

Handling requirements with XML like system specifications

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Abstract. This project shows how XML metalanguage capabilities and related tools could be used first to model data structures and operations of domain specific languages, and second to facilitate the transformation process from system specifications to software systems.

This approach allows to identify the subsystems of a software system using different domain specific languages. Such languages and the language transformer rules are the result of a domain analysis process adequately customized for this propose

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1 Introduction

A system specification is the result of the first step of the software engineering cycle. In it, software engineers must take into account business processes, and the relations the new system should have with its environment. Four decades of software engineering have shown that it is very difficult to verify the correctness of system specifications, and to prove they meet all user requirements. By now, most of the times it is only possible to verify the specification correctness when the final system is in operation, and behaves as users expected for a long period of time. Software reuse techniques tend to ensure correctness of software systems building them from reusable blocks of software proved correct and stable. This kind of software systems made of reusable components, are built in a dual software engineering process, the first part of the process focuses in obtaining reusable components, and the second one in the usual system engineering process.

A dual software engineering approach can improve traditional software engineering, but there are some pitfalls, and there exist domains 1 where this technique fails. It happens mainly because it is mandatory to reuse each component several times to obtain the return of the initial investment in building reusable components.

These languages can be combined to build a system specification, which can be transformed in a final running system. These languages are generated, combined, and handled using as base metalanguage the eXtensible Markup Language

(XML). XML2 has been selected because it provides a special kind of objects, named XML documents, made up of several units called entities. It provides mechanisms to impose constraints in the layout and structure of these XML documents. Furthermore XML processors can be used to read, and provide access to XML documents structure and content, and can work as front ends for other software systems, which are able to adapt its behavior according to the XML document contents.

References

1. A. Abraham, E. Corchado, and J.M. Corchado. Hybrid learning machines. *Neurocomputing*, 72(13-15):2729–2730, 2009.
2. O. Abrishambaf, P. Faria, L. Gomes, J. Spínola, Z. Vale, and J.M. Corchado. Implementation of a real-time microgrid simulation platform based on centralized and distributed management. *Energies*, 10(6), 2017.
3. H. Agrawal, J. Prieto, C. Ramos, and J.M. Corchado. Smart feeding in farming through iot in silos. *Advances in Intelligent Systems and Computing*, 530:355–366, 2016.
4. R.S. Alonso, D.I. Tapia, and J.M. Corchado. Sylph: A platform for integrating heterogeneous wireless sensor networks in ambient intelligence systems. *International Journal of Ambient Computing and Intelligence*, 3(2):1–15, 2011.
5. R.S. Alonso, D.I. Tapia, Ó. García, F. Guevara, J.A. Pardo, A.J. Sánchez, and J.M. Corchado. Guardian: Electronic system aimed at the protection of mistreated and at-risk people. *Advances in Intelligent and Soft Computing*, 153 AISC:11–18, 2012.
6. B. Baruque, E. Corchado, A. Mata, and J.M. Corchado. Ensemble methods for boosting visualization models. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5517 LNCS(PART 1):165–173, 2009.
7. B. Baruque, E. Corchado, A. Mata, and J.M. Corchado. A forecasting solution to the oil spill problem based on a hybrid intelligent system. *Information Sciences*, 180(10):2029–2043, 2010.
8. M.G. Bedia, J.M. Corchado, and L.F. Castillo. Bio-inspired memory generation by recurrent neural networks. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4507 LNCS:55–62, 2007.
9. C. Bielza, A. Salmerón, A. Alonso-Betanzos, J.I. Hidalgo, L. Martínez, A. Troncoso, E. Corchado, and J.M. Corchado. Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics): Preface. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 8109 LNAI:V–VII, 2013.
10. H. Billhardt, V. Julián, J.M. Corchado, and A. Fernández. An architecture proposal for human-agent societies. *Communications in Computer and Information Science*, 430:344–357, 2014.
11. H. Billhardt, V. Julián, J.M. Corchado, and A. Fernández. Human-agent societies: Challenges and issues. *International Journal of Artificial Intelligence*, 13(1):28–44, 2015.

