Forum Program

会议手册

International Forum on Computational Optical Measurement and its Education

COME 2021

2021 计算光学测量及其教育国际研讨会

Nanjing University of Science and Technology, Nanjing, China
25-26 June 2021

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Welcome Message

The third international forum on Computational Optical Measurement and Education (COME 2021) will be held at Nanjing University of Science and Technology (NJUST) on June 25-26 (Time in China). The forum adopts online and offline parallel mode. The forum focuses on the in-depth integration of cutting-edge optical researches and postgraduate education, involving research fields including but not limited to optical measurement, optical testing, experimental mechanics, three-dimensional imaging, computational optics, optical instrumentation, artificial intelligence, etc. The forum has invited well-known experts and scholars in related fields to share their academic achievements and experiences. A student report competition is held to provide a platform for young scholars to exchange ideas and learn from each other.

The technical program of the COME 2021 consists of eight invited talks and some student presentations. In the student competition, five Best Oral Presentations will be awarded. COME 2021 will be held both physically and virtually. Bilibili will be used for live streaming. If speakers permit, we will record and share the presentation on the website of SCI Lab at NJUST.

This forum is free of charge for all online and offline participants. For offline participants, we do not cover the expense of the transportation, meals and accommodation (we only provide a lunch at June 26). We would like to express our deepest gratitude to the great contributions from our volunteers. Our heartfelt thanks go to the invited speakers, student competition presenters, the forum participants, and the officers at NJUST. Welcome you to this global forum to share your ideas and experience and enjoy the company of new and old friends.

Forum Sponsorship

Research on Image Measurement Techniques Base for International Science and Technology Cooperation

Forum Chairs

Chao Zuo
Nanjing University
of Science and Technology

Shijie Feng
Nanjing University
of Science and Technology

Kemao Qian
Nanyang Technological
University

欢迎辞

第三届计算光学测量与教育国际论坛（Computational Optical Measurement and Education, COME 2021）将于 6 月 25-26 日在南京理工大学举行。会议采用线上和线下并行模式来进行。会议聚焦于前沿光学研究与研究生教育的深度融合，涉及研究领域包括但不限于光学测量、光学测试、实验力学、三维成像、计算光学、光学仪器、人工智能等。会议邀请了相关领域的知名专家和学者分享他们的学术成果和经验。同时，会议将举办学生报告比赛，为青年学者提供一个交流和学习的平台。

COME 2021 的会议日程包括 8 个特邀报告和若干学生报告。在学生报告比赛中，将评出 5 个最佳学生报告奖。COME 2021 将以线下报告和线上报告的方式举行，所有的学术报告将通过 Bilibili 平进行现场直播。如果发言者允许，我们将在南京理工大学智能计算成像实验室（SCILab）的网站主页（https://scilaboratory.com/）分享演讲内容。

本次会议无需注册，对所有线上与线下参与人员免费开放。对于线下参与人员，交通与食宿自理（会议提供 6 月 26 号中午午餐）。我们对会议志愿者们的巨大贡献表示深深的谢意。我们衷心感谢被邀请的演讲者、学生报告比赛演讲者、会议参与者以及南京理工大学的主办人员。欢迎大家来到这个全球论坛分享你们的想法和经验，享受新老朋友的陪伴！

会议资助

图像测量技术研究国际科技合作基地

会议主席

左超
南京理工大学

冯世杰
南京理工大学

钱克矛
南洋理工大学

Program Overview

June 25, Friday, School of EOE（电子工程与光电技术学院，二楼报告厅 B205）	
Time	**Activity**
19:30-21:30	**Student Competition**

