Workshop on Evolutionary Computation for Explainable Artificial Intelligence (ECXAI)

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Artificial intelligence (AI) is a big research field covering a wide range of techniques. AI techniques have successfully achieved human-competitive performance in many tasks, such as computer vision, natural language processing, and games. However, many popular AI models, i.e., deep neural networks (DNNs), are known as "black-box" models with a large or huge number of parameters, resulting in poor explainability. This limits the practical deployment of AI models in many fields such as precision medicine and autonomous vehicles.

eXplainable AI (XAI) is an emerging topic in the field of AI. It studies AI and machine learning (ML) techniques to produce more explainable models while maintaining a high level of learning performance. XAI defined by A. B. Arrieta et al is "Given an audience, an explainable Artificial Intelligence is one that produces details or reasons to make its functioning clear or easy to understand." XAI enables human users to understand, appropriately trust, and effectively manage the merging generation of artificially intelligent partners. Although different XAI techniques have been proposed, this field still has many research opportunities due to the tradeoff between interpretability and performance and the challenges of obtaining explainability in many AI models including deep learning models.

Evolutionary computation (EC) includes a family of nature-inspired population-based algorithms/techniques, including genetic algorithms (GAs), genetic programming (GP), particle swarm optimization (PSO), ant colony optimization (ACO), differential evolution (DE), evolutionary multi-objective optimization (EMO). EC techniques have promising global search ability to find high-quality solutions to problems without requiring rich domain knowledge and

differential objective functions. EC techniques have been widely applied for many tasks in the fields of engineering, economics, finance, manufacturing, management, etc.

EC techniques have shown great potential in achieving EAI. Examples range from using EC techniques to evolve small but effective NNs, reduce the number of features for machine learning tasks, and learn “white-box” or “greybox” models. These methods have been applied for many AI tasks including regression, classification, clustering, routing, scheduling, image analysis, etc. In recent years, the topic of EC for XAI becomes increasingly important and has attracted much attention from researchers and practitioners over the world. It is clear that there is a growing interest in utilizing EC for XAI to address different types of tasks.

However, the potential of EC for XAI has not been comprehensively explored. EC techniques learn or optimise more interpretable AI or machine learning models, but they often require the development of solution representations, operators, fitness measures, and search mechanisms under different scenarios. In addition, there are many AI/ML algorithms and applications that provide great opportunities for using EC for XAI. Therefore, it is necessary to develop new EC techniques for XAI in solving various tasks.

Aims and scope:

The theme of this workshop is the use of evolutionary computation for explainable artificial intelligence and machine learning, covering ALL different evolutionary computation paradigms for explainable artificial intelligence and machine learning. The aim of this workshop is to investigate both the new theories and applications in different evolutionary computation paradigms for explainable artificial intelligence. This workshop will bring together researchers and practitioners from around the world to discuss the latest advances in the field and will act as a major forum for the presentation of recent research. Authors are invited to submit their original and unpublished work to this workshop. Topics related to all aspects of evolutionary computation for explainable artificial intelligence, such as theories, algorithms, systems and applications, are welcome.

Topics of interest include but are not limited to:

- Transparent AI and machine learning models
- Post-hoc explainability techniques

- Explanation by simplification
- Feature relevance explanation techniques
- Local explanation
- Visual explanation
- Global explanation
- Example-based explanations
- Model-agnostic techniques for explainability
- Neural network explanation
- “Black-box” model explanation
- Hybrid transparent and black-box methods
- Tradeoff between interpretability and performance
- Explainability in classic machine learning
- Explainability in deep learning
- Adaptive human-AI co-learning and co-creation
- Integration of learning and reasoning
- Transparent, explainable and accountable AI
- Fair, ethical, responsible and trustworthy AI
- Representations learning for communicative or collaborative AI
- Symbolic and narrative-based representations for human-centric AI
- Role of design and compositionality of AI systems in interpretable/collaborative AI
- Applications of EC-based XAI methods
- Interpretability vs explainability in EC and their quantification
- Landscape analysis and XAI
- Contributions of EC to XAI in general
- Use of EC to generate explainable/interpretable models
- XAI in real-world applications of EC
- Other related research on using EC to address issues pertaining to explainability and interpretability in AI

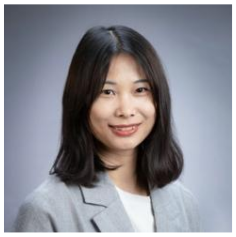
Paper submission:

Each workshop will solicit papers (max 8 pages) for peer review. Please follow the IEEE CEC 2023 Workshop Paper Submission Web Site. All submissions will be refereed by experts in the fields and ranked based on the criteria of originality, significance, quality and clarity.

Preliminary list of invited speakers (may change)

- **Prof. Yew Soon Ong**, Nanyang Technological University, Singapore
- **Prof. Kay Chen Tan**, Hong Kong Polytechnic University
- **Prof. Huanhuan Chen**, University of Science & Technology of China (USTC), China
- **Prof. Yaochu Jin**, Bielefeld University, Germany
- **Prof. Ruili Wang**, Massey University, New Zealand
- **A/Prof. Grant Dick**, University of Otago, New Zealand
- **Prof. Will Browne,** Queensland University of Technology, Australia
- **A/Prof Yi Mei**, Victoria University of Wellington, New Zealand

Short bio of the organizers



Ying Bi is a postdoctoral research fellow with the School of Engineering and Computer Science at Victoria University of Wellington (VUW), New Zealand. Her research focuses mainly on computer vision, image analysis, machine learning, deep learning, evolutionary computation, genetic programming, classification, feature learning, and transfer learning. She has published an authored book on genetic programming for image classification and over 50 papers in fully refereed journals and conferences in computer vision and evolutionary computation.