12. X. Blanco, S. Rodríguez, J.M. Corchado, and C. Zato. Case-based reasoning applied to medical diagnosis and treatment. *Advances in Intelligent Systems and Computing*, 217:137–146, 2013.
13. D. Borrajo, L. Castillo, and J.M. Corchado. Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics): Preface. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4788 LNAI:v, 2007.
14. M.L. Borrajo, E.S. Corchado, M.A. Pellicer, and J.M. Corchado. Cbr based engine for business internal control. *Studies in Fuzziness and Soft Computing*, 230:243–260, 2008.
15. M.L. Borrajo, J.M. Corchado, E.S. Corchado, and M.A. Pellicer. Neural business control system. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4597 LNCS:242–254, 2007.
16. M.L. Borrajo, R. Laza, and J.M. Corchado. A complex case-based advisor. *Applied Artificial Intelligence*, 22(5):377–406, 2008.
17. E. Bucciarelli, S.-H. Chen, and J.M. Corchado. Preface. *Advances in Intelligent Systems and Computing*, 618:v–xii, 2018.
18. J. Cabestany, F. Sandoval, A. Prieto, and J.M. Corchado. Lecture notes in computer science: Preface. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5517 LNCS(PART 1):vii–ix, 2009.
19. J.A.F. Canelas, Q.M. Martin, and J.M.C. Rodriguez. Argumentative sox compliant and intelligent decision support systems for the suppliers contracting process. *Intelligent Systems Reference Library*, 87:333–375, 2015.
20. B. Canizes, T. Pinto, J. Soares, Z. Vale, P. Chamoso, and D. Santos. Smart city: A geCAD-bisite energy management case study. *Advances in Intelligent Systems and Computing*, 619:92–100, 2017.
21. J. Casillas, F.J. Martínez-López, and J.M. Corchado. Advances in intelligent systems and computing: Preface. *Advances in Intelligent Systems and Computing*, 171 AISC:V–VI, 2012.
22. J.A. Castellanos-Garzón, J. Ramos, A. González-Briones, and J.F. de Paz. A clustering-based method for gene selection to classify tissue samples in lung cancer. *Advances in Intelligent Systems and Computing*, 477:99–107, 2016.
23. L.F. Castillo, M. Cristancho, G. Isaza, A. Pinzón, and J.M.C. Rodríguez. Advances in computational biology: Proceedings of the 2nd colombian congress on computational biology and bioinformatics (ccbcob). *Advances in Intelligent Systems and Computing*, 232, 2014.
24. R. Centeno, M. Fagundes, H. Billhardt, S. Ossowski, J.M. Corchado, V. Julian, and A. Fernandez. An organisation-based multiagent system for medical emergency assistance. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5517 LNCS(PART 1):561–568, 2009.
25. P. Chamoso, F. de La Prieta, A. Eibenstein, D. Santos-Santos, A. Tizio, and P. Vittorini. A device supporting the self management of tinnitus. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 10209 LNCS:399–410, 2017.
26. P. Chamoso, L. García-Ortiz, J.I. Recio-Rodríguez, and M.A. Gómez-Marcos. Platform image processing applied to the study of retinal vessels. *Advances in Intelligent Systems and Computing*, 294(AISC):21–30, 2014.

27. P. Chamoso, A. Pérez, S. Rodríguez, J.M. Corchado, M. Sempere, R. Rizo, F. Aznar, and M. Pujol. Modeling oil-spill detection with multirotor systems based on multi-agent systems. 2014.
28. P. Chamoso, W. Raveane, V. Parra, and A. González. Uavs applied to the counting and monitoring of animals. *Advances in Intelligent Systems and Computing*, 291:71–80, 2014.
29. P. Chamoso, A. Rivas, J.J. Martín-Limorti, and S. Rodríguez. A hash based image matching algorithm for social networks. *Advances in Intelligent Systems and Computing*, 619:183–190, 2017.
30. P. Chamoso, A. Rivas, S. Rodríguez, and J. Bajo. Relationship recommender system in a business and employment-oriented social network. *Information Sciences*, 433-434:204–220, 2018.
31. P. Chamoso, S. Rodríguez, F. de la Prieta, J.F. de Paz, J.B. Pérez, J.M.C. Rodríguez, and L. García-Ortiz. Software agents in retinal vessels classification. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 10207 LNAI:509–523, 2017.
32. W.H. Chan, M.S. Mohamad, S. Deris, J.M. Corchado, S. Omatu, Z. Ibrahim, and S. Kasim. An improved gsvm-scadl2 with firefly algorithm for identification of informative genes and pathways. *International Journal of Bioinformatics Research and Applications*, 12(1):72–93, 2016.
33. W.H. Chan, M.S. Mohamad, S. Deris, N. Zaki, S. Kasim, S. Omatu, J.M. Corchado, and H. Al Ashwal. Identification of informative genes and pathways using an improved penalized support vector machine with a weighting scheme. *Computers in Biology and Medicine*, 77:102–115, 2016.
34. Y.W. Choon, M.S. Mohamad, S. Deris, C.K. Chong, S. Omatu, and J.M. Corchado. Gene knockout identification using an extension of bees hill flux balance analysis. *BioMed Research International*, 2015, 2015.
35. Y.W. Choon, M.S. Mohamad, S. Deris, R.M. Illias, C.K. Chong, L.E. Chai, S. Omatu, and J.M. Corchado. Differential bees flux balance analysis with opt-knock for in silico microbial strains optimization. *PLoS ONE*, 9(7), 2014.
36. E. Corchado, B. Baruque, A. Mata, and J.M. Corchado. A wevos-cbr approach to oil spill problem. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5271 LNAI:378–384, 2008.
37. E. Corchado, J.M. Corchado, L. Sáiz, and A. Lara. Constructing a global and integral model of business management using a cbr system. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3190:141–147, 2004.
38. E. Corchado, A. Mata, B. Baruque, J.M. Corchado, and B. Pérez-Lancho. A topology-preserving system for environmental models forecasting. *International Journal of Computer Mathematics*, 88(9):1979–1989, 2011.
39. E.S. Corchado, J.M. Corchado, and J. Aiken. Ibr retrieval method based on topology preserving mappings. *Journal of Experimental and Theoretical Artificial Intelligence*, 16(3):145–160, 2004.
40. J.M. Corchado and J. Aiken. Hybrid artificial intelligence methods in oceanographic forecast models. *IEEE Transactions on Systems, Man and Cybernetics Part C: Applications and Reviews*, 32(4):307–313, 2002.
41. J.M. Corchado, J. Aiken, E.S. Corchado, and F. Fdez-Riverola. Evaluating the air-sea interactions and fluxes using an instance-based reasoning system. *AI Communications*, 18(4):247–256, 2005.

