**Title**: Automated Algorithm Design: Data-Driven Algorithms

**Summary**: Automation is a widely used strategy to eliminate or limit human assistance in manufacturing. The underlying motivation behind automation is to reduce the effort required to achieve given design, planning and control tasks with high accuracy or success. Besides the popularity of automation in manufacturing, it has been referred in Algorithm Design, as well since designing an effective algorithm for a given problem is a major creative act requiring to consider enormous design choices. In addition to dealing with large design spaces, it requires expertise both on algorithms and the problem domains being targeted. Even when the required expertise is available, it is usually a time-consuming process to come up with an effective algorithm for a particular problem. For high performance and the efficient use of the resources that need to be utilized for algorithm design, the focus should be on designing algorithm designers rather than algorithm design. Automated Algorithm Design (AAD) is the area that can design algorithm designers, mostly through Machine Learning in a data-driven manner. An AAD method can effectively search large algorithm design spaces and understand inter-algorithmic relations, revealing better algorithm designs with less human effort and limited problem domain expertise. In this tutorial, the idea of AAD will be introduced and the basic AAD strategies will be discussed together with a number of case studies.

**Keywords**: Algorithm Selection, Algorithm Configuration, Algorithm Generation, Hyper-heuristics, Automated Machine Learning (AutoML), Search and Optimization

**Level**: Introductory / Intermediate

**Expected Length**: ~2 Hours

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- **Affiliation**: Duke Kunshan University, China
- **Bio**: Mustafa Misir is an Associate Professor of Data and Computational Science at Duke Kunshan University in China. He completed his Ph.D. in Computer Science at KU Leuven (Belgium) in 2012. After graduation, he worked as a postdoctoral researcher at INRIA Saclay - Universite Paris Sud XI (France), Singapore Management University (SMU) and University of Freiburg (Germany) respectively. He was also a visiting researcher shortly at University of Zurich (Switzerland) and Universitat Politècnica de Catalunya (UPC) / BarcelonaTech (Spain). Afterwards, he moved to Nanjing University of Aeronautics and Astronautics (China) as a faculty member at the College of Computer Science and Technology. Prior to joining Duke Kunshan University, he was a faculty member in Computer Engineering at Istinye University (Turkey). His main research interests include Automated Algorithm Design (Machine Learning + Algorithm Design) / Automated Algorithm Design, Data Science, and Operations Research. He is the recipient of several prestigious academic awards and published over 60 papers in various international conferences/journals.
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