



# ICONIP 2023

November 20-23, 2023, Changsha, China

## Tutorial/ Workshop Proposal for ICONIP2023

**Title:** Hypervolume Approximation for Many-objective Optimization and Learning

**Duration:** Half day (3 hours)

**Organizers:**

Ke Shang, Research Associate Professor, Southern University of Science and Technology, [kshang@foxmail.com](mailto:kshang@foxmail.com)

Dr. Ke Shang received his BS and PhD degrees from Xi'an Jiaotong University, China, in 2009 and 2016, respectively. He was a Visiting Scholar in Tokushima University, Japan, from 2012 to 2014. He is currently a Research Associate Professor in Southern University of Science and Technology, China. His research interests include multi-objective optimization and learning. He received Best Paper Awards from GECCO 2018 and 2021, First Runner-up Conference Paper Award from CEC 2019, and Best Paper Nomination from PPSN 2020. He is the organizer of “Workshop on Subset Selection in Evolutionary Multi-objective Optimization” at WCCI 2022, and two tutorials at WCCI 2022 and GECCO 2022. He is a senior member of IEEE.

Hisao Ishibuchi, Chair Professor, Southern University of Science and Technology, [hisao@sustech.edu.cn](mailto:hisao@sustech.edu.cn)

Hisao Ishibuchi received the B.S. and M.S. degrees from Kyoto University in 1985 and 1987, respectively, and the Ph.D. degree from Osaka Prefecture University in 1992. He is a Chair Professor with the Department of Computer Science and Engineering, Southern University of Science and Technology. His research interest is evolutionary multiobjective optimization. He is currently an IEEE CIS AdCom Member from 2021 to 2023, an IEEE CIS Distinguished Lecturer from 2021 to 2023, and General Chair of IEEE WCCI 2024 in Yokohama, Japan. He is a fellow of IEEE.

**Description:**

Hypervolume is one of the most popular performance indicators in multi-objective optimization and learning. It possesses rich theoretical properties and has been extensively used for performance evaluation and algorithm design. However, its main drawback is that it becomes computationally intractable in high-dimensional spaces,

which limits its application in many-objective optimization and learning. To overcome this difficulty, approximation methods can be used instead of exact methods for hypervolume calculation. In this tutorial, I will first review studies on hypervolume approximation in the literature, including the Monte Carlo method, R2 indicator method, and deep learning method. Then, I will present recent studies on hypervolume approximation and its applications, including multi-objective optimization algorithm design and subset selection. Lastly, I will provide some directions for future research, with a particular focus on the deep learning approach.

**Confirmed and/or potential speakers:**

Ke Shang and Hisao Ishibuchi

**Link to organizer's web page and/or tutorial/workshop web site (optional).**

Ke Shang: <http://cse.sustech.edu.cn/faculty/~shangk/>

Hisao Ishibuchi: <https://cse.sustech.edu.cn/faculty/~hisao/>