models. *Machine Learning*, 2019. To appear.
- [18] Kliegr T., Bahník Š., and Fürnkranz J. Advances in machine learning for the behavioral sciences. *American Behavioral Scientist*, 2019.
- [19] Schwehr J., Luthardt S., Dang H. Q., Henzel M., Winner H., Adamy J., Fürnkranz J., Willert V., Lattke B., Höpfl M., and Wannemacher C. The PRORETA 4 city assistant system. *Automatisierungstechnik*, 67(9):783–798, 2019.
- [20] Friesen J., Rausch L., Pelz P. F., and Fürnkranz J. Determining factors for slum growth with predictive data mining methods. *Urban Science*, 2(3):81:1–81:19, 2018. Special Issue on Urban Modeling and Simulation.
- [21] Joppen T., Moneke M., Schröder N., Wirth C., and Fürnkranz J. Informed hybrid game tree search. *IEEE Transactions on Games*, 10(1):78–90, 2018.
- [22] Wirth C., Akrouf R., Neumann G., and Fürnkranz J. A survey of preference-based reinforcement learning methods. *Journal of Machine Learning Research*, 18(136):1–46, 2017.
- [23] Valmarska A., Lavrač N., Fürnkranz J., and Robnik-Sikonja M. Refinement and selection heuristics in subgroup discovery and classification rule learning. *Expert Systems with Applications*, 81:147–162, 2017.
- [24] Wirth C. and Fürnkranz J. On learning from game annotations. *IEEE Transactions on Computational Intelligence and AI in Games*, 7(3):304–316, 2015.
- [25] Park S.-H. and Fürnkranz J. Efficient implementation of class-based decomposition schemes for Naïve Bayes. *Machine Learning*, 96(3):295–309, 2014. Technical Note.
- [26] Fürnkranz J., Hüllermeier E., Cheng W., and Park S.-H. Preference-based reinforcement learning: a formal framework and a policy iteration algorithm. *Machine Learning*, 89(1-2):123–156, 2012. Special Issue on ECML/PKDD 2011.
- [27] Park S.-H. and Fürnkranz J. Efficient prediction algorithms for binary decomposition techniques. *Data Mining and Knowledge Discovery*, 24(1):40–77, 2012.
- [28] Wohlrab L. and Fürnkranz J. A review and comparison of strategies for handling missing values in separate-and-conquer rule learning. *Journal of Intelligent Information Systems*, 36(1):73–98, 2011.
- [29] Fürnkranz J. and Sima J.-F. On exploiting hierarchical label structure with pairwise classifiers. *SIGKDD Explorations*, 12(2):21–25, 2010. Special Issue on Mining Unexpected Results.
- [30] Janssen F. and Fürnkranz J. On the quest for optimal rule learning heuristics. *Machine Learning* 78(3):343–379, 2010.
- [31] Ghiglieri M. and Fürnkranz J. Learning to recognize missing e-mail attachments. *Applied Artificial Intelligence*, 24(5):443–462, 2010.

- [32] Loza Mencía E., Park S.-H., and Fürnkranz J. Efficient voting prediction for pairwise multilabel classification. *Neurocomputing* 73(7-9):1164–1176, 2010.
- [33] Hüllermeier E. and Fürnkranz J. On predictive accuracy and risk minimization in pairwise label ranking. *Journal of Computer and System Sciences* 76(1):49–62, 2010.
- [34] Droste S. and Fürnkranz J., Learning the piece values for three chess variants. *International Computer Games Association Journal*, 19(4):209–233, 2008.
- [35] Hüllermeier E., Fürnkranz J., Cheng W., and Brinker K. Label ranking by learning pairwise preferences. *Artificial Intelligence*, 172:1897–1916, 2008.
- [36] Fürnkranz J., Hüllermeier E., Loza Mencía E., and Brinker K. Multilabel Classification via Calibrated Label Ranking, *Machine Learning*, 73(2):133–153, 2008.
- [37] Bowling M., Fürnkranz J., Graepel T., and Musick R. Guest editorial: Machine learning and games. *Machine Learning*, 63(3):211–215, June 2006.
- [38] Billari F.C., Fürnkranz J., and Prskawetz A. Timing, sequencing, and quantum of life course events: A machine learning approach. *European Journal of Population*, 22(1):37–65, March 2006.
- [39] Fürnkranz J. and Flach P. ROC 'n' rule learning – Towards a better understanding of covering algorithms. *Machine Learning*, 58(1):39–77, 2005.
- [40] Fürnkranz J. Round Robin Ensembles. *Intelligent Data Analysis* 7(5): 385–404, 2003.
- [41] Fürnkranz J. Hyperlink ensembles: A case study in hypertext classification. *Information Fusion* 3(4):299–312, 2002. Special Issue on Fusion of Multiple Classifiers.
- [42] Fürnkranz J. Round robin classification. *Journal of Machine Learning Research* 2:721–747, 2002.
- [43] Fürnkranz J., Holzbaur C., and Temel R. User profiling for the Melvil knowledge retrieval system. *Applied Artificial Intelligence* 16(4):243–281, 2002.
- [44] Kovar K., Fürnkranz J., Petrak J., Pfahringer B., Trappl R., and Widmer G. Searching for patterns in political event sequences: Experiments with the KEDS database. *Cybernetics and Systems*, 31(6):649–668, 2000.
- [45] Fürnkranz J. Separate-and-conquer rule learning. *Artificial Intelligence Review*, 13(1):3–54, February 1999.
- [46] Fürnkranz J. Integrative windowing. *Journal of Artificial Intelligence Research*, 8:129–164, 1998.
- [47] Winkler F.-G. and Fürnkranz J. A hypothesis on the divergence of AI research. *International Computer Chess Association Journal*, 21(1):3–13, March 1998.
- [48] Fürnkranz J. Pruning algorithms for rule learning. *Machine Learning*, 27(2):139–171, 1997.
- [49] Fürnkranz J., Petrak J., and Trappl R. Knowledge discovery in international conflict databases. *Applied Artificial Intelligence*, 11(2):91–118, 1997.
- [50] Fürnkranz J. Machine learning in computer chess: The next generation. *International Computer Chess Association Journal*, 19(3):147–161, September 1996.

Articles in Peer-Reviewed Conference Proceedings

- [51] Zap, A., Joppen, T., and Fürnkranz, J. Deep ordinal reinforcement learning. In *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD-19)*, 2019. In press.
- [52] Diallo, A., Zopf, M., and Fürnkranz, J. Learning analogy-preserving sentence embeddings for answer selection. In *Proceedings of the 23rd SIGNLL Conference on Computational Natural Language Learning (CONLL-19)*, Hong Kong, 2019. Association for Computational Linguistics. To appear.
- [53] Fleckenstein L., Kauschke S., and Fürnkranz J. Beta distribution drift detection for adaptive classifiers. In *Proceedings of the 2019 European Symposium on Artificial Neural Networks (ESANN-19)*, 2019. To appear.
- [54] Nam J., Kim Y., Loza Mencía E., Park S., Sarikaya R., and Fürnkranz J. Learning context-dependent label permutations for multi-label classification. In Chaudhuri, K. and Salakhutdinov, R. (eds.), *Proceedings of the 36th International Conference on Machine Learning (ICML-19)*, pp. 4733–4742, Long Beach, California, USA, 2019. PMLR.

