

- **Title of the Tutorial:**

Meta-Evolution: Biological Backgrounds, Design Principles, Meta-Diversity, and Distributed Implementations

- **Short Introduction to the Topic:**

In this Tutorial, we will present the history and advances of meta-evolution. First, we will introduce biological backgrounds of meta-evolution and their possible motivations for evolutionary computation. Then, we will discuss main design principles of meta-evolution for the design and extensions of evolutionary algorithms. In particular, the advantages and disadvantages of meta-diversity implied in meta-evolution will be emphasized and analyzed. Finally, we will present our own research papers on meta-evolution (which have been published in e.g., TPDS, PPSN, and GECCO) mainly from a distributed computing perspective. All the contents of this Tutorial will be available at: <https://github.com/Evolutionary-Intelligence/CEC2025-Tutorials-MetaEvolution>.

- **Outline of the Tutorial:**

1. Bio introduction to four presenters of this tutorial (from SUSTech, HIT, and SZTU).
2. Introduction to the brief history of meta-evolution and a latest review paper.
3. Presentation of biological backgrounds of meta-evolution (e.g., MTE and MLS).
4. Discussion of possible motivations for evolutionary computation.
5. Introduction to main design principles of meta-evolution for possible extensions of evolutionary algorithms.
6. Discussion of meta-diversity implied in meta-evolution.
7. Presentation of our own research papers on meta-evolution from a distributed computing perspective.
8. Conclusions and future work on meta-evolution.

- **Expected Length of the Tutorial:** Two hours

- **Level of the Tutorial:** Introductory

- **Names, Affiliations, Websites, and Bios of Presenters:**

Yuhui Shi is a Chair Professor of Department of Computer Science and Engineering, Southern University of Science and Technology (SUSTech), China. His main research interests include computational intelligence techniques (including swarm intelligence and evolutionary computation) and their applications. His papers have been published in some top-tier journals and conferences of AI such as JMLR, TPAMI, NeurIPS, ICML, and ICLR and also some representative journals and conferences of evolutionary computation such as TEVC, PPSN, GECCO, CEC, and SSCI. He was Associate Editor of IEEE Transactions on Evolutionary Computation and is among Editorial Board of

Swarm Intelligence, and so on. He has been the Founding Chair of ICSI Series (2010-2018), etc. He is also a Fellow of the IEEE.

Qiqi Duan is pursuing towards the Ph.D. Degree of Computer Science and Engineering in Harbin Institute of Technology (HIT), China. His main research interests are evolutionary algorithms, particularly meta-evolution and distributed evolutionary algorithms. He has published related papers in some top-tier and representative journals and conferences such as JMLR, TPDS, TMLR, TEVC, ASOC, PPSN, GECCO, CEC, SSCI, etc.

Qi Zhao is a Research Assistant Professor with Department of Computer Science and Engineering, Southern University of Science and Technology (SUSTech), China. He received the Ph.D. Degree from Beijing University of Technology, China, in 2019 and was a joint Ph.D. student in Computer Science with University of New South Wales, Australia from 2017 to 2018. His research interests include automated machine learning, operations research, and evolutionary computation.

Lijun Sun is an Assistant Professor in Shenzhen Technology University (SZTU), China. She obtained the Ph.D. Degree in University of Technology Sydney (UTS), Australia. Her main research interests are multi-agent coordination, swarm intelligence, and evolutionary computation. She has published related papers in TEVC, TCYB, ASOC, PPSN, CEC, etc.