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 Andrea Bertozzi, Ron Fedkiw, Frederic Gibou, Chiu-Yen Kao, Chi-Wang Shu, Richard Tsai, Wotao Yin & Hong-Kai Zhao

Preface

During April 20–22, 2022, colleagues and friends gathered at the Institute of Pure & Applied Mathematics (IPAM), at the University of California at Los Angeles to celebrate Professor Stanley Osher's 80th birthday in a conference focusing on recent developments in "Optimization, Shape analysis, High-dimensional differential equations in science and Engineering, and machine learning Research (OSHER)". This conference hosted in-person talks by mathematicians, scientists, and industrial professionals worldwide. Those who could not attend extended their warm regards and expressed their appreciation for Professor Osher. Professor Mitch Luskin quintessentially summarized one of the unique reasons for our gathering:

"None of your [Osher's] exceptional mathematical accomplishments can capture your extraordinary ability to inspire and to bring enthusiasm and fun to our applied math community."

We thank the Air Force Office of Scientific Research (AFOSR) and the Office of Naval Research (ONR) for their substantial financial contributions. Our thanks are extended to the Department of Mathematics and the Institute for Pure and Applied Mathematics (IPAM) at UCLA for their support in the organization and execution of the conference. In particular, we express our appreciation to Professors Dimitri Shlyakhtenko and Christian Ratsch for their invaluable insights on conference management, and to Corinne Smith and Ginger Williams for their indispensable administrative assistance.

In this special issue, we curated scholarly articles that reflect the broad and dynamic scope of research areas championed by Professor Stanley Osher. These include advancements in numerical methods for nonlinear partial differential equations, optimization, interface problems, image processing, machine learning, and artificial intelligence. We sincerely wish that this issue brings the excitement and enthusiasm we all experienced as we discussed new ideas with Professor Osher.

Author information

Authors and Affiliations

1. **Department of Mathematics, University of California, Los Angeles, Los Angeles, USA**
   Andrea Bertozzi & Wotao Yin
2. **Department of Computer Science, Stanford University, Stanford, USA**
   Ron Fedkiw
3. **Department of Mechanical Engineering, University of California, Santa Barbara, Santa Barbara, USA**
   Frederic Gibou
4. **Department of Computer Science, University of California, Santa Barbara, Santa Barbara, USA**
   Frederic Gibou

5. **Department of Mathematics, University of California, Santa Barbara, Santa Barbara, USA**
   Frederic Gibou
6. **Department of Mathematical Sciences, Claremont McKenna College, Claremont, USA**
   Chiu-Yen Kao
7. **Department of Applied Mathematics, Brown University, Providence, USA**
   Chi-Wang Shu
8. **Department of Mathematics, Oden Institute for Computational Engineering and Sciences, University of Texas at Austin, Austin, USA**
   Richard Tsai
9. **Department of Mathematics, Duke University, Durham, USA**
   Hong-Kai Zhao

Corresponding author

Correspondence to Chiu-Yen Kao.