June 26, Saturday, Science and Technology Hall（南京理工大学科技会堂）	
Time	**Activity**
8:30-8:40	**Opening Remarks** Qian Chen, Nanjing University of Science and Technology, China
8:40-8:50	**Forum Introduction** Kemao Qian, Nanyang Technological University, Singapore
8:50-9:00	**Group Photo**
9:00-9:40	**Advancing photomechanics: where are the giants who will help us?** Xiaoping Wu, University of Science and Technology of China, China
9:40-10:20	**Ptychographic structured modulation for super-resolution imaging** Guoan Zheng, University of Connecticut, USA
10:20-10:40	**Tea break**
10:40-11:20	**Dynamic 3D shape measurement based on fringe projection** Qican Zhang, Sichuan University, China
11:20-12:00	**Optical interferometry and its application in optical testing** Lei Chen, Nanjing University of science and technology, China
12:00-14:00	**Lunch**
14:00-14:40	**Single-pixel imaging: An example of computational imaging** Jingang Zhong, Jinan University, China
14:40-15:20	**Convolutional neural network and its application in optical information processing** Jianglei Di, Northwestern Polytechnical University, China
15:20-15:40	**Tea break**
15:40-16:20	**Digital holographic microscopy and its applications in characterizing 3D dynamics of particles and microorganisms** Xiangjun Gong, South China University of Technology, China
16:20-17:00	**Hilbert transform in fringe pattern analysis: a review** Maciej Trusiak, Warsaw University of Technology, Poland
17:00-17:30	**Award Presentation and Closing Ceremony**

Forum Venue

南京理工大学
NANJING UNIVERSITY OF SCIENCE & TECHNOLOGY

Situated in Nanjing, the ancient capital of six dynasties in Chinese history, Nanjing University of Science and Technology (NJUST) was founded in 1953, and it is one of the seven universities affiliated to the Ministry of Industry and Information Technology. As a key university of "Project 211"and a member of the "Double First-class" construction universities and disciplines, NJUST ranks the 36th on the latest Academic Ranking of World Universities (ARWU) and the 41st among all the Chinese Universities on QS ranking. The university boasts two gorgeous scenic campuses: Nanjing Campus and Jiangyin Campus, covering an area of 288 hectares.

NJUST is home to a total of 20 schools, with an enrollment of more than 30,000 students, including around 800 international students. Furthermore, NJUST has more than 2000 full-time faculty members, of whom 20 are Academicians of Chinese Academy of Sciences or Chinese Academy of Engineering. NJUST have annual research funding which exceeds 1.5 Billion RMB.

At present, NJUST has 9 national key disciplines, 6 provincial first-level disciplines and 9 provincial key disciplines. The 4 disciplines of Engineering, Chemistry, Materials Science and Computer Science have been listed among the top 1% of ESI and Engineering has entered 1‰. NJUST offers a diverse curriculum including such subjects as engineering, science, management, economics, humanities, law, education, and many more. NJUST carries out pioneering research in the fields of Advanced Materials, Applied Chemistry, Optical Engineering, Optoelectronic Information, Electromagnetic and Microwave Technology, Pattern Recognition and Intelligent System, etc.

Forum Room

June 25: Lecture Hall at School of EOE（电子工程与光电技术学院，二楼报告厅 B205）

June 26: Science and Technology Hall（南京理工大学科技会堂）

Transportation

From Nanjing Lukou International Airport
从禄口国际机场出发

- By metro: Take S1 at Lukou International Airport to Nanjing South Station, transfer to Line 3 to Daxinggong metro station, transfer to Line 2 to Xiaolingwei metro station, and walk 200 meters to gate 2 of Nanjing University of Technology.
  搭乘地铁：在禄口国际机场搭乘 S1 到达南京南站，换乘 3 号线至大行宫地铁站，换乘 2 号线至孝陵卫地铁站，步行 200 米至南京理工大学 2 号门。

- By taxi: It is about 45 kilometers from Lukou International Airport to Nanjing University of technology.
  搭乘出租车：禄口国际机场至南京理工大学 2 号门 45 公里左右。

From Nanjing Railway Station
从南京火车站出发

- By metro: Take Line 1 at Nanjing station metro station to Xinjiekou station, then transfer to Line 2 to Xiaolingwei metro station, and walk 200 meters to gate 2 of Nanjing University of Technology.
  搭乘地铁：在南京火车站地铁站搭乘 1 号线至新街口地铁站，换乘 2 号线至孝陵卫地铁站，步行 200 米至南京理工大学 2 号门。