- [55] Tavakol M., Joppen T., Brefeld U., and Fürnkranz J. Personalized transaction kernels for recommendation using MCTS. In Benz Müller, C. and Stuckenschmidt, H. (eds.), *Proceedings of the 42nd German Conference on AI (KI-19)*, pp. 338–352, Kassel, Germany, 2019. Springer.
- [56] Joppen T., Strübig T., and Fürnkranz J. Ordinal bucketing for game trees using dynamic quantile approximation. In *Proceedings of the IEEE Conference on Games (CoG-19)*, London, United Kingdom, 2019. IEEE.
- [57] Rapp M., Loza Mencía E., and Fürnkranz J. On the trade-off between consistency and coverage in multi-label rule learning heuristics. In Kralj Novak, P., Šmuc, T., and Džeroski, S. (eds.), *Proceedings of the 22nd International Conference on Discovery Science (DS-19)*, pp. 96–111, Split, Croatia, October 2019. Springer International Publishing.
- [58] Kulesa M., Loza Mencía E., and Fürnkranz J. Improving the fusion of outbreak detection methods with supervised learning. In *Proceedings of the 16th International Conference on Computational Intelligence methods for Bioinformatics and Biostatistics (CIBB-19)*, 2019.
- [59] Dang H. Q. and Fürnkranz J. Driver information embedding with Siamese LSTM networks. In *Proceedings of the IEEE Intelligent Vehicles Symposium (IV-19)*, pp. 935–940. IEEE, June 2019.
- [60] Kauschke S., Fleckenstein L., and Fürnkranz J. Mending is better than ending: Adapting immutable classifiers to nonstationary environments using ensembles of patches. In *Proceedings of the 2019 International Joint Conference on Neural Networks (IJCNN-19)*, Budapest, Hungary, 2019. IEEE.
- [61] Kauschke S., Lehmann D. H., and Fürnkranz J. Patching deep neural networks for nonstationary environments. In *Proceedings of the 2019 International Joint Conference on Neural Networks (IJCNN-19)*, Budapest, Hungary, 2019. IEEE.
- [62] Joppen T., Wirth C., and Fürnkranz J. Preference-based Monte Carlo tree search. In Trollmann, F. and Turhan, A.-Y. (eds.), *Proceedings of the 41st German Conference on Artificial Intelligence (KI-18)*, pp. 327–340, Berlin, Germany, 2018. Springer. *Best Paper Award*.
- [63] Kauschke S., Mühlhäuser M., and Fürnkranz J. Towards semi-supervised classification of event streams via denoising autoencoders. In *Proceedings of the 17th IEEE International Conference on Machine Learning and Applications (ICMLA-18)*, pp. 131–136. IEEE, December 2018.
- [64] Dang H. Q. and Fürnkranz J. Using past maneuver executions for personalization of a driver model. In *Proceedings of the 21th IEEE International Conference on Intelligent Transportation Systems (ITSC-18)*, pp. 742–748. IEEE, 2018.
- [65] Kauschke S., Mühlhäuser M., and Fürnkranz J. Leveraging reproduction-error representations for multi-instance classification. In *Proceedings of the 21st International Conference on Discovery Science (DS-18)*, pp. 83–95. Springer Nature, 2018.
- [66] Zopf M., Loza Mencía E., and Fürnkranz J. Which scores to predict in sentence regression for text summarization? In Walker, M. A., Ji, H., and Stent, A. (eds.), *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT-19)*, Vol. 1: Long Papers, pp. 1782–1791, June 2018.
- [67] Rapp M., Loza Mencía E., and Fürnkranz J. Exploiting anti-monotonicity of multi-label evaluation measures for inducing multi-label rules. In Phung, D. Q., Tseng, V. S., Webb, G. I., Ho, B., Ganji, M., and Rashidi, L. (eds.), *Proceedings of the 22nd Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD-18)*, pp. 29–42, Melbourne, Australia, 2018. Springer-Verlag.
- [68] Kauschke S. and Fürnkranz J. Batchwise patching of classifiers. In *Proceedings of the 32nd AAAI Conference on Artificial Intelligence (AAAI-18)*, pp. 3374–3381, 2018.
- [69] Nam J., Loza Mencía E., Kim H. J., and Fürnkranz J. Maximizing subset accuracy with recurrent neural networks in multi-label classification. In Guyon, I., von Luxburg, U., Bengio, S., Wallach, H. M., Fergus, R., Vishwanathan, S. V. N., and Garnett, R. (eds.), *Advances in Neural Information Processing Systems 30 (NIPS-17)*, pp. 5419–5429, Long Beach, CA, 2017.
- [70] Dang H. Q., Fürnkranz J., Hoepfl M., and Biedermann A. Time-to-lane-change prediction with deep learning. In *Proceedings of the 20th IEEE International Conference on Intelligent Transportation Systems (ITSC-17)*, Yohohama, Japan, 2017. IEEE.
- [71] Tolstikov A., Janssen F., and Fürnkranz J. Evaluation of different heuristics for accommodating asymmetric loss functions in regression. In Yamamoto, A., Kida, T., Uno, T., and Kuboyama, T. (eds.), *Proceedings of the 20th International Conference on Discovery Science (DS-17)*, pp. 67–81. Springer-Verlag, 2017.

- [72] González C., Loza Mencía E., and Fürnkranz J. Re-training deep neural networks to facilitate boolean concept extraction. In *Proceedings of the 20th International Conference on Discovery Science (DS-17)*, pp. 127–143. Springer-Verlag, October 2017.
- [73] Khan M. A., Ekbal A., Loza Mencía E., and Fürnkranz J. Multi-objective optimisation-based feature selection for multi-label classification. In *Proceedings of the 22nd International Conference on Natural Language and Information Systems (NLDB-17)*, pp. 38–41, Liège, Belgium, 2017. Springer-Verlag.
- [74] Wirth C., Fürnkranz J., and Neumann G. Model-free preference-based reinforcement learning. In Schuurmans D. and Wellman M. P. (eds.) *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI-16)*, pp. 2222–2228, 2016.
- [75] Nam J., Loza Mencía E., and Fürnkranz J. All-in text: Learning document, label, and word representations jointly. In Schuurmans D. and Wellman M. P. (eds.) *Proceedings of the 30th AAAI Conference on Artificial Intelligence*, pp. 1948–1954. AAAI Press, 2016.
- [76] Hirschmann F., Nam J., and Fürnkranz J. What makes word-level neural machine translation hard: A case study on english-german translation. In Calzolari N., Matsumoto Y., and Prasad R. (eds.) *Proceedings of the 26th International Conference on Computational Linguistics (COLING-16)*, pp. 3199–3208, Osaka, Japan, 2016. ACL.
- [77] Zopf M., Loza Mencía E., and Fürnkranz J. Sequential clustering and contextual importance measures for incremental update summarization. In Calzolari, N., Matsumoto, Y., and Prasad, R. (eds.), *Proceedings of the 26th International Conference on Computational Linguistics (COLING-16)*, pp. 1071–1082, Osaka, Japan, 2016. ACL.
- [78] Zopf M., Loza Mencía E., and Fürnkranz J. Beyond centrality and structural features: Learning information importance for text summarization. In *Proceedings of the 20th SIGNLL Conference on Computational Natural Language Learning (CONLL-16)*, pp. 84–94. Association for Computational Linguistics, 2016.
- [79] Kauschke S., Fürnkranz J., and Janssen F. Predicting cargo train failures: A machine learning approach for a lightweight prototype. In Calders T., Ceci M., and Malerba D. (eds.) *Proceedings of the 19th International Conference on Discovery Science (DS-16)*, pp. 151–166. Bari, Italy, 2016. Springer-Verlag.
- [80] Stecher J., Janssen F., and Fürnkranz J. Shorter rules are better, aren't they? In Calders T., Ceci M., and Malerba D. (eds.) *Proceedings of the 19th International Conference on Discovery Science (DS-16)*, pp. 279–294. Bari, Italy, 2016. Springer-Verlag.
- [81] Sappadla P. V., Nam J., Loza Mencía E., and Fürnkranz J. Using semantic similarity for multi-label zero-shot classification of text documents. In *Proceedings of the 23rd European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN-16)*, Bruges, Belgium, April 2016. d-side publications.
- [82] Nam J., Loza Mencía E., Kim H. J., and Fürnkranz J. Predicting unseen labels using label hierarchies in large-scale multi-label learning. In *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD-15)*, pp. 102–118. Springer, 2015.
- [83] Schulz A., Janssen F., Ristoski P., and Fürnkranz J. Event-based clustering for reducing labeling costs of event-related microposts. In *Proceedings of the 9th International AAAI Conference on Web and Social Media (ICWSM-15)*, pp. 686–690. AAAI Press, May 2015.
- [84] Brinker C., Loza Mencía E., and Fürnkranz J. Graded multilabel classification by pairwise comparisons. In *Proceedings of the International Conference on Data Mining (ICDM-14)*, pp. 731–736, Shenzhen, China, December 2014. IEEE.
- [85] Stecher J., Janssen F., and Fürnkranz J. Separating rule refinement and rule selection heuristics in inductive rule learning. In Calders, T., Esposito, F., Hüllermeier, E., and Meo, R. (eds.), *Proceedings of the European Conference on Machine Learning and Knowledge Discovery in Databases (ECML-PKDD-14)*, Part III, pp. 114–129, Nancy, France, Springer-Verlag, 2014.
- [86] Nam J., Kim J., Loza Mencía E., Gurevych I., and Fürnkranz J. Large-scale multi-label text classification – Revisiting neural networks. In Calders T., Esposito F., Hüllermeier E., and Meo R. (eds.), *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD-14)*, Part II, pp. 437–452. Springer-Verlag, 2014.