42. J.M. Corchado, J. Aiken, E.S. Corchado, N. Lefevre, and T. Smyth. Quantifying the ocean's co2 budget with a cohel-ibr system. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3155:533–546, 2004.
43. J.M. Corchado, E.S. Corchado, J. Aiken, C. Fyfe, F. Fernandez, and M. Gonzalez. Maximum likelihood hebbian learning based retrieval method for cbr systems. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 2689:107–121, 2003.
44. J.M. Corchado, E.S. Corchado, and M.A. Pellicer. Design of cooperative agents for mobile devices. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3190:205–212, 2004.
45. J.M. Corchado and C. Fyfe. Unsupervised neural method for temperature forecasting. *Artificial Intelligence in Engineering*, 13(4):351–357, 1999.
46. J.M. Corchado and R. Laza. Constructing deliberative agents with case-based reasoning technology. *International Journal of Intelligent Systems*, 18(12):1227–1241, 2003.
47. J.M. Corchado, R. Laza, L. Borrajo, J.C. Yañez, A. De Luis, and M. Gonzalez-Bedia. Agent-based web engineering. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 2722:17–25, 2003.
48. J.M. Corchado and B. Lees. A hybrid case-based model for forecasting. *Applied Artificial Intelligence*, 15(2):105–127, 2001.
49. J.M. Corchado, B. Lees, and C. Fyfe. Project monitoring intelligent agent system. *IEE Colloquium (Digest)*, (118):4/1–4/6, 1997.
50. J.M. Corchado and A. Mata. Predicting the presence of oil slicks after an oil spill. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5239 LNAI:573–586, 2008.
51. J.M. Corchado, J. Pavón, E.S. Corchado, and L.F. Castillo. Development of cbr-bdi agents: A tourist guide application. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3155:547–559, 2004.
52. J.M. Corchado and J.B. Perez. Preface. *Advances in Intelligent Systems and Computing*, 293:v–vi, 2014.
53. J.M. Corchado, N. Rees, B. Lees, and J. Aiken. Data mining using example-based methods in oceanographic forecast models. *IEE Colloquium (Digest)*, (310):7/1–7/4, 1998.
54. S.E.P. Costa, J.J.P.C. Rodrigues, B.M.C. Silva, J.N. Isento, and J.M. Corchado. Integration of wearable solutions in aal environments with mobility support. *Journal of Medical Systems*, 39(12), 2015.
55. Â. Costa, P. Novais, J.M. Corchado, and J. Neves. Increased performance and better patient attendance in an hospital with the use of smart agendas. *Logic Journal of the IGPL*, 20(4):689–698, 2012.
56. N.C. Dang, F. De la Prieta, J.M. Corchado, and M.N. Moreno. Framework for retrieving relevant contents related to fashion from online social network data. *Advances in Intelligent Systems and Computing*, 473:335–347, 2016.
57. F. De la Prieta, A.B. Gil, S. Rodríguez-González, and J.M. Corchado. Cloud computing and multi agent system to improve learning object paradigm. *Interaction Design and Architecture(s)*, 23(1):38–49, 2014.

