Foreword

The Engineering Fronts reports are important guidelines for the future development directions of engineering science and technology. The Chinese Academy of Engineering (CAE) has been conducting studies pertaining to Engineering Fronts for two years since 2017, with the aim of offering academic guidance and assistance in decision making.

In collaboration with *Clarivate Analytics*, studies in Engineering Fronts rely on nine core academic divisions and "1+9" academic journals of the CAE (i.e., Engineering and nine other specialized journals). Each year, the study issues 94 identified engineering research fronts and 96 engineering development fronts in both Chinese and English. Among them, 27 key engineering research fronts and 27 key engineering development fronts are selected for detailed interpretations.

The studies in Engineering Fronts combine quantitative and qualitative analyses. On the one hand, published journal papers (e.g., from the SCIE), conference papers, and global patents are taken into consideration to obtain the initial alternative fronts. On the other hand, experts are involved in the whole study process, including proposing candidate engineering fronts from their perspective and experience, researching the results from data-mining, and interpreting the key results.

This report consists of two parts. The first part introduces the methodology. The second part includes a total of nine reports on the engineering research fronts and engineering development fronts in nine fields corresponding to the nine core academic divisions.