

Foreword

Engineering science and technology are important driving forces in the development of society, and engineering fronts are important guidelines for the future development of engineering science and technology. Understanding trends and aiming to be at the forefront of global engineering technology has become a strategic choice for countries around the world. Since 2017, the Chinese Academy of Engineering (CAE), in conjunction with *Clarivate Analytics* and the Higher Education Press, has been organizing a research project named “Global Engineering Fronts,” which aims to bring together talents in engineering and technology and push the fronts of global engineering research and development by reviewing papers and patent data. They also hope that the results of this project will provide a reference for people to respond to global challenges and achieve sustainable development.

The 2019 Global Engineering Fronts research continues to draw knowledge from journals and supplements in academic divisions of the CAE. By paying equal attention to the engineering research and development fronts, this project has obtained 93 global engineering research fronts and 94 global engineering development fronts through data analysis, expert review, integration of quantitative analysis and qualitative research, and combination of data mining and expert argumentation. Among these, 28 engineering research fronts and 28 engineering development fronts are listed as the focus fields.

To achieve a more scientific pre-judgment, the 2019 Global Engineering Fronts project began to nominate fronts from the perspective of the demand based on the experience of the first two years. Moreover, three rounds of deep interactions and iterative argumentation between data and experts have been conducted at each stage of data exchange, data analysis, and expert review. The aim is to improve the accuracy of data mining, research, and judgment, which can effectively maximize the utilization of papers, patents, and data indicators.

This report consists of two parts. The first chapter explains the research through data and methodology and the second chapter includes nine analysis reports, focusing on nine fields, namely mechanical and vehicle engineering; information and electronic engineering; chemical, metallurgical, and materials engineering; energy and mining engineering; civil, hydraulic, and architectural engineering; environmental and light textile engineering; agriculture; medicine and health; and engineering management. Each report describes and analyzes the engineering research and development fronts in the abovementioned fields, and explains in detail the key fronts.