- [87] Wirth C. and Fürnkranz J. EPMC: Every visit preference Monte Carlo for reinforcement learning. In Ong C. S. and Ho T.-B. (eds.), *Proceedings of the 5th Asian Conference on Machine Learning, (ACML-13)*, volume 29 of *JMLR Proceedings*, pp. 483–497, Canberra, ACT, Australia, 2013. JMLR.org.
- [88] Wirth C. and Fürnkranz J. A policy iteration algorithm for learning from preference-based feedback. In Tucker A., Höppner F., Siebes A., Swift S. (eds.) *Advances in Intelligent Data Analysis XII—Proceedings of the 12th International Symposium on Intelligent Data Analysis (IDA-13)*. IOPress, October 2013.
- [89] Fürnkranz J. and Park S.-H. Error-correcting output codes as a transformation from multi-class to multi-label prediction. In Ganascia J.-G., Lenca P., Petit, J.-M. (eds.) *Proceedings of the 15th International Conference on Discovery Science (DS-12)*, Lyon, France, pp. 254–267. Springer-Verlag, 2012.
- [90] Duivesteyn W., Loza Mencía E., Fürnkranz J., and Knobbe A. Multi-label LeGo – Enhancing multi-label classifiers with local patterns. In Hollmén J., Klawonn F., Tucker A. (eds.) *Advances in Intelligent Data Analysis XI — Proceedings of the 11th International Symposium on Intelligent Data Analysis (IDA-12)*, Helsinki, Finland, pp. 114–125. Springer-Verlag, 2012.
- [91] Paulheim H. and Fürnkranz J. Unsupervised generation of data mining features from linked open data. In *Proceedings of the 2nd International Conference on Web Intelligence and Semantics (WIMS-12)*, 2012.
- [92] Janssen F. and Fürnkranz J. Heuristic rule-based regression via dynamic reduction to classification. In T. Walsh (ed.) *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11)*, pp. 1330–1335, 2011.
- [93] Cheng W., Fürnkranz J., Hüllermeier E., and Park S.-H. Preference-based policy iteration: Leveraging preference learning for reinforcement learning. In Gunopulos D., Hofmann T., Malerba D., and Vazirgiannis M. (eds.) *Proceedings of the 22nd European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD-11)*, Athens, Greece, Part I, pp. 312–327. Springer, 2011.
- [94] Sulzmann J.-N. and Fürnkranz J. Rule stacking: An approach for compressing an ensemble of rule sets into a single classifier. In Elomaa T., Hollmén J., and Mannila H. (eds.) *Proceedings of the 14th International Conference on Discovery Science (DS-11)*, pp. 323–334, Espoo, Finland, 2011. Springer-Verlag.
- [95] Park S.-H., Weizsäcker L. and Fürnkranz J. Exploiting code redundancies in ECOC. In Pfahringer B., Holmes G., and Hoffmann A. (eds.) *Proceedings of the 13th International Conference on Discovery Science (DS-10)*, pp. 266–280, Canberra, Australia. Springer-Verlag, 2010.
- [96] Sulzmann J.-N. and Fürnkranz J. An empirical comparison of probability estimation techniques for probabilistic rules. In J. Gama, V. Santos Costa, A. Jorge, P. Brazdil (eds.) *Proceedings of the 12th International Conference on Discovery Science (DS-09)*, pp. 317–331, Porto, Portugal. Springer-Verlag, 2009. *Carl Smith Award for Best Student Paper*.
- [97] Fürnkranz J., Hüllermeier E., and Vanderlooy S. Binary decomposition methods for multipartite ranking. In W. L. Buntine, M. Grobelnik, D. Mladenic, and J. Shawe-Taylor (eds.) *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD-09)*, Part I, pp. 359–374, Bled, Slovenia, 2009. Springer-Verlag.
- [98] Park S.-H. and Fürnkranz J. Efficient decoding of ternary error-correcting output codes for multiclass classification. In W. L. Buntine, M. Grobelnik, D. Mladenic, and J. Shawe-Taylor (eds.) *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD-09)*, Part II, pp. 189–204, Bled, Slovenia, 2009. Springer-Verlag.
- [99] Schweizer I., Panitzek K., Park S.-H., and Fürnkranz J. An exploitative Monte-Carlo poker agent. In B. Mertsching, M. Hund, and M. Zaheer Aziz (eds.) *Proceedings of the 32nd Annual German Conference on Artificial Intelligence (KI-09)*, pp. 65–72, Paderborn, Germany, 2009. Springer-Verlag.
- [100] Loza Mencía E., Park S.-H., and Fürnkranz J. Efficient voting prediction for pairwise multilabel classification. In *Proceedings of the 11th European Symposium on Artificial Neural Networks (ESANN-09)*, pp. 117–122, Bruges, Belgium, 2009. d-side publications.
- [101] Janssen F. and Fürnkranz J. A re-evaluation of the over-searching phenomenon in inductive rule learning. In H. Park, S. Parthasarathy, H. Liu, and Z. Obradovic (eds.) *Proceedings of the SIAM International Conference on Data Mining (SDM-09)*, pp. 329–340, Sparks, Nevada, 2009.