She has been serving as a workshop chair of IEEE CEC 2024, student affair co-chair of GECCO 2023, an organizing committee member of ECOLE 2022, IEEE CEC 2019 and Australasian AI 2018, an organizer of a workshop in ICDM 2022, ICDM 2021, the symposium in SSCI 2022, a special session in SSCI 2021 and a special session in IDEAL 2021, and a program committee member of over twenty international conferences including IJCAI, GECCO, IEEE CEC, IEEE SSCI, and Australasian AI. She was co-chair Poster session in IEEE CEC 2019. She is serving as a reviewer of over twenty international journals. She is a member of IEEE, IEEE Computational Intelligence Society (CIS) and ACM SIGEVO.

Bing Xue is currently a Professor of Artificial Intelligence and Deputy Head of School in the School of Engineering and Computer Science at VUW. She has over 300 papers published in fully refereed international journals and conferences and her research focuses mainly on evolutionary computation, data mining, machine learning, classification, symbolic regression, feature selection, evolving deep neural networks, image analysis, transfer learning, multi-objective machine learning. Dr Xue is currently the Chair of IEEE CIS Task Force on Transfer Learning & Transfer Optimization, and Vice-Chair of IEEE Task Force on Evolutionary Feature Selection and Construction and of IEEE CIS Task Force on Evolutionary Deep Learning and Applications. She was the Chair of IEEE CIS Data Mining and Big Data Analytics Technical Committee.

Prof Xue is the organizer of the special session on Evolutionary Feature Selection and Construction in IEEE CEC 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022. Prof Xue has been a chair for a number of international conferences including the Chair of Women@GECCO 2018, a co-Chair of the Evolutionary Machine Learning Track for GECCO 2019 and 2020, a co-Chair of the Neuroevolution Track for GECCO 2021 and 2022. She is the Lead Chair of IEEE Symposium on Computational Intelligence in Feature Analysis, Selection, and Learning in Image and Pattern Recognition (FASLIP) at SSCI 2016, 2017, 2018, 2019 and 2020, a Program Chair of Australasian AI 2018, Finance Chair of IEEE CEC 2019, a Workshop Chair of 2021 IEEE ICDM, a Conference Activities Chair of IEEE SSCI 2021, a General Co-Chair of IVCNZ 2020, a Tutorial Co-Chair of IEEE WCCI 2022, a Publication Co-Chair of EuroGP 2022, a conference Chairo f IEEE CEC 2024.

She is an Editor of the IEEE CIS Newsletter. She is an Associate Editor or Member of the Editorial Board for over ten international journals, including IEEE TEVC, IEEE CIM, IEEE TAI, IEEE TETCI, and ACM TELO.

Mengjie Zhang is a Fellow of the Royal Society of New Zealand, a Fellow of New Zealand Engineering, a Fellow of IEEE, an IEEE CIS Distinguished Lecturer, and currently a Professor of Computer Science at VUW, where he heads the interdisciplinary Evolutionary Computation Research Group. He is a member of the University Academic Board, a member of the University Postgraduate Scholarships Committee, Associate Dean (Research and Innovation) in the Faculty of Engineering, and Chair of the Research Committee of the Faculty of Engineering and School of Engineering and Computer Science.

His research is mainly focused on evolutionary computation with the application areas of feature selection/construction and dimensionality reduction, computer vision and image processing, evolutionary deep learning and transfer learning, job shop scheduling, multiobjective optimization, and clustering and classification with unbalanced and missing data. Prof Zhang has published over 700 research papers in refereed international journals and conferences in these areas.

He has been serving as an associated editor or editorial board member for over 10 international journals including IEEE TEVC, IEEE TCYB, ECJ (MIT Press), ACM TELO, GPEM(Springer), IEEE TETC, AOSO, and EAAI, and as a reviewer of over 30 international journals. He has been a major chair for eight international conferences. He has also been serving as a steering committee member and a program committee member for over 80 international conferences including all major conferences in evolutionary computation. Since 2007, he has been listed as one of the top ten world genetic programming researchers by the GP bibliography (http://www.cs.bham.ac.uk/~wbl/biblio/gp-html/index.html).

He was the Tutorial Chair for GECCO 2014, an AIS-BIO Track Chair for GECCO 2016, an EML Track Chair for GECCO 2017, and a GP Track Chair for GECCO 2020 and GECCO 2021. Since 2012, he has been co-chairing several parts of IEEE CEC, SSCI, and EvoIASP/EvoApplications conference (he has been involving major EC conferences such as GECCO, CEC, EvoStar, SEAL). Since 2014, he has been co-organizing and co-chairing the special session on evolutionary feature selection and construction at IEEE CEC and SEAL, and also delivered a keynote/plenary talk for IEEE CEC 2018, IEEE ICAVSS 2018, DOCSA 2019, IES 2017 and Chinese National

Conference on AI in Law 2017. Prof. Zhang is the Chair of IEEE CIS PhD Dissertation Award Committee and IEEE CIS Publication Strategic Planning Committee. He was the Chair of the IEEE CIS Intelligent Systems Applications, the IEEE CIS Emergent Technologies Technical Committee, and the IEEE CIS Evolutionary Computation Technical Committee; a Vice-Chair of the IEEE CIS Task Force on Evolutionary Feature Selection and Construction, the IEEE CIS Task Force on Evolutionary Computer Vision and Image Processing, and the IEEE CIS Task Force on Evolutionary Deep Learning and Applications; and also the founding chair of the IEEE Computational Intelligence Chapter in New Zealand.