

Title: The Renaissance of Phase

Abstract: The phase or argument of a complex number is an important yet elementary concept, essential to almost all scientific disciplines. What are the phases of a complex matrix? This question has been largely neglected until very recently. We will present several possible answers to this question. These answers immediately trigger the following further questions:

- What are the phases of a multivariable system?
- What are the phases of a nonlinear system?
- What are the phases of a dynamic network?
- What are the phases of an algorithm?
- What are the phases of a data set?

We will present partial answers to these questions. Along the way, we will also see why these questions are important. The growing number of partial answers are shaping a new scientific theory called phase theory, complementary to the existing contraction theory based on magnitudes or gains.



Biography: Prof. Li Qiu received his Ph.D. degree in electrical engineering from the University of Toronto in 1990. After briefly working in the Canadian Space Agency, the Fields Institute for Research in Mathematical Sciences (Waterloo), and the Institute of Mathematics and its Applications (Minneapolis), he joined Hong Kong University of Science and Technology in 1993 and worked there until very recently. In 2023, he started working in Southern University of Science and Technology, Shenzhen.

Prof. Qiu's research interests include system, control, optimization theory, and mathematics for information technology, as well as their applications in manufacturing industry and energy systems. He is also interested in control education and co-authored an undergraduate textbook "Introduction to Feedback Control" which was published by Prentice-Hall in 2009. He served as an associate editor of the IEEE Transactions on Automatic Control and Automatica. He was the general chair of the 7th Asian Control Conference, which was held in Hong Kong in 2009. He was a Distinguished Lecturer from 2007 to 2010 and was a member of the Board of Governors in 2012 and 2017 of the IEEE Control Systems Society. He was the founding chairperson of the Hong Kong Automatic Control Association and a vice president of Asian Control Association. He is a Fellow of IEEE and a Fellow of IFAC.