- [102] Gamberger D., Lavrač N., and Fürnkranz J. Handling unknown and imprecise attribute values in propositional rule learning: A feature-based approach. In Tu-Bao Ho and Zhi-Hua Zhou (eds.) *Proceedings of the 10th Pacific Rim International Conference on Artificial Intelligence (PRICAI-08)*, pp. 636–645, Hanoi, Vietnam, 2008. Springer-Verlag.
- [103] Janssen F. and Fürnkranz J. An empirical investigation of the trade-off between consistency and coverage in rule learning heuristics. In J.-F. Boulicaut, M. Berthold, and T. Horváth (eds.) *Proceedings of the 11th International Conference on Discovery Science (DS-08)*, pp. 40–51, Budapest, Hungary, 2008. Springer-Verlag.
- [104] Loza Mencía E. and Fürnkranz J. Efficient pairwise multilabel classification for large-scale problems in the legal domain. In W. Daelemans, B. Goethals, and K. Morik (eds.) *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD-2008), Part II*, pp. 50–65, Antwerp, Belgium, 2008. Springer-Verlag.
- [105] Loza Mencía E. and Fürnkranz J. Pairwise learning of multilabel classifications with perceptrons. In *Proceedings of the 2008 International Joint Conference on Neural Networks (IJCNN-08)*. pp. 2900–2907, Hong Kong, 2008. IEEE.
- [106] Janssen F. and Fürnkranz J. On meta-learning rule learning heuristics. In *Proceedings of the IEEE International Conference on Data Mining (ICDM-07)* pp. 529–534, Omaha, NE, 2007.
- [107] Park S.-H. and Fürnkranz J. Efficient pairwise classification. In *Proceedings of the 18th European Conference on Machine Learning (ECML-07)*, pp. 658–665, Warsaw, Poland, 2007. Springer-Verlag.
- [108] Hüllermeier E. and Fürnkranz J. On minimizing the position error in label ranking. In *Proceedings of the 18th European Conference on Machine Learning (ECML-07)*, pp. 583–590, Warsaw, Poland, 2007. Springer-Verlag.
- [109] Sulzmann J.-N., Fürnkranz J. and Hüllermeier E. On pairwise naïve bayes classifiers. In *Proceedings of the 18th European Conference on Machine Learning (ECML-07)*, pp. 371–381, Warsaw, Poland, 2007. Springer-Verlag.
- [110] Brinker K., Fürnkranz J., and Hüllermeier E. A unified model for multilabel classification and ranking. In G. Brewka, S. Coradeschi, A. Perini, and P. Traverso (eds.) *Proceedings of the 17th European Conference on Artificial Intelligence (ECAI-06)*, 2006.
- [111] Hüllermeier E. and Fürnkranz J. Learning label preferences: Ranking error versus position error. In *Advances in Intelligent Data Analysis: Proceedings of the 6th International Symposium (IDA-05)*, pp. 180–191, Madrid, Spain, 2005. Springer-Verlag.
- [112] Fürnkranz J. and Flach P. An analysis of stopping and filtering criteria for rule learning. In *Proceedings of the 15th European Conference on Machine Learning (ECML-04)*, pp. 123–133, Pisa, Italy, 2004. Springer-Verlag.
- [113] Hüllermeier E. and Fürnkranz J. Comparison of ranking procedures in pairwise preference learning. In *Proceedings of the 10th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems (IPMU-04)*, Perugia, Italy, 2004.
- [114] Hüllermeier E. and Fürnkranz J. Ranking by pairwise comparison: A note on risk minimization. In *Proceedings of the IEEE International Conference on Fuzzy Systems (FUZZ-IEEE-04)*, Budapest, Hungary, 2004.
- [115] Fürnkranz J. and Flach P. An analysis of rule evaluation metrics. In T. Fawcett and N. Mishra (eds.) *Proceedings of the 20th International Conference on Machine Learning (ICML-03)*, pp. 202–209, Washington, DC, 2003. AAAI Press.
- [116] Savicky P. and Fürnkranz J. Combining pairwise classifiers with stacking. In *Advances in Intelligent Data Analysis: Proceedings of the 5th International Symposium (IDA-03)*, pp. 219–229, Berlin, Germany, 2003. Springer-Verlag.
- [117] Fürnkranz J. and Hüllermeier E. Pairwise preference learning and ranking. In N. Lavrač, D. Gamberger, H. Blockeel, and L. Todorovski (eds.) *Proceedings of the 14th European Conference on Machine Learning (ECML-03)*, pp. 145–156, Cavtat, Croatia, 2003. Springer-Verlag.
- [118] Fürnkranz J. A Pathology of Bottom-Up Hill-Climbing in Inductive Rule Learning In N. Cesa-Bianchi, M. Numao and R. Reischuk (eds.) *Proceedings of the 13th International Conference on Algorithmic Learning Theory (ALT-02)*, pp. 263–277, Lübeck, Germany, 2002.

- [119] Fürnkranz J. Pairwise Classification as an Ensemble Technique. In *Proceedings of the 13th European Conference on Machine Learning (ECML-02)*, pp. 97–110, Helsinki, Finland, 2002.
- [120] Seewald A.K. and Fürnkranz J. An evaluation of grading classifiers. In F. Hoffmann, D.J. Hand, N. Adams, D. Fisher, and G. Guimaraes (eds.) *Advances in Intelligent Data Analysis: Proceedings of the 4th International Conference (IDA-01)*, pp. 115–124, Cascais, Portugal, 2001. Springer-Verlag.
- [121] Blockeel H., Fürnkranz J., Prskawetz A., and Billari F.C. Detecting temporal change in event sequences: An application to demographic data. In L. De Raedt and A. Siebes (eds.) *Proceedings of the 5th European Conference on Principles of Data Mining and Knowledge Discovery (PKDD-01)*, pp. 29–41, Freiburg, Germany, 2001. Springer-Verlag.
- [122] Fürnkranz J. Round robin rule learning. In C. E. Brodley and A. P. Danyluk (eds.) *Proceedings of the 18th International Conference on Machine Learning (ICML-01)*, pp. 146–153, Williamstown, MA, 2001. Morgan Kaufmann Publishers.
- [123] Fürnkranz J., Pfahringer B., Kaindl H., and Kramer S. Learning to use operational advice. In W. Horn (ed.) *Proceedings of the 14th European Conference on Artificial Intelligence (ECAI-00)*, pp. 291–295, Berlin, 2000. IOS Press.
- [124] Fürnkranz J. Exploiting structural information for text classification on the WWW. In D.J. Hand, J. N. Kok, and M.R. Berthold (eds.) *Advances in Intelligent Data Analysis: Proceedings of the 3rd International Symposium (IDA-99)*, pp. 487–489, Amsterdam, Netherlands, 1999. Springer-Verlag.
- [125] Fürnkranz J. Noise-tolerant windowing. In *Proceedings of the 15th International Joint Conference on Artificial Intelligence (IJCAI-97)*, pp. 852–857, Nagoya, Japan, 1997. Morgan Kaufmann.
- [126] Fürnkranz J. More efficient windowing. In *Proceedings of the 14th National Conference on Artificial Intelligence (AAAI-97)*, pp. 509–514, Providence, RI, 1997. AAAI Press.
- [127] Trappl R., Fürnkranz J., and Petrak J. Digging for peace: Using machine learning methods for assessing international conflict databases. In W. Wahlster (ed.) *Proceedings of the 12th European Conference on Artificial Intelligence (ECAI-96)*, pp. 453–457, Budapest, Hungary, 1996. John Wiley & Sons.
- [128] Fürnkranz J. A tight integration of pruning and learning (extended abstract). In N. Lavrač and S. Wrobel (eds.) *Proceedings of the 8th European Conference on Machine Learning (ECML-95)*, pp. 291–294, Heraclion, Greece, 1995. Springer-Verlag.
- [129] Fürnkranz J. and Widmer G. Incremental Reduced Error Pruning. In W. Cohen and H. Hirsh (eds.) *Proceedings of the 11th International Conference on Machine Learning (ML-94)*, pp. 70–77, New Brunswick, NJ, 1994. Morgan Kaufmann.
- [130] Fürnkranz J. Top-down pruning in relational learning. In A.G. Cohn (ed.) *Proceedings of the 11th European Conference on Artificial Intelligence (ECAI-94)*, pp. 453–457, Amsterdam, The Netherlands, 1994. John Wiley & Sons.
- [131] Fürnkranz J. FOSSIL: A robust relational learner. In F. Bergadano and L. De Raedt (eds.) *Proceedings of the 7th European Conference on Machine Learning (ECML-94)*, pp. 122–137, Catania, Italy, 1994. Springer-Verlag.

