IPDO 2019

Tianjin,China

CONFERENCE HANDBOOK

5th International Symposium on

Inverse Problems, Design and Optimization

http://ipdo2019.ipdos.org/

CHAIRMAN

Prof. Xu Han, Hebei University of Technology, China

HONARARY CO-CHAIRMEN

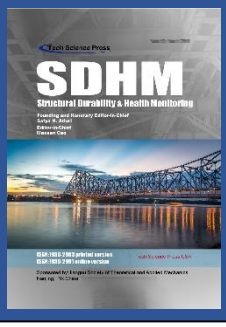
Prof. George S. Dulikravich, Florida International University, USA

Profs. Helcio R. B. Orlande and Marcelo J. Colaco,

Federal University of Rio de Janeiro, Brazil

SECRETARY

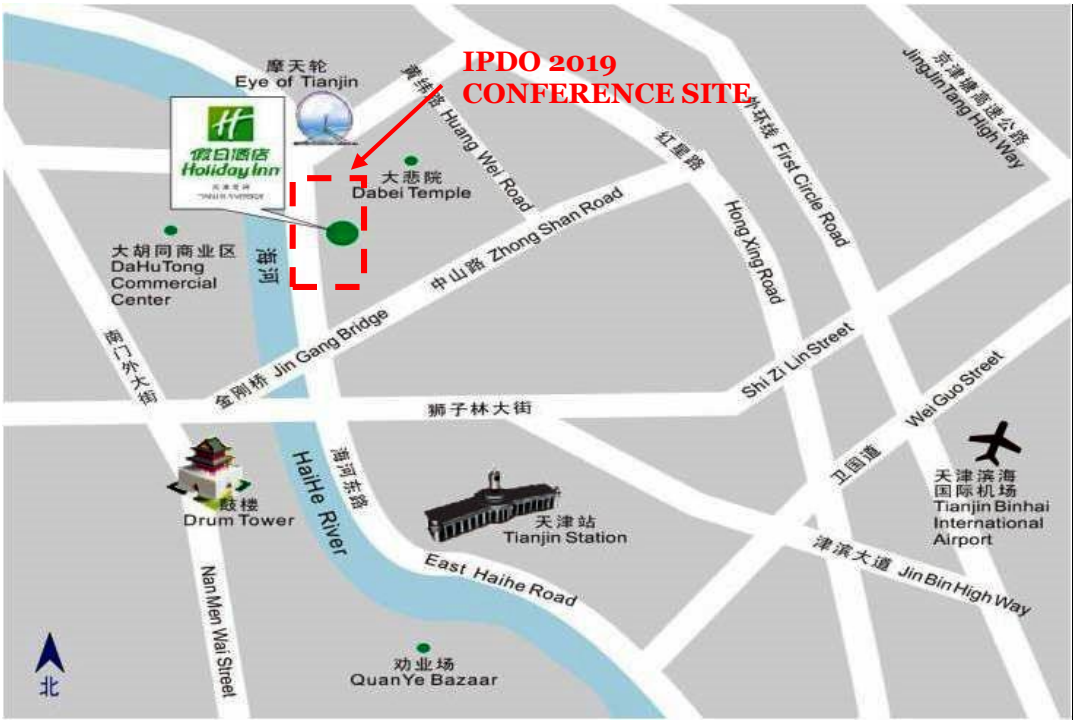
A/Prof. Jie Liu, Hunan University, China