58. Y. Demazeau, F. Dignum, J.M. Corchado, and J.B. Pérez. Preface. *Advances in Intelligent and Soft Computing*, 70, 2010.
59. F. Díaz, F. Fdez-Riverola, and J.M. Corchado. Gene-cbr: A case-based reasoning tool for cancer diagnosis using microarray data sets. *Computational Intelligence*, 22(3-4):254–268, 2006.
60. F. Díaz, F. Fdez-Riverola, D. Glez-Peña, and J.M. Corchado. Applying gcs networks to fuzzy discretized microarray data for tumour diagnosis. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4224 LNCS:1095–1102, 2006.
61. F. Díaz, F. Fdez-Riverola, D. Glez-Peña, and J.M. Corchado. Using fuzzy patterns for gene selection and data reduction on microarray data. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4224 LNCS:1087–1094, 2006.
62. R. Faia, T. Pinto, O. Abrishambaf, F. Fernandes, Z. Vale, and J.M. Corchado. Case based reasoning with expert system and swarm intelligence to determine energy reduction in buildings energy management. *Energy and Buildings*, 155:269–281, 2017.
63. R. Faia, T. Pinto, Z. Vale, and J.M. Corchado. An ad-hoc initial solution heuristic for metaheuristic optimization of energy market participation portfolios. *Energies*, 10(7), 2017.
64. F. Fdez-Riverola and J.M. Corchado. Cbr based system for forecasting red tides. *Knowledge-Based Systems*, 16(5-6 SPEC.):321–328, 2003.
65. F. Fdez-Riverola and J.M. Corchado. Forecasting red tides using an hybrid neuro-symbolic system. *AI Communications*, 16(4):221–233, 2003.
66. F. Fdez-Riverola and J.M. Corchado. Fsftr: forecasting system for red tides. a hybrid autonomous ai model. *Applied Artificial Intelligence*, 17(10):955–982, 2003.
67. F. Fdez-Riverola, J.M. Corchado, and J.M. Torres. An automated hybrid cbr system for forecasting. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 2416:519–533, 2002.
68. F. Fdez-Riverola, E.L. Iglesias, F. Díaz, J.R. Méndez, and J.M. Corchado. Applying lazy learning algorithms to tackle concept drift in spam filtering. *Expert Systems with Applications*, 33(1):36–48, 2007.
69. F. Fdez-Riverola, E.L. Iglesias, F. Díaz, J.R. Méndez, and J.M. Corchado. Spamhunting: An instance-based reasoning system for spam labelling and filtering. *Decision Support Systems*, 43(3):722–736, 2007.
70. F. Fdez-Riverola and J.M. Corchado. Fsftr: Forecasting system for red tides. *Applied Intelligence*, 21(3):251–264, 2004.
71. F. Fernandes, L. Gomes, H. Morais, M. Silva, Z. Vale, and J.M. Corchado. Dynamic energy management method with demand response interaction applied in an office building. *Advances in Intelligent Systems and Computing*, 473:69–82, 2016.
72. F. Fernández-Riverola, F. Díaz, and J.M. Corchado. Reducing the memory size of a fuzzy case-based reasoning system applying rough set techniques. *IEEE Transactions on Systems, Man and Cybernetics Part C: Applications and Reviews*, 37(1):138–146, 2007.
73. J.A. Fraile, D.I. Tapia, S. Rodríguez, and J.M. Corchado. Agents in home care: A case study. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5572 LNAI:1–8, 2009.

74. C. Fyfe and J. Corchado. A comparison of kernel methods for instantiating case based reasoning systems. *Advanced Engineering Informatics*, 16(3):165–178, 2002.
75. C. Fyfe and J.M. Corchado. Automating the construction of cbr systems using kernel methods. *International Journal of Intelligent Systems*, 16(4):571–586, 2001.
76. O. García, R.S. Alonso, D.I. Tapia, and J.M. Corchado. Using zigbee in ambient intelligence learning scenarios. *International Journal of Ambient Computing and Intelligence*, 4(3):33–45, 2012.
77. O. García, P. Chamoso, J. Prieto, S. Rodríguez, and F. De La Prieta. A serious game to reduce consumption in smart buildings. *Communications in Computer and Information Science*, 722:481–493, 2017.
78. Ó. García, R.S. Alonso, J. Prieto, and J.M. Corchado. Energy efficiency in public buildings through context-aware social computing. *Sensors (Switzerland)*, 17(4), 2017.
79. Ó. García, R.S. Alonso, D.I. Tapia, and J.M. Corchado. Evaluating zigbee protocol to design cafcla: A framework to develop location-based learning activities. *Advances in Intelligent and Soft Computing*, 152 AISC:125–132, 2012.
80. Ó. García, R.S. Alonso, D.I. Tapia, and J.M. Corchado. Cafcla: An ami-based framework to design and develop context-aware collaborative learning activities. *Advances in Intelligent Systems and Computing*, 219:41–48, 2013.
81. Ó. García, R.S. Alonso, D.I. Tapia, and J.M. Corchado. Supporting context-aware collaborative learning activities by cafcla. *Advances in Intelligent Systems and Computing*, 218:57–65, 2013.
82. Ó. García, J. Prieto, R.S. Alonso, and J.M. Corchado. A framework to improve energy efficient behaviour at home through activity and context monitoring. *Sensors (Switzerland)*, 17(8), 2017.
83. Ó. García, D.I. Tapia, R.S. Alonso, S. Rodríguez, and J.M. Corchado. Ambient intelligence and collaborative e-learning: A new definition model. *Journal of Ambient Intelligence and Humanized Computing*, 3(3):239–247, 2012.
84. Ó. García, D.I. Tapia, S. Rodríguez, and J.M. Corchado. Ambient intelligence application scenario for collaborative e-learning. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 6096 LNAI(PART 1):407–416, 2010.
85. J.A. García Coria, J.A. Castellanos-Garzón, and J.M. Corchado. Intelligent business processes composition based on multi-agent systems. *Expert Systems with Applications*, 41(4 PART 1):1189–1205, 2014.
86. R. Gennari, P. Vittorini, I. Marenzi, T. Di Mascio, F. De La Prieta Pintado, and J.M. Corchado. Editorial. *International Journal of Technology Enhanced Learning*, 5(3-4):195–197, 2013.
87. A.B. Gil, S. Rodríguez, F. De La Prieta, and J.M. Corchado. Learning object retrieval in heterogeneous environments. *International Journal of Web Engineering and Technology*, 8(2):197–213, 2013.
88. M. Glez-Bedia, J.M. Corchado, E.S. Corchado, and C. Fyfe. Analytical model for constructing deliberative agents. *International Journal of Engineering Intelligent Systems for Electrical Engineering and Communications*, 10(3):173–185, 2002.
89. D. Glez-Peña, F. Díaz, F. Fdez-Riverola, J.R. Méndez, and J.M. Corchado. Fuzzy patterns and gcs networks to clustering gene expression data. *Studies in Fuzziness and Soft Computing*, 242:103–125, 2009.
90. D. Glez-Peña, F. Díaz, J.M. Hernández, J.M. Corchado, and F. Fdez-Riverola. genecbr: A translational tool for multiple-microarray analysis and integrative information retrieval for aiding diagnosis in cancer research. *BMC Bioinformatics*, 10, 2009.