Invited Papers, Book Chapters and Published Workshop Papers

- [132] Fürnkranz J. and Kliegr T. The need for interpretability biases. In Duivesteijn, W., Siebes, A., and Ukkonen, A. (eds.), *Proceedings of the 17th International Symposium on Intelligent Data Analysis (IDA-18)*, pp. 15–27. Springer-Verlag, 2018.
- [133] Zopf M., Botschen T., Falke T., Heinzerling B., Marasović A., Mihaylov T., P.V.S A., Loza Mencía E., Fürnkranz J., and Frank A. What’s important in a text? An extensive evaluation of linguistic annotations for summarization. In *Proceedings of the 5th International Conference on Social Networks Analysis, Management and Security (SNAMS-18)*, pp. 272–277, Valencia, Spain, 2018. IEEE.
- [134] Loza Mencía E., Fürnkranz J., Hüllermeier E., and Rapp M. Learning interpretable rules for multi-label classification. In Jair Escalante, H., Escalera, S., Guyon, I., Baró, X., Güçlütürk, Y., Güçlü, U., and van Gerven, M. A. J. (eds.), *Explainable and Interpretable Models in Computer Vision and Machine Learning*, pp. 81–113. Springer-Verlag, 2018.

- [135] Gurevych I., Meyer C. M., Binnig C., Fürnkranz J., Kersting K., Roth S., and Simpson E. Interactive data analytics for the humanities. In Gelbukh, A. (ed.), *Proceedings of the 18th International Conference on Computational Linguistics and Intelligent Text Processing (CICLing-17)*, pp. 527–549, Budapest, Hungary, 2018. Springer-Verlag.
- [136] Fürnkranz J. and Kliegr T. A brief overview of rule learning. In Bassiliades N., Gottlob G., Sadri F., Paschke A., and Roman D. (eds.), *Rule Technologies: Foundations, Tools, and Applications - Proceedings of the 9th International Symposium (RuleML-15)*, pp. 54–69, Berlin, Germany, 2015. Springer. Invited Paper.
- [137] Hüllermeier E. and Fürnkranz J. Learning from label preferences. In Elomaa T., Hollmén J., and Mannila H. (eds.) *Proceedings of the 14th International Conference on Discovery Science (DS-11)*, pp. 2–17, Espoo, Finland, 2011. Springer-Verlag. Invited Paper.
- [138] Fürnkranz J. Web mining. In O. Maimon and L. Rokach (eds.) *Data Mining and Knowledge Discovery Handbook*, pp. 913–930. Springer-Verlag, 2nd edition, 2010.
- [139] Fürnkranz J. and Hüllermeier E. Preference learning: An introduction. In J. Fürnkranz and E. Hüllermeier (eds.) *Preference Learning*, pp. 1–17. Springer-Verlag, 2010.
- [140] Fürnkranz J. and Hüllermeier E. Preference learning and ranking by pairwise comparison. In J. Fürnkranz and E. Hüllermeier (eds.) *Preference Learning*, pp. 65–82. Springer-Verlag, 2010.
- [141] Loza Mencía E. and Fürnkranz J. Efficient multilabel classification algorithms for large-scale problems in the legal domain. In E. Francesconi, S. Montemagni, W. Peters, and D. Tiscornia (eds.) *Semantic Processing of Legal Texts – Where the Language of Law Meets the Law of Language*, pp. 192–215. Springer-Verlag, 2010.
- [142] Lavrač N., Fürnkranz J., and Gamberger D. Explicit feature construction and manipulation for covering rule learning algorithms. In J. Koronacki, S. T. Wirzchon, Z. Ras, and J. Kacprzyk (eds.) *Advances in Machine Learning I – Dedicated to the Memory of Ryszard Michalski*, pp. 121–146. Springer-Verlag, 2010.
- [143] Hüllermeier E. and Fürnkranz J. Learning preference models from data: On the problem of label ranking and its variants. In G. Della Riccia, D. Dubois, R. Kruse, and H.J. Lenz (eds.) *Preferences and Similarities*, pp. 283–304. Springer-Verlag, 2008.
- [144] Utard H. and Fürnkranz J. Link-local features for hypertext classification. In B. Berendt, M. Grobelnik, A. Hotho, D. Mladenič, G. Semeraro, M. van Someren, M. Spiliopoulou, G. Stumme, and V. Svatek (eds.) *Semantics, Web and Mining*. Springer-Verlag, 2006.
- [145] Fürnkranz J. Web mining. In O. Maimon and L. Rokach (eds.) *Data Mining and Knowledge Discovery Handbook*, pp. 899–920. Springer-Verlag, 2005.
- [146] Fürnkranz J. From local to global patterns: Evaluation issues in rule learning algorithms. In K. Morik, J.-F. Boulicaut, and A. Siebes (eds.) *Local Pattern Detection*, pp. 20–38. Springer-Verlag, 2005.
- [147] Druckman D., Harris R., and Fürnkranz J. Modeling international negotiation: Statistical and machine learning approaches. In R. Trappl (ed.) *Programming for Peace: Computer-Aided Methods for International Conflict Resolution and Prevention*, volume 2 of *Advances in Group Decision and Negotiation*, pp. 227–250. Kluwer Academic Publishers, Dordrecht, 2006.
- [148] Billari F. C., Prskawetz A., and Fürnkranz J. On the Cultural Evolution of Age-at-marriage Norms. In F. C. Billari and A. Prskawetz (eds.) *Agent-Based Computational Demography*, pp. 139–157. Physica-Verlag / Springer, 2003.
- [149] Fürnkranz J. Machine learning in games: A survey. In J. Fürnkranz and M. Kubat (eds.) *Machines that Learn to Play Games*, chapter 2, pp. 11–59. Nova Science Publishers, Huntington, NY, 2001.
- [150] Fürnkranz J., Mitchell T., and Riloff E. A case study in using linguistic phrases for text categorization on the WWW. In M. Sahami (ed.) *Learning for Text Categorization: Proceedings of the 1998 AAAI/ICML Workshop*, pp. 5–12, Madison, WI, 1998. AAAI Press. Technical Report WS-98-05.
- [151] Winkler F.-G. and Fürnkranz J. On effort in AI research: A description along two dimensions. In Robert Morris (ed.) *Deep Blue Versus Kasparov: The Significance for Artificial Intelligence: Papers from the 1997 AAAI Workshop*, pp. 56–62, Providence, RI, 1997. AAAI Press. Technical Report WS-97-04.

- [152] Trappl R., Fürnkranz J., Petrak J., and Bercovitch J. Machine learning and case-based reasoning: Their potential role in preventing the outbreak of wars or in ending them. In G. Della Riccia, H.-J. Lenz, and R. Kruse (eds.) *Learning, Networks and Statistics: Proceedings of the ISSEK-96 Workshop*, pp. 209–225, Wien, New York, 1997. Springer-Verlag.
- [153] Fürnkranz J. A comparison of pruning methods for relational concept learning. In U. Fayyad and R. Uthurusamy (eds.) *Knowledge Discovery in Databases: Papers from the 1994 AAAI Workshop (KDD-94)*, pp. 371–382. AAAI Press, 1994. Technical Report WS-94-03.