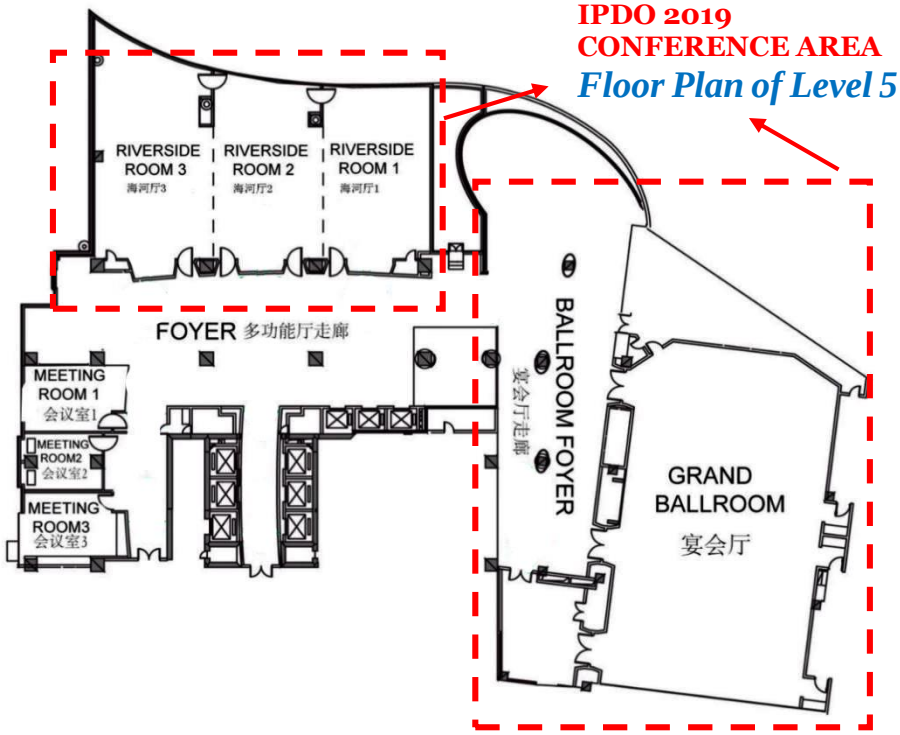


September 24-26, 2019

Holiday Inn Tianjin Riverside, China

IPDO 2019 CONFERENCE SITE





Designation of Rooms Allocated for IPDO 2019 Event.

Room A	Room B	Room C	Room D
GRAND BALLROOM	RIVERSIDE ROOM 1	RIVERSIDE ROOM 2	RIVERSIDE ROOM 3

Contents

1. WELCOME MESSAGE

Dear Colleagues and Friends

On behalf of the organizing committees, we are delighted to welcome you to the 5th International Symposium on Inverse Problems, Design and Optimization (IPDO2019) at Tianjin, China.

IPDO sequence of international symposia's main objective is to bring three communities of researchers in the fields of inverse problems, multidisciplinary design theory and optimization together in a unique international forum that provides an excellent basis for cross-fertilization of ideas, as well as for the creation of new synergistic approaches and methodologies.

The IPDO conference series were originated at Rio de Janeiro, Brazil in 2004 by Prof. George S. Dulikravich, followed by IPDO 2007 at Miami Beach, USA, IPDO 2010 at Joao Pessoa, Brazil, and IPDO 2013 at Albi, France. Now IPDO 2019 comes to China for celebrating its 5th event.

The IPDO2019 conference program includes over 180 presentations from about 20 countries and regions scheduled in 21 technical mini-symposia. There will be 4 plenary lectures, 6 keynote lectures, and many invited lectures at the conference. The mini-symposia will cover a broad range of topics related to ideas in aeronautics, astronautics, transport, materials design and processing, remote sensing, non-destructive evaluation, material property determination, acceleration of optimization procedures, combinations of inverse design and optimization, data driven many-objectives constrained optimization, uncertainty quantification, unsupervised deep machine learning, and other topic of high utility.

We would like to express our gratitude to all the members of the local organizing committee, international scientific committee, and the student helpers who have contributed significantly in this conference. Our sincere thanks and appreciation go to some international reviewers for their prompt review reports on the submitted abstracts. Our appreciation goes also to all the mini-symposium organizers for their effort and contribution in the organization. Special thanks go to associate professor Jie Liu, the secretary general, for handling a lot of tedious work, and professor Yourui Tao for the great support by organizing student helpers.