91. D. Glez-Peña, F. Díaz, J.R. Méndez, J.M. Corchado, and F. Fdez-Riverola. An evolutionary approach for sample-based clustering on microarray data. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5518 LNCS(PART 2):972–978, 2009.
92. A. González-Briones, J. Ramos, J.F. De Paz, and J.M. Corchado. Multi-agent system for obtaining relevant genes in expression analysis between young and older women with triple negative breast cancer. *Journal of integrative bioinformatics*, 12(4):278, 2015.
93. K. Harashima, H. Nakazaki, P. Chamoso, J. Bajo, and J.M. Corchado. Integration of a purchase porter system into a vo developed by pangea. *Advances in Intelligent Systems and Computing*, 372:65–72, 2015.
94. Á. Herrero, B. Baruque, F. Klett, A. Abraham, V. Snášel, A.C.P.L.F. de Carvalho, P. García Bringas, I. Zelinka, H. Quintián, J.M. Corchado, and E. Corchado. Special issue soco13-jal. *Journal of Applied Logic*, 17:1–3, 2016.
95. Y. Ikeda, S. Omatu, P. Chamoso, A. Pérez, and J. Bajo. Multi-agent systems for classification of e-nose data. *Advances in Intelligent Systems and Computing*, 376:183–192, 2015.
96. J. Koetsier, E. Corchado, D. MacDonald, J. Corchado, and C. Fyfe. Kernel maximum likelihood hebbian learning. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3037:650–653, 2004.
97. B. Lees and J. Corchado. Integrated case-based neural network approach to problem solving. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 1570 LNAI:157–166, 1999.
98. T. Li, J.M. Corchado, S. Sun, and H. Fan. Multi-eap: Extended eap for multi-estimate extraction for smc-phd filter. *Chinese Journal of Aeronautics*, 30(1):368–379, 2017.
99. T. Li, S. Sun, M. Bolić, and J.M. Corchado. Algorithm design for parallel implementation of the smc-phd filter. *Signal Processing*, 119:115–127, 2016.
100. T. Li, S. Sun, J.M. Corchado, T.P. Sattar, and S. Si. Numerical fitting-based likelihood calculation to speed up the particle filter. *International Journal of Adaptive Control and Signal Processing*, 30(11):1583–1602, 2016.
101. T. Li, S. Sun, T.P. Sattar, and J.M. Corchado. Fight sample degeneracy and impoverishment in particle filters: A review of intelligent approaches. *Expert Systems with Applications*, 41(8):3944–3954, 2014.
102. Z. Li, R.O. Sinnott, Y.W. Choon, M.F. Sjaugi, M.S. Mohammad, S. Deris, S. Napis, S. Omatu, J.M. Corchado, Z. Ibrahim, and Z.M. Yusof. Exploring the high performance computing-enablement of a suite of gene-knockout based genetic engineering applications. *Advances in Intelligent Systems and Computing*, 477:133–139, 2016.
103. S.Y. Lim, M.S. Mohamad, L.E. Chai, S. Deris, W.H. Chan, S. Omatu, J.M. Corchado, M.F. Sjaugi, M.M. Zainuddin, G. Rajamohan, Z. Ibrahim, and Z.M. Yusof. Investigation of the effects of imputation methods for gene regulatory networks modelling using dynamic bayesian networks. *Advances in Intelligent Systems and Computing*, 474:413–421, 2016.
104. A.C.E.S. Lima, L.N. De Castro, and J.M. Corchado. A polarity analysis framework for twitter messages. *Applied Mathematics and Computation*, 270:756–767, 2015.