Workshop Proceedings Edited

- [154] Fürnkranz J., Hüllermeier E., Rudin C., Slowinski R., and Sanner S. (eds.) *Preference Learning* (Dagstuhl Seminar 14101). *Dagstuhl Reports*, 4(3), 2014.
- [155] Fürnkranz J. and Hüllermeier E. (eds.) *Proceedings of the ECML/PKDD-13 Workshop on Reinforcement Learning with Generalized Feedback: Beyond Numeric Rewards*, Prague, Czech Republic, 2013.
- [156] Fürnkranz J. and Hüllermeier E. (eds.) *Proceedings of the ECAI-12 Workshop on Preference Learning: Methods and Applications in AI*, Montpellier, France, 2012.
- [157] Hüllermeier E. and Fürnkranz J. (eds.) *Proceedings of the ECML/PKDD-10 Workshop on Preference Learning*, Barcelona, Spain, 2010.
- [158] Knobbe A. and Fürnkranz J. (eds.) *From Local Patterns to Global Models: Proceedings of the ECML/PKDD-09 Workshop*, Bled, Slovenia, 2009.
- [159] Hüllermeier E. and Fürnkranz (eds.) *Proceedings of the ECML/PKDD-09 Workshop on Preference Learning*, Bled, Slovenia, 2009.
- [160] Fürnkranz J. and Knobbe A. (eds.) *From Local Patterns to Global Models: Proceedings of the ECML/PKDD-08 Workshop*, Antwerp, Belgium, 2008.
- [161] Hüllermeier E. and Fürnkranz J. (eds.) *Proceedings of the ECML/PKDD-08 Workshop on Preference Learning*, Antwerp, Belgium, 2008.
- [162] Bauer M., Brandherm B., Fürnkranz J., Grieser G., Hotho A., Jedlitschka A., and Kröner A. (eds.) *LWA 2005, Lernen Wissensentdeckung Adaptivität*, Saarland University, Saarbrücken, Germany, 2005. German Research Center for Artificial Intelligence (DFKI).
- [163] Fürnkranz J. (ed.) *Proceedings of the ECML/PKDD-04 Workshop on Advances in Inductive Rule Learning*, Pisa, Italy, 2004.
- [164] Hüllermeier E. and Fürnkranz J. (eds.) *Preference Learning: Models, Methods, Applications – Proceedings of the KI-2003 Workshop*, Hamburg, Germany, 2003.
- [165] Fürnkranz J. and Kubat M. (eds.) *Proceedings of the ICML-99 Workshop on Machine Learning in Game Playing*, Bled, Slovenia, 1999. J. Stefan Institute (IJS).
- [166] Pfahringer B. and Fürnkranz J. (eds.) *Proceedings of the MLnet Familiarization Workshop on Data Mining with Inductive Logic Programming (ILP for KDD)*, Bari, Italy, 1996.

Workshop Papers

- [167] Diallo, A., Zopf, M., and Fürnkranz, J. Improving answer selection with analogy-preserving sentence embeddings. In Jäschke, R. and Weidlich, M. (eds.), *Proceedings of the Conference on "Lernen, Wissen, Daten, Analysen" (LWDA-19)*, pp. 84–88, Berlin, Germany, 2019. CEUR-WS.org.
- [168] Kulessa M., Loza Mencía E., and Fürnkranz J. Improving outbreak detection with stacking of statistical surveillance methods. In *Proceedings of the ACM SIGKDD Workshop "Epidemiology meets Data Mining and Knowledge Discovery" (epiDAMIK-19)*, 2019.
- [169] Rapp M., Loza Mencía E., and Fürnkranz J. Simplifying random forests: On the trade-off between interpretability and accuracy. In *Proceedings of the 1st Workshop on Deep Continuous-Discrete Machine Learning (DeCoDeML-19)*, ECML/PKDD-19, Würzburg, Germany, September 2019.
- [170] Burkhardt S., Wagner N., Fürnkranz J., and Kramer S. Extracting rules with adaptable complexity from neural networks using k-term DNF optimization. In *Proceedings of the 1st Workshop on Deep Continuous-Discrete Machine Learning (DeCoDeML-19)*, ECML/PKDD-19, Würzburg, Germany, September 2019.

- [171] Dang H. Q. and Fürnkranz J. Exploiting maneuver dependency for personalization of driver assistance systems. In *12. Uni-DAS e.V. Workshop Fahrerassistenz und automatisiertes Fahren*, pp. 106–115, December 2018.
- [172] Dang H. Q. and Fürnkranz J. Exploiting maneuver dependency for personalization of a driver model. In Gemulla R., Ponzetto S. P., Bizer C., Keuper M., and Stuckenschmidt, H. (eds.), *Proceedings of the Conference “Lernen, Wissen, Daten, Analysen” (LWDA-18)*, pp. 93–97, Mannheim, Germany, 2018. CEUR-WS.org.
- [173] Schulz A., Ristoski P., Fürnkranz J., and Janssen F. Event-based clustering for reducing labeling costs of incident-related microposts. In *Proceedings of the ICML-15 2nd International Workshop on Mining Urban Data (MUD-15)*, pp. 44–52. CEUR workshop proceedings, July 2015.
- [174] Nam J., Kirschner C., Ma Z., Erbs N., Neumann S., Oelke D., Remus S., Biemann C., Eckle-Kohler J., Fürnkranz J., Gurevych I., Rittberger M., and Weihe K. Knowledge discovery in scientific literature. In Ruppenhofer, J. and Faaß, G. (eds.), *Proceedings of the 12th Edition of the Konvens Conference*, pp. 66–76, Hildesheim, Germany, 2014. Universitätsbibliothek Hildesheim.
- [175] Wirth C. and Fürnkranz J. Preference learning from annotated game databases. In Seidl, T., Hassani, M., and Beecks, C. (eds.), *Proceedings of the 16th LWA Workshops: KDML, IR and FGWM*, volume 1226 of *CEUR Workshop Proceedings*, pp. 57–68, Aachen, Germany, September 2014. CEUR-WS.org.
- [176] Wirth C. and Fürnkranz J. Preference-based reinforcement learning: A preliminary survey, In *Proceedings of the ECML/PKDD-13 Workshop on Reinforcement Learning from Generalized Feedback: Beyond Numeric Rewards*, Prague, Czech Republic, September 2013.
- [177] Wirth C. and Fürnkranz J. Learning from trajectory-based action preferences. In *Proceedings of the ICRA 2013 Workshop on Autonomous Learning*, May 2013.
- [178] Weizsäcker L. and Fürnkranz J. Multidimensional ordered mappings for empirical machine learning research. *Proceedings of the LWA 2012: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-12)*, Dortmund, Germany, 2012.
- [179] Wirth C. and Fürnkranz J. First steps towards learning from game annotations. In *Proceedings of the ECAI-12 Workshop on Preference Learning: Problems and Applications in AI*, pp. 53–58, August 2012.
- [180] Janssen F. and Fürnkranz J. In Spiliopoulou M., Nürnberger A., and Schult R. (eds.) *Proceedings of the LWA 2011: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-11)*, pp. 48–53. Magdeburg, Germany, 2011.
- [181] Paulsen P. and Fürnkranz J. A moderately successful attempt to train chess evaluation functions of different strengths. In *Proceedings of the ICML-10 Workshop on Machine Learning in Games*, Haifa, Israel, 2010.
- [182] Janssen F. and Fürnkranz J. Separate-and-conquer regression. In Atzmüller M., Benz D., Hotho A., and Stumme G. (eds.) *Proceedings of the LWA 2010: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-10)*, pp. 81–89. Kassel, Germany, 2010.
- [183] Sulzmann J.-N. and Fürnkranz J. Probability estimation and aggregation for rule learning. In Atzmüller M., Benz D., Hotho A., and Stumme G. (eds.) *Proceedings of the LWA 2010: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-10)*, pp. 143–150. Kassel, Germany, 2010.
- [184] Loza Mencía E., Park S.-H., and Fürnkranz J. Efficient voting prediction for pairwise multilabel classification. In D. Benz and F. Janssen (eds.) *Proceedings of the LWA 2009: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-09)*, pp. 72–75, Darmstadt, Germany, 2009.
- [185] Schweizer I., Panitzek K., Park S.-H., and Fürnkranz J.. An exploitative Monte-Carlo poker agent. In D. Benz and F. Janssen (eds.) *Proceedings of the LWA 2009: Lernen – Wissen – Adaption, Workshop Knowledge Discovery, Data Mining and Machine Learning (KDML-09)*, pp. 100–104, Darmstadt, Germany, 2009. Technical Report TUD-CS-2009-0157 and TUD-KE-2009-04, TU Darmstadt, Germany.