We hope that this conference will provide a great venue of presenting and exchanging information for your scientific work. We wish all of you have a great time in this beautiful city Tianjin.

Finally, we would like to thank you for your contribution to the IPDO 2019 conference. We are looking forward to your participation and continued engagement for the future IPDO conferences.

Professor Xu Han

Conference Chairman
Hebei University of Technology, China

2. CONFERENCE DETAILS

Conference Venue

IPDO 2019 will be held in Holiday Inn Tianjin Riverside, China.
• The main event will be held in the Riverside rooms on the 5th floor.
• Plenary Lectures (PL) will be held in Room A.
• Keynote Lectures (KL) will be given in Rooms B, C and D, respectively.
• Mini-symposia will be in Rooms B, C and D, respectively.
• Conference Banquet will be in Room A on September 25, 2019.
Please refer to the second page about the designation of rooms allocated for the event.

Catering

Morning and afternoon coffee breaks, buffet lunches and dinners (September 23 - 26), and a round table banquet are included for all registered participants. Tickets will be provided at the on-site registration desk to all registered participants for accessing these services.

Instructions for Chairs and Presenters

Timeslots: Plenary Lecture **45** minutes;
Keynote Lecture **30** minutes;
All other presentations **15** minutes.
The timeslots include presentation and Q&A. It is advisable to give 5 minutes for Q&A. The conference program is fully packed. Please stick to the program schedule so as to facilitate the smooth transition between sessions.

Instructions for Oral Presenters

Only overhead projector and one computer are provided in each room. Please bring your file on a USB stick to the room of your presentation during the break before your session, or 20 minutes before the start of the day's proceedings. A volunteer in the room will help you to upload the files.

Name Tags

Name tags are your entry to conference events. Please wear them at all times.

Registration/Information Desk

Please make the registration in the lobby on the first floor of the hotel. Registration Desk will be open between 9:00 and 20:00 on September 23, 2019, and between 8:30 and 18:00 from September 24 to September 25, 2019.

WIFI Service

Connecting point: HolidayInn

Contact

A/Prof. Jie Liu, Secretariat of IPDO 2019, liujie@hnu.edu.cn, +86 18890376710
Prof. Yourui Tao, taoyourui@hebut.edu.cn, +86 13752555389

3. ORGANIZATION COMMITTEE

Chairman

Xu Han	Hebei University of Technology, China

Honorary co-chairmen

George S. Dulikravich	Florida International University, USA
Helcio R. B. Orlande	Federal University of Rio de Janeiro, Brazil
Marcelo J. Colaco	Federal University of Rio de Janeiro, Brazil

International organizing committee

Oleg M. Alifanov	Moscow Aviation Institute, Russia
Marc Bonnet	Applied Mathematics Department-Poems, France
Jin Cheng	Fudan University, China
Gengdong Cheng	Dalian University of Technology, China
Carlos A. Coello Coello	CINVESTAV-IPN, Mexico
Baoyan Duan	Xidian University, China
Igor Nikolayevich Egorov	IOSO Technology Center, Russia
Isaac Elishakoff	Florida Atlantic University, USA
Maosen Cao	Hohai University, China
Michael I. Friswell	University of Wales Swansea, UK
Omar Ghattas	University of Texas at Austin, USA
Alemdar Hasanoglu	Izmir University, Turkey
Dinh Nho Hào	Vietnam Academy of Science and Technology, Vietnam
Michael V. Klibanov	University of North Carolina-Charlotte, USA
Daniel Lesnic	University of Leeds, UK
Guirong Liu	University of Cincinnati, USA
Liviu Marin	University of Bucharest, Romania
Frank Natterer	University of Münster, Germany
Antonio J. Silva Neto	State University of Rio de Janeiro, Brazil
Ziemowit Ostrowski	Silesian University of Technology, Poland
Roland Potthast	Deutscher Wetterdienst, Germany