105. V.F. López, R. Aguilar, L. Alonso, M.N. Moreno, and J.M. Corchado. Data mining for grammatical inference with bioinformatics criteria. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 6077 LNAI(PART 2):53–60, 2010.
106. V.F. López, R. Aguilar, L. Alonso, M.N. Moreno, and J.M. Corchado. Grammatical inference with bioinformatics criteria. *Neurocomputing*, 75:88–97, 2012.
107. P. Martín-Martín, A. González-Briones, G. Villarrubia, and J.F. De Paz. Intelligent transport system through the recognition of elements in the environment. *Communications in Computer and Information Science*, 722:470–480, 2017.
108. A. Mata, B. Baruque, B. Pérez-Lancho, E. Corchado, and J.M. Corchado. Forest fire evolution prediction using a hybrid intelligent system. *IFIP Advances in Information and Communication Technology*, 322 AICT:64–71, 2010.
109. A. Mata and J.M. Corchado. Forecasting the probability of finding oil slicks using a cbr system. *Expert Systems with Applications*, 36(4):8239–8246, 2009.
110. A. Mata, J.M. Corchado, and D.I. Tapia. Cros: A contingency response multi-agent system for oil spills situations. *Applied Soft Computing Journal*, 11(3):3147–3159, 2011.
111. A. Mata, M.D. Muñoz, E. Corchado, and J.M. Corchado. Isotropic image analysis for improving cbr forecasting. *Journal of Mathematical Imaging and Vision*, 42(2-3):212–224, 2012.
112. A. Mata, B. Pérez, and J.M. Corchado. Forest fires prediction by an organization based system. *Advances in Intelligent and Soft Computing*, 70:135–144, 2010.
113. K. Matsui, K. Kimura, A. Pérez, S. Rodríguez, and J.M. Corchado. Development of electrolarynx by multi-agent technology and mobile devices for prosody control. *Communications in Computer and Information Science*, 430:54–65, 2014.
114. J.A. Morente-Moliner, G. Kou, R. González-Crespo, J.M. Corchado, and E. Herrera-Viedma. Solving multi-criteria group decision making problems under environments with a high number of alternatives using fuzzy ontologies and multi-granular linguistic modelling methods. *Knowledge-Based Systems*, 137:54–64, 2017.
115. M.D. Muñoz, A. Mata, E. Corchado, and J.M. Corchado. Obifs isotropic image analysis for improving apredicting agent based systems. *Expert Systems with Applications*, 40(12):5011–5020, 2013.
116. J.R. Méndez, F. Fdez-Riverola, F. Díaz, and J.M. Corchado. Intelligent systems for detecting and filtering spam e-mail: A survey [sistemas inteligentes para la detección y filtrado de correo spam: Una revisión]. *Inteligencia Artificial*, 11(34):63–81, 2007.
117. J.R. Méndez, F. Fdez-Riverola, F. Díaz, E.L. Iglesias, and J.M. Corchado. A comparative performance study of feature selection methods for the anti-spam filtering domain. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4065 LNAI:106–120, 2006.
118. J.R. Méndez, F. Fdez-Riverola, D. Glez-Peña, F. Díaz, and J.M. Corchado. Relaxing feature selection in spam filtering by using case-based reasoning systems. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4874 LNAI:53–62, 2007.
119. J.R. Méndez, F. Fdez-Riverola, E.L. Iglesias, F. Díaz, and J.M. Corchado. Tracking concept drift at feature selection stage in spamhunting: An anti-spam instance-based reasoning system. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4106 LNAI:504–518, 2006.

120. J.R. Méndez, D. Glez-Peña, F. Fdez-Riverola, F. Díaz, and J.M. Corchado. Managing irrelevant knowledge in cbr models for unsolicited e-mail classification. *Expert Systems with Applications*, 36(2 PART 1):1601–1614, 2009.
121. J.R. Méndez, C. González, D. Glez-Peña, F. Fdez-Riverola, F. Díaz, and J.M. Corchado. Assessing classification accuracy in the revision stage of a cbr spam filtering system. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4626 LNAI:374–388, 2007.
122. J.R. Méndez, E.L. Iglesias, F. Fdez-Riverola, F. Díaz, and J.M. Corchado. Tokenising, stemming and stopword removal on anti-spam filtering domain. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 4177 LNAI:449–458, 2006.
123. P. Novais, K. Hallenborg, D.I. Tapia, and J.M.C. Rodríguez. Advances in intelligent and soft computing: Preface. *Advances in Intelligent and Soft Computing*, 153 AISC:VI, 2012.
124. P. Novais, D. Preuveneers, and J.M. Corchado. Preface. *Advances in Intelligent and Soft Computing*, 92:v–vi, 2011.
125. S. Omatu, H. Bersini, J.M. Corchado, S. Rodríguez, P. Pawlewski, and E. Bucciarelli. Distributed computing and artificial intelligence, 11th international conference. *Advances in Intelligent Systems and Computing*, 290:III–IV, 2014.
126. S. Omatu, H. Bersini, J.M. Corchado, S. Rodríguez, P. Pawlewski, and E. Bucciarelli. Preface. *Advances in Intelligent Systems and Computing*, 290:V–VI, 2014.
127. S. Omatu, M.P. Rocha, J. Bravo, F. Fernandez, E. Corchado, A. Bustillo, and J.M. Corchado. Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics): Preface. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5518 LNCS(PART 2):VII–VIII, 2009.
128. S. Omatu, T. Wada, S. Rodríguez, P. Chamoso, and J.M. Corchado. Multi-agent technology to perform odor classification. *Advances in Intelligent Systems and Computing*, 291:241–252, 2014.
129. J. Palanca, E.D. Val, A. Garcia-Fornes, H. Billhardt, J.M. Corchado, and V. Julián. Designing a goal-oriented smart-home environment. *Information Systems Frontiers*, pages 1–18, 2016.
130. J. Pavón and J.M. Corchado. Agents for the web. *International Journal of Web Engineering and Technology*, 1(4):393–396, 2004.
131. J. Pavón, J.M. Corchado, J.J. Gómez-Sanz, and L.F. Castillo Ossa. Mobile tourist guide services with software agents. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3284:322–330, 2004.
132. D. Preuveneers, P. Novais, and J.M. Corchado. Introduction to the thematic issue. *Journal of Ambient Intelligence and Smart Environments*, 4(3):147–148, 2012.
133. A. Pérez, P. Chamoso, V. Parra, and A.J. Sánchez. Ground vehicle detection through aerial images taken by a uav. 2014.
134. J.B. Pérez, J.M.C. Rodríguez, J. Fähndrich, P. Mathieu, A. Campbell, M.C. Suárez-Figueroa, E. Adam, A. Fernández-Caballero, R. Hermoso, and M.N. Moreno. Trends in practical applications of agents and multiagent systems: 11th international conference on practical applications of agents and multi-agent systems abc. *Advances in Intelligent Systems and Computing*, 221, 2013.
135. C. Ramos, P. Novais, C.E. Nihan, and J.M.C. Rodríguez. Preface. *Advances in Intelligent Systems and Computing*, 291:V–VI, 2014.