- By taxi: It is about 10 kilometers from Nanjing Railway Station to Nanjing University of technology.
  搭乘出租车：南京火车站至南京理工大学 2 号门 10 公里左右。

From Nanjing South Railway Station
从南京南站出发

- By metro: Take Line 3 at Nanjing South station metro station to Daxinggong metro station, then transfer Line 2 to Xiaolingwei metro station, and walk 200 meters to gate 2 of Nanjing University of Technology.
  搭乘地铁：在南京南地铁站搭乘 3 号线至大行宫地铁站，换乘 2 号线至孝陵卫地铁站，步行 200 米至南京理工大学 2 号门。

- By taxi: It is about 12 kilometers from Nanjing South Railway Station to Nanjing University of technology.
  搭乘出租车：南京南站至南京理工大学 2 号门 12 公里左右。

Invited Speaker

Xiaoping Wu

University of Science and Technology of China

Presentation Title: Advancing photomechanics: where are the giants who will help us?

Abstract: Looking back at the development of photomechanics, there have been several leaps since the mid-20th century. Each leap is the result of the giants, i.e., those far-reaching scientific and engineering achievements. These giants could be discovered theories, technological breakthroughs, or national/international facilities. Who will be the new giants to help innovate today's photomechanics? Let's find them out.

Biography: Wu Xiaoping is professor of University of Science and Technology of China and an academician of Chinese Academy of Sciences. She graduated from Peking University in 1960, and was a Visiting Scholar of State University of New York from 1984 to 1986. She has been working on experimental mechanics for about sixty years with numerous achievements and over 200 scientific publications. Her recent works include using synchrotron radiation for meso-mechanics study and using speckle interferometry for dynamically observing the Portevin–Le Chatelier (PLC) effects of metals. She was the Editor-in-Chief for Chinese journal of Experimental Mechanics, and was on the editorial boards of Optics and Lasers in Engineering, Chinese Journal of Theoretical and Applied Mechanics, and Chinese Journal of Solid Mechanics.

Invited Speaker

Guoan Zheng

University of Connecticut

Presentation Title: Ptychographic structured modulation for super-resolution imaging

Abstract: Achieving high spatial resolution is the goal of many imaging systems. Designing a high-resolution lens with diffraction-limited performance over a large field of view remains a difficult task in imaging system design. In this talk, I will discuss a coherent imaging technique, termed ptychographic structured modulation, for quantitative super-resolution microscopy. In this technique, we place a thin diffuser in between the sample and the detection optics to modulate the complex light waves from the object. The otherwise inaccessible high-resolution object information can thus be encoded into the captured images. We then employ a ptychographic phase retrieval process to jointly recover the exit wavefront of the complex object and the unknown diffuser profile. Unlike the illumination-based super-resolution approach, the recovered image of our approach depends upon how the complex wavefront exits the sample -- not enters it. Therefore, the sample thickness becomes irrelevant during reconstruction. After recovery, we can propagate the super-resolution complex wavefront to any position along the optical axis. We validate our approach using both a lens-based and a lensless setup. We demonstrate a 4.5-fold resolution gain over the diffraction limit in the lens-based setup. We also demonstrate a half-pitch resolution of 315 nm in the lensless setup. The reported approach may provide new super-resolution imaging strategies for coherent light, X-ray, and electron microscopy.

Biography: Dr. Guoan Zheng received the B.S. degree in Electrical Engineering from Zhejiang University in 2007, M.S. and Ph.D. degrees in Electrical Engineering from Caltech in 2008 and 2013. He joined the University of Connecticut in 2013 as an assistant professor. Currently, he is the United Technologies Corporation associate professor in the areas of Biomedical Engineering and Electrical Engineering. Dr. Zheng has published more than 90 papers, including Nature Photonics, Nature Reviews Physics, Nature Communications, and PNAS. He has been cited over 6600 times and has an h-index of 42. The Fourier ptychography approach he developed with his colleagues is now a subchapter in Goodman's textbook, "Introduction to Fourier Optics (4 edition)". His current research efforts focus on the development of novel imaging tools to tackle measurement problems in biology and medicine.

