# Tutorial Proposal to IEEE CEC 2023

## 1 Extended Abstract

**Title:** Does Preference Always Help? A Holistic Study on Preference-Based Evolutionary Multi-objective Optimization Using Reference Points

**Instructor:** Dr. Ke Li, Department of Computer Science, University of Exeter, UK.

**Short introduction to the topic:** The ultimate goal of multi-objective optimization is to help a decision maker (DM) identify solution(s) of interest (SOI) achieving satisfactory tradeoffs among multiple conflicting criteria. This can be realized by leveraging DM's preference information in evolutionary multiobjective optimization (EMO). No consensus has been reached on the effectiveness brought by incorporating preference in EMO (either a priori or interactively) versus a posteriori decision making after a complete run of an EMO algorithm. In this tutorial, I will present a series of experimental results show that preference incorporation in EMO does not always lead to a desirable approximation of SOI if the DM's preference information is not well utilized, nor does the DM elicit invalid preference information, which is not uncommon when encountering a black-box system. To a certain extent, this issue can be remedied through an interactive preference elicitation. Last but not the least, we find that a preference-based EMO (PBEMO) algorithm is able to be generalized to approximate the whole PF given an appropriate setup of preference information.

**An outline of the tutorial:** This tutorial will 1) provide a pragmatic overview of the existing developments of PBEMO; 2) present a series of experiments to investigate the effectiveness brought by preference incorporation in EMO for approximating various SOI; and 3) discuss the future opportunities for possible further developments.

**Learning outcomes:** The intended audience of this tutorial can be both novices and people familiar with EMO or PBEMO. In particular, it is self-contained that foundations of multi-objective optimization and the basic working principles of EMO algorithms will be included for those without experience in EMO to learn. Open questions will be posed and highlighted for discussion at the latter session of this tutorial.

**Expected length of the tutorial:** This tutorial is expected to be less than 1.5 hours including the discussion session.

**The level of the tutorial:** This tutorial is advanced level but with a gender introduction at the outset.

## 2 Short Bio of the Instructor

[Ke Li](#) is a Senior Lecturer (Associate Professor) in Computer Science at the Department of Computer Science, University of Exeter (UoE). His current research interests include the evolutionary multi-objective optimization, machine learning and applications in science and engineering. He was the founding chair of IEEE Computational Intelligence Society (CIS) Task Force on Decomposition-based Techniques in Evolutionary Computation from 2019 to 2022. He currently serves as an associate editor of IEEE Transactions on Evolutionary Computation, International Journal of Machine Learning and Cybernetics and Complex & Intelligent Systems. He served as a guest editor in Neurocomputing Journal and Multimedia Tools and Applications Journal. He has been awarded a prestigious UKRI Future Leaders Fellow (FLF) and a Turing Fellow with the Alan Turing Institute. Since 2020, he has been recognized as being in the Stanford list of top $2\%$ of scientists in the world (ranked as $\#2625$ in the AI field). In 2021, he was awarded an Amazon Research Award for which I am $1$ of only $3$ winners in the UK, and he was selected in the finalist of a Facebook Research Award. In 2020, he was awarded Research Excellence Award of the CEMPS Academic Recognition Awards 2020 and Teaching Awards 2020 as Outstanding Supervisor. Only one STEM faculty can be selected for these two awards at the UoE.