- [186] Weizsäcker L. and Fürnkranz J. On table extraction from text sources with markups. In T. Mandl and I. Frommholz (eds.) *Proceedings of the LWA 2009: Lernen – Wissen – Adaption, Workshop Information Retrieval (WIR-09)*, pages 1–8, Darmstadt, Germany, 2009. Technical Report TUD-CS-2009-0157 and TUD-KE-2009-04, TU Darmstadt, Germany.
- [187] Sulzmann J.-N. and Fürnkranz J. A study of probability estimation techniques for rule learning. In A. Knobbe and J. Fürnkranz (ed.) *From Local Patterns to Global Models: Proceedings of the ECML/PKDD-09 Workshop (LeGo-09)*, pp. 123–138, Bled, Slovenia, 2009.
- [188] Tsoumakas G., Loza Mencía E., Katakis I., Park S.-H., and Fürnkranz J. On the combination of two decompositive multi-label classification methods. In E. Hüllermeier and J. Fürnkranz (eds.) *Proceedings of the ECML/PKDD-09 Workshop on Preference Learning (PL-09)*, pp. 114–129, Bled, Slovenia, 2009.
- [189] Janssen F. and Fürnkranz J. A re-evaluation of the over-searching phenomenon in inductive rule learning. In *Proceedings of the LWA 2008: Lernen – Wissen – Adaption*, Würzburg, Germany, 2008.
- [190] Sulzmann J.-N. and Fürnkranz J. A comparison of techniques for selecting and combining class association rules. In *Proceedings of the LWA 2008: Lernen – Wissen – Adaption*, Würzburg, Germany, 2008.
- [191] Knobbe A., Crémilleux B., Fürnkranz J., and Scholz M. From local patterns to global models: The LeGo approach to data mining. In Fürnkranz J. and Knobbe A. (eds.) *From Local Patterns to Global Models: Proceedings of the ECML/PKDD-08 Workshop (LeGo-08)*, pp. 1–16, Antwerp, Belgium, 2008.
- [192] Sulzmann J.-N. and Fürnkranz J. A comparison of techniques for selecting and combining class association rules. In Fürnkranz J. and Knobbe A. (eds.) *From Local Patterns to Global Models: Proceedings of the ECML/PKDD-08 Workshop (LeGo-08)*, pp. 154–168, Antwerp, Belgium, 2008.
- [193] Park S.-H. and Fürnkranz J. Multi-label classification with label constraints. In Hüllermeier E. and Fürnkranz J. (eds.) *Proceedings of the ECML/PKDD-08 Workshop on Preference Learning (PL-08)*, pp. 157–171, Antwerp, Belgium, 2008.
- [194] Loza Mencía E. and Fürnkranz J. An Evaluation of Efficient Multilabel Classification Algorithms for Large-Scale Problems in the Legal Domain. In *Proceedings of the LREC 2008 Workshop on Semantic Processing of Legal Texts*, Marrakech, Morocco, 2008.
- [195] Janssen F. and Fürnkranz J. Meta-Learning a Rule Learning Heuristic. In *Proceedings of the ECML/PKDD-07 Workshop on Planning to Learn (PlanLearn-07)*. Warsawa, Poland, 2007.
- [196] Loza Mencía E. and Fürnkranz J. An Evaluation of Efficient Multilabel Classification Algorithms for Large-Scale Problems in the Legal Domain In *Proceedings of the LWA 2007, Lernen Wissensentdeckung Adaptivität*. Halle, Germany, 2007.
- [197] Janssen F. and Fürnkranz J. Meta-Learning Rule Learning Heuristics. In *Proceedings of the LWA 2007, Lernen Wissensentdeckung Adaptivität*. Halle, Germany, 2007.
- [198] Janssen F. and Fürnkranz J. On Trading Off Consistency and Coverage in Inductive Rule Learning. In *Proceedings of the LWA 2006, Lernen Wissensentdeckung Adaptivität*. Hildesheim, Germany, 2006.
- [199] Utard H. and Fürnkranz J. Link-local features for hypertext classification. In B. Berendt, M. Grobelnik, A. Hotho, D. Mladenič, G. Semeraro, M. Spiliopoulou, G. Stumme, and M. van Someren (eds.) *Proceedings of the European Web Mining Forum (EWMF-05): Workshop at ECML/PKDD-05*, pp. 40–51, 2005.
- [200] Hüllermeier E., Fürnkranz J., and Beringer J. On position error and label ranking through iterated choice. In *LWA 2005, Lernen Wissensentdeckung Adaptivität*, pp. 158–163, Saarland University, Saarbrücken, Germany, 2005. German Research Center for Artificial Intelligence (DFKI).
- [201] Fürnkranz J. Modeling rule precision. In A. Abecker, S. Bickel, U. Brefeld, I. Drost, N. Henze, O. Herden, M. Minor, T. Scheffer, L. Stojanovic, and S. Weibelzahl (eds.) *Lernen – Wissensentdeckung — Adaptivität. Proceedings of the LWA-04 Workshops*, pp. 147–154, Humboldt-Universität zu Berlin, 2004.
- [202] Fürnkranz J. Modeling rule precision. In J. Fürnkranz (ed.) *Proceedings of the ECML/PKDD-04 Workshop on Advances in Inductive Rule Learning*, pp. 30–45, Pisa, Italy, 2004.

- [203] Fürnkranz J. and Hüllermeier E. Pairwise preference learning and ranking. In E. Hüllermeier and J. Fürnkranz (eds.) *Preference Learning: Models, Methods, Applications – Proceedings of the KI-2003 Workshop*, Hamburg, Germany, 2003.
- [204] Fürnkranz J. and Petrak J. An evaluation of landmarking variants. In C. Giraud-Carrier, N. Lavrač, Steve Moyle, and B. Kavšek (eds.) *Proceedings of the ECML/PKDD Workshop on Integrating Aspects of Data Mining, Decision Support and Meta-Learning (IDDM-2001)*, pp. 57–68, Freiburg, Germany, 2001.
- [205] Pfahringer B., Kaindl H., Kramer S., and Fürnkranz J. Learning to make good use of operational advice. In J. Fürnkranz and M. Kubat (eds.) *Proceedings of the ICML-99 Workshop on Machine Learning in Game Playing*, Bled, Slovenia, 1999.
- [206] Fürnkranz J. Dimensionality reduction in ILP: A call to arms. In L. De Raedt and S. Muggleton (eds.) *Proceedings of the IJCAI-97 Workshop on Frontiers of Inductive Logic Programming*, pp. 81–86, Nagoya, Japan, 1997.
- [207] Fürnkranz J. Pruning methods for rule learning algorithms. In S. Wrobel (ed.) *Proceedings of the 4th International Workshop on Inductive Logic Programming (ILP-94)*, number 237 in GMD-Studien, pp. 321–336, 1994.
- [208] Fürnkranz J. Avoiding noise fitting in a FOIL-like learning algorithm. In *Proceedings of the IJCAI-93 Workshop on Inductive Logic Programming*, pp. 14–23, 1993.

