Kevin Sim   Edinburgh Napier University

Kevin Sim is a Lecturer in Computing Science at Edinburgh Napier University and member of the Nature-Inspired Intelligent Systems research group within the School of Computing led by Professor Emma Hart. He holds a PhD from Edinburgh Napier University in Hyper-Heuristics. Before commencing his current employment as a lecturer in computing science he worked for 3 years as a research fellow working on an EPSRC funded project entitled Real World Optimisation with Life-Long Learning. His research interests lie in the field of biologically inspired computing and machine learning, with an emphasis on hyper-heuristics applied to real world problems including logistics, and optimisation. More recent publications have focussed on algorithm selection and automated algorithm generation for optimisation and learning, specifically in the area of combinatorial optimisation. He is a regular member of program committees for the main conferences in our field EvoStar, GECCO, PPSN, CEC and was Conference Chair of EvoApplications in 2018. He was Co-author of the Best Paper in the ECOM track at GECCO 2019 and Winner of the Hummies Bronze Medal along with Prof. Hart at GECCO 2018.

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Research group

The Nature Inspired Intelligent Systems group (NIIS) is one of two groups in the interdisciplinary centre for Artificial Intelligence and Data Science. The vibrant group of 8 academic staff, 3 post-docs and around 6 current PhD students.

The group takes inspiration from processes observed in natural systems to build computational systems that are capable of problem solving – tackling problems that range from optimising processes, through engineering design, to enabling groups reach socially beneficial outcomes, e.g. by reducing energy consumption. A number of members focus on combinatorial optimisation problems, with expertise in logistics (vehicle-routing), workforce scheduling, timetabling and packing. While in many applications, optimisation leads to considerable economic benefits, our work has a particular emphasis on reducing carbon emissions and sustainable travel. We combine evolution with machine-learning techniques to improve algorithm selection and develop optimisation systems that exhibit life-long learning, capable of automatic algorithm generation and improvement through application of genetic programming methods.

The group also does research in the area of robotics, using evolution as a tool to design and build novel robots for use in unknown-environments, and as a method to develop adaptive robot behavioural mechanisms, that enable robot(s) to remain fit-for-purpose in dynamically changing environments, and to collaborate to achieve tasks more efficiently. We study also human behaviour, and use this understanding to engineer socio-technical systems. Evolutionary game theory combined with agent-based-modelling and models of social learning and cultural evolution are used to understand how groups can create institutions and solve social dilemmas, which influences the design of socio-technical systems such as smart grids and peer-2-peer clouds. Finally, one-shot learning techniques (the ability of a system to learn a new concept from a single or very few examples) are used to understand and generate language in the context of situated dialogue (i.e. human-robot interaction).

Projects

1. Algorithm Selection for meta-heuristics, leveraging a range of machine-learning approaches.
2. Evolution of algorithm portfolios which exhibit diversity of behaviours.
3. Lifelong learning in optimisation: methods for continual adaptation of algorithms based on problem-solving experience.

About the university and the city

Now home to over 19,500 students from over 140 countries, Edinburgh was officially inaugurated as a University in 1992., However our story goes back to the time of John Napier, the brilliant 16th-century mathematician and philosopher from whom we take our name and whose original residence now forms an integral part of our Merchiston Campus (one of 3 campuses spread around the city). The School of Computing is located at Merchiston, in the south-west of the city, an area renowned for its many cafes and restaurants and a short walk from the city centre. Edinburgh. It's probably one of the few cities in the world to have an extinct volcano in its centre, and is known world-wide for hosting a unique range of festivals, including the Edinburgh Fringe, an International Science Festival and an annual Jazz and Blues Festival.