Evolutionary Computation for Intelligent Data Analytics

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Abstract

Artificial Intelligence has been widely used during the last two decades and has remained a highly-researched topic, especially for complex real-world problems. Evolutionary Computation (EC) techniques are a subset of artificial intelligence, but they are slightly different from the classical methods in the sense that the intelligence of EC comes from biological systems or nature in general. The efficiency of EC is due to their significant ability to imitate the best features of nature which have evolved by natural selection over millions of years. The central theme of this presentation is about EC techniques and their application to complex real-world problems. On this basis, first I will talk about an automated learning approach called genetic programming. Applied evolutionary learning will be presented, and then their new advances will be mentioned. Here, some of my studies on big data analytics and modelling using EC and genetic programming, in particular, will be presented. Second, EC will be presented including key applications in the optimization of complex and nonlinear systems. It will also be explained how such algorithms have been adopted to engineering problems and how their advantages over the classical optimization problems are used in action. Optimization results of large-scale towers and many-objective problems will be presented which show the applicability of EC. Finally, heuristics will be explained which are adaptable with EC and they can significantly improve the optimization results.

Bio

Amir H. Gandomi is a Professor of Data Science and an ARC DECRA Fellow at the Faculty of Engineering & Information Technology, University of Technology Sydney. He is also affiliated with Obuda University, Budapest, as a Distinguished Professor. Prior to joining UTS, Prof. Gandomi was an Assistant Professor at Stevens Institute of Technology, USA and a distinguished research fellow at BEACON center, Michigan State University, USA. Prof. Gandomi has published 350+ journal papers and 14 books which collectively have been cited 43,000+ times (H-index = 93). He has been named as one of the most influential scientific minds and received the Highly Cited Researcher award (top 1% publications and 0.1% researchers) from Web of Science for six consecutive years, from 2017 to 2022. In the recent most impactful researcher list, done by Stanford University and released by Elsevier, Prof Amir H Gandomi is ranked as the top 1,000 researchers (top 0.01%) and top 50 researchers in AI and Image Processing subfield in 2021! He also ranked 17th in GP bibliography among more than 15,000 researchers. He has received multiple prestigious awards for his research excellence and impact, such as the 2023 Achenbach Medal and 2022 Walter L. Huber Prize, the highest-level mid-career research award in all areas of civil engineering. He has served as associate editor, editor, and guest editor in several prestigious journals, such as AE of IEEE Networks and IEEE IoTJ. Prof Gandomi is active in delivering keynotes and invited talks. His research interests are data analytics and global optimisation (big) in real-world problems in particular.