136. J. Ramos, J.A. Castellanos-Garzón, A. González-Briones, J.F. de Paz, and J.M. Corchado. An agent-based clustering approach for gene selection in gene expression microarray. *Interdisciplinary Sciences: Computational Life Sciences*, 9(1), 2017.
137. M. Rebollo, A. Giret, E. Argente, C. Carrascosa, J.M. Corchado, A. Fernandez, and V. Julian. On the road to an abstract architecture for open virtual organizations. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5517 LNCS(PART 1):642–650, 2009.
138. E. Redondo-Gonzalez, L.N. De Castro, J. Moreno-Sierra, M.L. Maestro De Las Casas, V. Vera-Gonzalez, D.G. Ferrari, and J.M. Corchado. Bladder carcinoma data with clinical risk factors and molecular markers: A cluster analysis. *BioMed Research International*, 2015, 2015.
139. M.A. Remli, S. Deris, M.S. Mohamad, S. Omatu, and J.M. Corchado. An enhanced scatter search with combined opposition-based learning for parameter estimation in large-scale kinetic models of biochemical systems. *Engineering Applications of Artificial Intelligence*, 62:164–180, 2017.
140. A. Rivas, P. Chamoso, J.J. Martín-Limorti, S. Rodríguez, F. de la Prieta, and J. Bajo. Image matching algorithm based on hashes extraction. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 10423 LNAI:87–94, 2017.
141. M.P. Rocha, N. Luscombe, J.M.C. Rodríguez, and F. Fdez-Riverola. Advances in intelligent and soft computing: Preface. *Advances in Intelligent and Soft Computing*, 154 AISC:V–VI, 2012.
142. J.M.C. Rodríguez and J.B. Pérez. Preface. *Advances in Intelligent Systems and Computing*, 221:V–VI, 2013.
143. S. Rodríguez, F. De La Prieta, D.I. Tapia, and J.M. Corchado. Agents and computer vision for processing stereoscopic images. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 6077 LNAI(PART 2):93–100, 2010.
144. S. Rodríguez, A. Fernández, V. Julián, J.M. Corchado, S. Ossowski, and V. Botti. A thomas based multi-agent system for recommendations and guidance in malls. *Journal of Physical Agents*, 3(2):21–26, 2009.
145. S. Rodríguez, A. Fernández, V. Julián, J.M. Corchado, S. Ossowski, and V. Botti. Thomas-mall: A multiagent system for shopping and guidance in malls. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5517 LNCS(PART 1):594–601, 2009.
146. J.A. Román, S. Rodríguez, and J.M. Corchado. Improving intelligent systems: Specialization. *Communications in Computer and Information Science*, 430:378–385, 2014.
147. J.A. Román, S. Rodríguez, J.M. Corchado, C. Carrascosa, and S. Ossowski. Specialization: A new way to improve intelligent systems. *International Journal of Artificial Intelligence*, 13(1):58–73, 2015.
148. J.A. Román, D.I. Tapia, and J.M. Corchado. Scoda for the development of multi-agent systems [scoda para el desarrollo de sistemas multiagente]. *RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao*, (8):25–38, 2011.
149. J.Á. Román, S. Rodríguez, and J.M. Corchado. Distributed and specialized agent communities. *Advances in Intelligent Systems and Computing*, 221:33–40, 2013.

