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Artificial Immune Systems

9th International Conference, ICARIS 2010
Edinburgh, UK, July 26-29, 2010
Proceedings

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Preface

Artificial immune systems (AIS) is a diverse and maturing area of research that bridges the disciplines of immunology and computation. The original research impetus in AIS had a clear focus on applying immunological principles to computational problems in practical domains such as computer security, data mining and optimization. As the field has matured, it has diversified such that we now see a growing interest in formalizing the theoretical properties of earlier approaches, elaborating underlying relationships between applied computational models and those from theoretical immunology, as well a return to the roots of the domain in which the methods of computer science are being applied to immunological modelling problems. Following the trends in the field, the ICARIS conference intends to provide a forum for all these perspectives.

The 9th International Conference on AIS (ICARIS 2010) built on the success of previous years, providing a convenient vantage point for broader reflection as it returned to Edinburgh, the venue of the Second ICARIS in 2003. This time, the conference was hosted by Edinburgh Napier University at its Craiglockhart Campus, recently reopened after extensive refurbishment which has resulted in a stunning building and state-of-the-art facilities. The extent to which the field has matured over the preceding years is clear; a substantial track of theoretical research now underpins the discipline. The applied stream has expanded in its outlook, and has examples of AIS algorithms being applied across a wide spectrum of practical problems, ranging from sensor networks to semi-conductor design. This stream demonstrates a mix of both novel approaches and consolidation of more familiar approaches; new paradigms such as artificial chemistries are inspiring development of new algorithms while effort continues in the refinement of existing algorithms based on clonal selection and danger theory. The dedicated modelling stream further emphasizes the interdisciplinary nature of the field, and is an area which we hope to see grow in the future as immunologists and computer scientists continue to find mutually beneficial common ground. As in the previous conference, the Immune Modelling stream published extended abstracts, rather than full papers, appealing to the format more commonly adhered to in the biological sciences. In addition, ICARIS 2010 was pleased to host an additional workshop jointly organized with PerAda, the European Network in Pervasive Adaptation. The workshop solicited short position statements which identified novel applications of bio-inspired computing to pervasive adaptive systems and brought an interesting and eclectic mix of ideas to the area.

All papers underwent a thorough review process, and as in the previous year, a rebuttal system was used that allowed authors to respond directly to reviewers' comments. Based on the rebuttals, we were able to conditionally accept a number of papers that were revised and checked before full acceptance, resulting in an increased quality of these papers. From 41 submissions, we were pleased

to accepted 23 high-quality full-length papers and extended immune modelling abstracts for publication, giving us an acceptance rate of 56%. The PerAda workshop attracted nine position statements of which 100% were accepted.

ICARIS 2010 was delighted to play host to three fascinating keynote speakers. Derek Smith, Professor of Infectious Disease Informatics in the Zoology Department at Cambridge University. His talk, on “The Evolution of Influenza Viruses” showed how the evolution, and thus antigenic characteristics, of A(H3N2) viruses outside E-SE Asia might be forecast each year based on surveillance within E-SE Asia, and showed the importance of the co-evolution of the virus and population-level immunity to the virus. Falko Dressler from the University of Erlangen spoke on the subject of “Self-Organization”. His talk focused on the behavior and the challenges in networked embedded systems, and described the potential for bio-inspired and nano-scale networking in this area. Serge Kernbach from the University of Stuttgart addressed the PerAda workshop on the topic of self-adaptivity and self-development in cooperative and symbiotic swarms.

Three tutorial sessions on a diverse range of subjects illustrated the multi-disciplinary nature of ICARIS. The first tutorial was given by Mike Holcombe on the topic of agent-based modelling of biological systems, examining new techniques for simulating complex systems. Hugo Van den Berg gave an excellent insight into how mathematical modelling can be applied to immunology, and Mark Neal discussed the pros and cons of working with industry in applying AIS to real problems.

In addition, ICARIS 2010 played host to two industry-sponsored competitions. A DSTL-sponsored workshop on AIS for anomaly detection in real-time spectra was organized by Mark Neal of Aberystwyth University. The workshop included a competition requiring participants to perform anomaly detection on real-time mass-spectrometry data. A second competition was hosted by UReason which looked at rationalizing, analyzing and visualizing alarm data, typical of that generated by an operating plant.

We are grateful to The Institute for Informatics and Digital Innovation at Edinburgh Napier University for sponsoring a prize for the best student paper and to support from PerAda for the workshop. We would like to extend our thanks to the keynote and tutorial speakers, all members of the Program Committee, ICARIS Vice and Publicity Chairs, and Mark Neal and Martin Robbins for organizing the competitions with DSTL and UReason. The conference enjoyed excellent behind-the-scenes support from Callum Egan (design and maintenance of the website), Jennifer Willies (organizational matters) and an army of PhD students during the conference itself. The final thanks extends to the authors for their input into creating such a high-quality conference.

July 2010

Emma Hart
Chris McEwan

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