Invited Speaker

Qican Zhang

Sichuan University

Presentation Title: Dynamic 3D shape measurement based on fringe projection

Abstract: Three-dimensional (3D) shape measuring technique for dynamic scenes, using fringe projection and Fourier fringe analysis or phase shifting algorithm, has been introduced and blooming in numbers. Such kind technique has also been deeply researched in Sichuan University. This talk mainly reviews the research progress of this work in our group, including the general ideas, measuring equipment and their typical applications of the combined techniques that we have developed over past ten years in the research field of dynamic 3D shape measurement. Meanwhile, the advantages of each technique and the future wok of real-time and high-speed measurement in this research filed are also described.

Biography: Dr. Qican Zhang is a Professor of Electronics and Information Engineering at Sichuan University, China. He is a member of the Editorial Board at the SCI-indexing journal Optics and Lasers in Engineering, member of the Steering Committee of the Asian Society of Experimental Mechanics (ASEM), standing committee member of Opto-electronic Technology Committee of Chinese Optic Society (COS), committee member of Chinese Optical Engineering Society (COES), senior member of Chinese Optical Society (COS), member of the Optical Society of America (OSA), member of International Society for Optical Engineering (SPIE), member of the Optical and Photonics Society of Singapore (OPSS), advisor of the SPIE student chapter in SCU. He received his Ph.D. degree in optical engineering from Sichuan University in 2005. His major research interests are three-dimensional (3D) optical metrology technique for dynamic object. Devoting himself in 3D metrology for over 20 years, he has gained a great deal of practical experiences in participating in a number of projects (including two special equipment projects of NSFC, one international joint research project with Finland VTT) and a variety of 3D measuring equipment developments. He has published over 180 articles, co-authored 3 book chapters and filed 15 granted patents.

Invited Speaker

Lei Chen

Nanjing University of science and technology

Presentation Title: Optical interferometry and its application in optical testing

Abstract: As a precise and non-contacted method, optical interferometry is widely used in the inspection for optical components and optical systems. The report will introduce the development in the related field, such as phase-shifting interferometry, dynamic interferometer, and wavefront sensing technology. Some examples will be given for different optical interferometers in inspection of optical mirror surface figure, phase defect of optical material, surface defect of ICF target, et al.

Biography:

Education
Ph.D., Nanjing University of Science & Technology, 1997
M.S., Nanjing University of Science & Technology, 1990
B.S., Nanjing University of Science & Technology, 1987
Employment
Professor: Nanjing University of Science & Technology, Dept. of Optical Eng., 2003-present
Associate Professor: Nanjing University of Science & Technology, Dept. of Opt. Eng., 1997-2002
Lecturer: Nanjing University of Science & Technology, Dept. of Opt. Eng., 1993-1997
Tutor: Nanjing University of Science & Technology, Dept. of Opt. Eng., 1990-1992
Research Interests
Optical testing，Image process.

Invited Speaker

Jingang Zhong

Jinan University

Presentation Title: Single-pixel imaging: An example of computational imaging

Abstract: In recent years, computational imaging has been developing rapidly. An optical imaging system to image a target object can also be considered to measure the spatial distribution of the target object by means of the light-matter interaction. Computational imaging is an indirect measurement technology where the images are obtained by computing from the light waves before and after the interaction. Single-pixel imaging is typical computational imaging. This talk will briefly introduce computational imaging principle and various single-pixel imaging techniques from the perspective of computational imaging.

Biography: Jingang Zhong is currently a professor with the Department of Optoelectronic Engineering, Jinan University, China. His research interests include single-pixel imaging, digital holography, 3D imaging, light-field imaging, microscopic imaging, optical computing, and applications in industry, medicine, entertainment, and other fields.