Abstracts and Short Communications

- [209] Fürnkranz J. Class Binarization. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*, pp. 203–204. Springer-Verlag, 2017.
- [210] Fürnkranz J. Classification Rule. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*, p. 209. Springer-Verlag, 2017.
- [211] Fürnkranz J. Covering Algorithm. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*, p. 293–294. Springer-Verlag, 2017.
- [212] Fürnkranz J. Decision list. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*, p. 328. Springer-Verlag, 2017.
- [213] Fürnkranz J. Decision lists and decision trees. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 328–329. Springer-Verlag, 2017.
- [214] Fürnkranz J. Decision stump. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. p. 330. Springer-Verlag, 2017.
- [215] Fürnkranz J. Decision tree. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 330–335. Springer-Verlag, 2017.
- [216] Fürnkranz J. Divide-and-Conquer Learning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 372. Springer-Verlag, 2017.
- [217] Fürnkranz J. Machine learning and game playing. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 783–788. Springer-Verlag, 2017.
- [218] Fürnkranz J. Pruning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. p. 1031–1032. Springer-Verlag, 2010.
- [219] Fürnkranz J. Rule learning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 1117–1121. Springer-Verlag, 2010.
- [220] Fürnkranz J. Rule set. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. p. 1121. Springer-Verlag, 2010.
- [221] Fürnkranz J. and Hüllermeier E. Preference learning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. pp. 1000–1005. Springer-Verlag, 2017.
- [222] Fürnkranz J. and Hüllermeier E. Rank Correlation In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning and Data Mining*. p. 1055. Springer-Verlag, 2017.
- [223] Fürnkranz J. and Hüllermeier E. Editorial: Special issue on discovery science. *Information Sciences*, 329:849–850, 2016.
- [224] Fürnkranz J. Editorial. *Data Mining and Knowledge Discovery*, 29(1):1–2, 2015.

- [225] Fürnkranz J. Rule-based methods. In Dubitzky W. , Wolkenhauer O., Cho K.-H., and Yokota H. (eds.) *Encyclopedia of Systems Biology*. Springer-Verlag, 2013.
- [226] Hüllermeier E. and Fürnkranz J. Editorial: Preference learning and ranking. *Machine Learning*, 93(2-3):185–189, 2013.
- [227] Fürnkranz J. and Hüllermeier E. Preference learning. In Seel N. (ed.) *Encyclopedia of the Sciences of Learning*, p. 986. Springer-Verlag, 2012.
- [228] Hüllermeier E. and Fürnkranz J. Learning from label preferences. In Kivinen J., Szepesvári C., Ukkonen E., and Zeugmann T. (eds.) *Proceedings of the 22nd International Conference on Algorithmic Learning Theory (ALT-11)*, p. 38, Espoo, Finland, 2011. Springer/Verlag. Extended Abstract.
- [229] Fürnkranz J. and Knobbe A. Guest Editorial: Global modeling using local patterns. *Data Mining and Knowledge Discovery*, 21:1–8, 2010.
- [230] Fürnkranz J. Decision list. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*, p. 261. Springer-Verlag, 2010.
- [231] Fürnkranz J. Decision lists and decision trees. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. pp. 261–262. Springer-Verlag, 2010.
- [232] Fürnkranz J. Decision tree. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. pp. 263–267. Springer-Verlag, 2010.
- [233] Fürnkranz J. Machine learning and game playing. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. pp. 633–637. Springer-Verlag, 2010.
- [234] Fürnkranz J. Pruning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. p. 817. Springer-Verlag, 2010.
- [235] Fürnkranz J. Rule learning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. pp. 875–879. Springer-Verlag, 2010.
- [236] Fürnkranz J. and Hüllermeier E. Preference learning. In Sammut C. and Webb G. (eds.) *Encyclopedia of Machine Learning*. pp. 789–795. Springer-Verlag, 2010.
- [237] Fürnkranz J. Recent Advances in Machine Learning and Game Playing *ÖGAI-Journal*, 26(2), 2007.
- [238] Fürnkranz J. and Hüllermeier E. Preference learning. *Künstliche Intelligenz*, 19(1):60–61, 2005.
- [239] Fürnkranz J. Web Structure Mining — Exploiting the Graph Structure of the World Wide Web. *ÖGAI-Journal*, 21(2):17–26, 2002.
- [240] Fürnkranz J. and Pfahringer B. Guest editorial: First-order knowledge discovery in databases. *Applied Artificial Intelligence*, 12(5):345–361, 1998.
- [241] Fürnkranz J. A brief introduction to knowledge discovery in databases. *ÖGAI-Journal*, 14(4):14–17, 1995.
- [242] Fürnkranz J. Efficient pruning methods for relational learning (extended thesis abstract). *AI Communications*, 8(2):105–106, June 1995.
- [243] Fürnkranz J. Inductive logic programming (a short introduction and a thesis abstract). *ÖGAI-Journal*, 13(3–4):3–8, 1994.

Unpublished Technical Reports

- [244] Plöhn P., Fürnkranz J., and Janssen F. A Systematic Survey of Cluster Validity Indices. Technical Report TUD-KE-2016-02, Knowledge Engineering Group, Technische Universität Darmstadt, July 2016.
- [245] Gogel A. and Fürnkranz J. Sentiment Ranking of Product Reviews. Technical Report TUD-KE-2015-03, Knowledge Engineering Group, Technische Universität Darmstadt, May 2015.
- [246] Nam J. and Fürnkranz J. On learning vector representations in hierarchical label spaces. *arXiv preprint arXiv:1412.6881*, 2014.
- [247] Weizsäcker L. and Fürnkranz J. Basic instrument for experimental probes in machine learning. Technical Report TUD-KE-2012-01, Knowledge Engineering Group, Technische Universität Darmstadt, April 2012.
- [248] Weizsäcker L. and Fürnkranz J. Margin Driven Separate and Conquer by Asymmetric Loss Functions Technical Report TUD-KE-2011-01, TU Darmstadt, Knowledge Engineering Group, 2011.

- [249] Janssen F. and Fürnkranz J. The SeCo-Framework for rule learning. Technical Report TUD-KE-2010-02, TU Darmstadt, Knowledge Engineering Group, 2010.
- [250] Weizsäcker L. and Fürnkranz J. Margin driven separate and conquer by working set expansion. Technical Report TUD-KE-2009-06, TU Darmstadt, Knowledge Engineering Group, 2009.
- [251] Loza Mencía E., Park S.-H., and Fürnkranz J. Advances in efficient pairwise multilabel classification. Technical Report TUD-KE-2008-06, TU Darmstadt, Knowledge Engineering Group, 2008.
- [252] Fürnkranz J., Petrak J., Brazdil P., and Soares C. On the use of fast subsampling estimates for algorithm recommendation. Technical Report OEFAI-TR-2002-36, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 2002.
- [253] Fürnkranz J. A study using n -gram features for text categorization. Technical Report OEFAI-TR-98-30, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 1998.
- [254] Fürnkranz J. Knowledge discovery in chess databases: A research proposal. Technical Report OEFAI-TR-97-33, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 1997.
- [255] Fürnkranz J., Petrak J., Trappl R., and Bercovitch J. Machine learning methods for international conflict databases: A case study in predicting mediation outcome. Technical Report OEFAI-TR-94-33, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 1994.
- [256] Petrak J., Trappl R., and Fürnkranz J. The potential contribution of AI to the avoidance of crises and wars: Using CBR methods with the KOSIMO database of conflicts. Technical Report OEFAI-TR-94-32, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 1994.
- [257] Fürnkranz J. The role of qualitative knowledge in machine learning. Technical Report OEFAI-TR-93-09, Austrian Research Institute for Artificial Intelligence, Wien, Austria, 1993.

Under Review

- [258] Kliegr T., Bahník Š, and Fürnkranz J. A review of possible effects of cognitive biases on interpretation of rule-based machine learning models. *arXiv preprint*, 1804.02969, 2018. Submitted for journal publication.
- [259] Joppen, T. and Fürnkranz, J. Ordinal Monte Carlo tree search. *arXiv preprint*, 1901.04274, 2019. Submitted for journal publication.
- [260] Czech, J., Willig, M., Beyer, A., Kersting, K., and Fürnkranz, J. Learning to play the chess variant Crazyhouse above world champion level with deep neural networks and human data. *arXiv preprint*, 1908.06660, 2019. Submitted for journal publication.