150. A.H.M. Salleh, M.S. Mohamad, S. Deris, S. Omatu, F. Fdez-Riverola, and J.M. Corchado. Gene knockout identification for metabolite production improvement using a hybrid of genetic ant colony optimization and flux balance analysis. *Biotechnology and Bioprocess Engineering*, 20(4):685–693, 2015.
151. A. Sanchis, V. Julián, J.M. Corchado, H. Billhardt, and C. Carrascosa. Using natural interfaces for human-agent immersion. *Communications in Computer and Information Science*, 430:358–367, 2014.
152. A. Sanchis, V. Julián, J.M. Corchado, H. Billhardt, and C. Carrascosa. Improving human-agent immersion using natural interfaces and cbr. *International Journal of Artificial Intelligence*, 13(1):81–93, 2015.
153. T.W. Shi, W.S. Kah, M.S. Mohamad, K. Moorthy, S. Deris, M.F. Sjaugi, S. Omatu, J.M. Corchado, and S. Kasim. A review of gene selection tools in classifying cancer microarray data. *Current Bioinformatics*, 12(3):202–212, 2017.
154. L. Snidaro, J. Garcia, and J.M. Corchado. Context-based information fusion. *Information Fusion*, 21(1):82–84, 2015.
155. P.W. Tang, P.S. Chua, S.K. Chong, M.S. Mohamad, Y.W. Choon, S. Deris, S. Omatu, J.M. Corchado, W.H. Chan, and R.A. Rahim. A review of gene knock-out strategies for microbial cells. *Recent Patents on Biotechnology*, 9(3):176–197, 2015.
156. D.I. Tapia, A. Abraham, J.M. Corchado, and R.S. Alonso. Agents and ambient intelligence: Case studies. *Journal of Ambient Intelligence and Humanized Computing*, 1(2):85–93, 2010.
157. D.I. Tapia, R.S. Alonso, Ó. García, and J.M. Corchado. Hera: Hardware-embedded reactive agents platform. *Advances in Intelligent and Soft Computing*, 89:249–256, 2011.
158. D.I. Tapia and J.M. Corchado. An ambient intelligence based multi-agent system for alzheimer health care. *International Journal of Ambient Computing and Intelligence*, 1(1):15–26, 2009.
159. D.I. Tapia, J.A. Fraile, S. Rodríguez, R.S. Alonso, and J.M. Corchado. Integrating hardware agents into an enhanced multi-agent architecture for ambient intelligence systems. *Information Sciences*, 222:47–65, 2013.
160. D.I. Tapia, Ó. García, R.S. Alonso, F. Guevara, J. Catalina, R.A. Bravo, and J.M. Corchado. Evaluating the n-core polaris real-time locating system in an indoor environment. *Advances in Intelligent and Soft Computing*, 157 AISC:29–37, 2012.
161. D.I. Tapia, Ó. García, R.S. Alonso, F. Guevara, J. Catalina, R.A. Bravo, and J.M. Corchado. The n-core polaris real-time locating system at the eval competition. *Communications in Computer and Information Science*, 309 CCIS:92–106, 2012.
162. S.M. Thampi, A. Abraham, S.K. Pal, and J.M. Corchado Rodríguez. Preface. *Advances in Intelligent Systems and Computing*, 235:V–VI, 2014.
163. S.M. Thampi, A. Abraham, S.K. Pal, and J.M.C. Rodríguez. Recent advances in intelligent informatics: Proceedings of the second international symposium on intelligent informatics (isi'13), august 23-24, 2013, mysore, india. *Advances in Intelligent Systems and Computing*, 235, 2014.
164. L. Uden, J.B. Pérez, F. Herrera, and J.M.C. Rodríguez. Advances in intelligent systems and computing: Preface. *Advances in Intelligent Systems and Computing*, 172 AISC:V–VI, 2013.
165. A. van Berlo, K. Hallenborg, J.M.C. Rodríguez, D.I. Tapia, and P. Novais. Ambient intelligence - software and applications: 4th international symposium on ambient intelligence (isami 2013). *Advances in Intelligent Systems and Computing*, 219, 2013.

166. A. van Berlo, K. Hallenborg, J.M.C. Rodríguez, D.I. Tapia, and P. Novais. Preface. *Advances in Intelligent Systems and Computing*, 219:V–VI, 2013.
167. P. Vieira and J. Corchado. A formal machines as a player of a game. *Advances in Intelligent Systems and Computing*, 373:137–147, 2015.
168. P. Vittorini, R. Gennari, I. Marenzi, F. De La Prieta, and J.M. Corchado Rodríguez. Advances in intelligent and soft computing: Preface. *Advances in Intelligent and Soft Computing*, 152 AISC:V–VI, 2012.
169. N.S.A. Wahid, M.S. Mohamad, A.H.M. Salleh, S. Deris, W.H. Chan, S. Omatu, J.M. Corchado, M.F. Sjaugi, Z. Ibrahim, and Z.M. Yusof. A hybrid of harmony search and minimization of metabolic adjustment for optimization of succinic acid production. *Advances in Intelligent Systems and Computing*, 477:183–191, 2016.
170. X. Wang, T. Li, S. Sun, and J.M. Corchado. A survey of recent advances in particle filters and remaining challenges for multitarget tracking. *Sensors (Switzerland)*, 17(12), 2017.