Invited Speaker

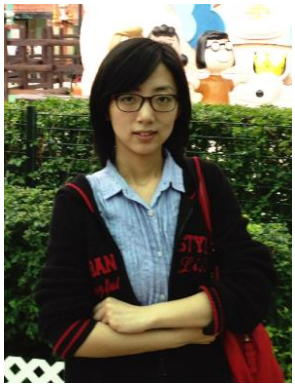
Jianglei Di

Northwestern Polytechnical University

Presentation Title: Convolutional neural network and its application in optical information processing

Abstract: In recent years, the explosive development of deep learning technology has led to another wave of development in machine learning. Convolutional neural network is one of the typical deep neural networks, which has great application potential in the field of optical information processing. This report introduces the basic concepts and structure of CNN in detail, and reviews its application in digital holography, fringe analysis, phase unwrapping, ghost imaging, super-resolution microscopy, and other fields, and prospects the future development of CNN in optical information processing.

Biography: Jianglei Di is an Associate Professor at Northwestern Polytechnical University (NPU) now. From NPU, he received his BS degree in applied physics in 2010, his MS degree in optics in 2007, and PhD degree in optical engineering in 2012. His research interests include digital holography, quantitative phase imaging, deep learning-based computational optical imaging, and optical precision instrument design.



Invited Speaker

Xiangjun Gong

South China University of Technology

Presentation Title: Digital holographic microscopy and its applications in characterizing 3D dynamics of particles and microorganisms

Abstract: Recently, a digital holographic microscopy (DHM) was established in our group to monitor 3D dynamics of colloidal particles and microorganisms near a surface. 3D trajectories of particles and bacteria in a volume over 106 μm3 upon the surface can be reconstructed with high localization resolution (axial resolution: 100 nm). In-situ 3D multi-particle tracking techniques were developed to monitor nanoparticles as small as tens of nm, and bacteria swimming in bulk solutions and near surfaces with different physical and chemical properties. The results revealed variation in those properties alters the surface-bacteria interactions and give rises to adapted responses of bacteria, thus significantly impacts on the bacterial adhesion and colonization. Meanwhile, applications in examining drug delivery and sperm migration further prove that DHM is a powerful tool for non-invasive observation of rapid microscopic biological processes.

Biography: Xiangjun GONG, professor from School of Material Science and Engineering, South China University of Technology (SCUT). She obtained Bachelor degree from Department of Physics, The University of Science and Technology of China at 2005, and Ph.D. degree from department of Physics, The Chinese University of Hong Kong at 2011 respectively. After that, she worked as a postdoctoral researcher at Department of Chemistry in The Chinese University of Hong Kong and joined the current institution at 2014. Her research interests are focusing on establishment of 3D imaging techniques with high spatial and temporal resolution and using these techniques to study fundamental problems near a surface, e.g., biofouling formation, microbial corrosion, interfacial dynamics and inter-compartmental transfer of environmental contaminants etc.

Invited Speaker

Maciej Trusiak

Warsaw University of Technology

Presentation Title: Hilbert transform in fringe pattern analysis: a review

Abstract: Single-frame fringe pattern processing and analysis is an important task of full-field (non-scanning) optical measurements (e.g., employing interferometry, digital holography, structural illumination and moiré techniques). In this contribution I will present several algorithmic solutions based on the notion of Hilbert transform for fringe pattern phase and amplitude demodulation. Hilbert transform needs fringe pattern pre-filtering, thus several pre-processing techniques will be described as well. I will discuss especially tailored manners proposed to extend both the filtering algorithms and the Hilbert transform to 2D and perform efficient fringe pattern denoising, detrending and amplitude/phase demodulation.

Biography: Maciej Trusiak is an Assistant Professor at the Institute of Micromechanics and Photonics Warsaw University of Technology. He received his B.Sc., M.Sc., and Ph.D. in Photonics Engineering from the Warsaw University of Technology in 2011, 2012, and 2019, respectively. He then conducted a year-long postdoctoral research in the Optoelectronic Image Processing Group headed by Prof. Javier García in the University of Valencia, Spain. He is actively working in computational imaging, optical metrology, interferometry, quantitative phase microscopy, lensless coherent imaging, and fringe pattern analysis. He is a coauthor of more than 60 peer-reviewed journal papers.