

Foreword

Engineering science and technology is an important force to change the world, and engineering fronts represent important directions for the future innovation of engineering science and technology. Currently, changes of the world, of our times and of history are unfolding in ways like never before. The new round of scientific and technological revolution and industrial transformation continue to deepen. Human society is facing unprecedented challenges. It has become the common choice of all countries to keep abreast of the trends in world science and technology, accurately identify changes, respond to them scientifically, and proactively seek changes.

In order to track the development trend of engineering science and technology, the Chinese Academy of Engineering (CAE), the most honorable consulting academic institution in China, has been organizing a project known as “Global Engineering Fronts” every year since 2017. The research identifies and releases nearly two hundreds of engineering research fronts and engineering development fronts every year to guide academic development and promote the innovation of engineering science and technology.

The 2022 Global Engineering Fronts research rely on nine academic divisions and academic journals of the CAE to identify 95 engineering research fronts and 93 engineering development fronts, collaborating with Clarivate. This is done by paying equal attention to the engineering research and development fronts, integrating quantitative analysis and qualitative research, and combining data mining and expert argumentation. Among these, 29 key engineering research fronts and 29 key engineering development fronts are selected for detailed interpretations.

In 2022, we explored and formulated a technical system at the initial stage of the project to define the technology boundary and structure of the nine fields and sort out the correlation among the branches of technology. In the process of key engineering fronts interpretation, a development roadmap tool is introduced to study the development directions of key engineering fronts in the next 5–10 years.

This report presents the results of the 2022 project and comprises two parts. Part A explains the data and methodology. Part B presents the technology reports focusing on nine fields: (i) mechanical and vehicle engineering; (ii) information and electronic engineering; (iii) chemical, metallurgical, and materials engineering; (iv) energy and mining engineering; (v) civil, hydraulic, and architectural engineering; (vi) environmental and light textile engineering; (vii) agriculture; (viii) medicine and health; and (ix) engineering management. Each report describes and analyzes the engineering research and development fronts in these fields and explains the key fronts in detail.

Identifying engineering fronts is a complex and challenging task. For six years, the research team have been focusing on the development hotspots and challenges of the global engineering science and technology and gradually explored a unique research path, that is, the research, forums, and journals were closely integrated to promote each other. The project was supported by nearly a thousand of academicians and experts from various fields and institutions. We are grateful to all of them!