Vladimir G. Romanov	Russian Academy of Sciences, Russia
Cristiana Sebu	University of Malta, Malta
Marian Slodicka	Ghent University, Belgium
Daniel Watzenig	Graz University of Technology, Austria
Anatoly G. Yagola	Moscow State University, Russia
Yaxiang Yuan	Chinese Academy of Sciences, China

Local organizing committee

Yanfei Wang	Chinese Academy of Sciences
Haitian Yang	Dalian University of Technology
Chao Jiang	Hunan University
Jie Liu	Hunan University
Zhihai Xiang	Tsinghua University
Yourui Tao	Hebei University of Technology

4. PROGRAM OVERVIEW

Overall Conference Program

IPDO2019, September 24-26, 2019

Date	Time	Conference Program
Day 0 September 23, 2019	9:00-20:00	Registration
Day 1 September 24, 2019 (Tuesday)	8:30-8:45	Opening Ceremony
	8:45-9:30	Plenary lecture 1
	9:30-10:15	Plenary lecture 2
	10:15-10:45	Group photo, Coffee break
	10:45-11:30	Plenary lecture 3
	11:30-12:15	Plenary lecture 4
	12:15-13:30	Buffet lunch
	13:30-15:30	Mini-Symposia
	15:30-15:45	Coffee break
	15:45-18:30	Mini-Symposia
	18:30-20:30	Buffet dinner
Day 2 September 25, 2019 (Wednesday)	8:30-9:00	Keynote lectures 1-3
	9:00-10:45	Mini-Symposia
	10:45-11:00	Coffee break
	11:00-12:15	Mini-Symposia
	12:15-13:30	Buffet lunch
	13:30-15:30	Mini-Symposia
	15:30-15:45	Coffee break
	15:45-18:30	Mini-Symposia
	19:00-20:30	IPDO banquet
Day 3 September 26, 2019 (Thursday)	8:30-9:00	Keynote lectures 4-6
	9:00-10:45	Mini-Symposia
	10:45-11:00	Coffee break
	11:00-12:15	Mini-Symposia
	12:15-13:30	Buffet lunch
	13:30-15:45	Mini-Symposia
	17:30-20:00	Buffet dinner

5. SUMMARY OF PLENARY LECTURE, KEYNOTE LECTURE AND MINI-SYMPOSIA

Plenary Lecture (PL)

- **PL-1:** Interaction of inverse problems, design and optimization / *George S. Dulikravich*
- **PL-2:** Topology optimization via sequential integer programming and discrete sensitivity analysis/ *Gengdong Cheng*
- **PL-3:** Customized optimization for practical problem solving / *Kalyanmoy Deb*
- **PL-4:** Modelling of boundary uncertainties in inverse problems / *Jari Kaipio*

Keynote Lecture (KL)

- **KL-1:** A priori and a posteriori error estimation for solutions of ill-posed problems / *Anatoly G. Yagola*
- **KL-2:** An optimization procedure for parametric identification of complex structural systems / *Qing Li*
- **KL-3:** Nonlinear static/dynamic response structural optimization / *Gyung-Jin Park*
- **KL-4:** Inverse problems for degenerate parabolic equations / *Daniel Lesnic*
- **KL-5:** IOSO optimization technology: main possibilities and examples usage for real-life problems in different area / *Igor N. Egorov*
- **KL-6:** Sparse regularization and optimization methods for seismic data processing and imaging / *Yanfei Wang*

Proposed Mini-Symposium (MS) - Titles and Organizers

MS	MS Title	Organizer(s)
MS1	Computational methods for inverse problems and applications	*Anatoly G. Yagola*, Lomonosov Moscow State University *Yanfei Wang*, Chinese Academy of Sciences
MS3	Optimization problems for real-life objects	*Igor Nikolayevich Egorov*, IOSOLabs
MS4	Inverse coefficient identification problems	*Daniel Lesnic*, University of Leeds
MS5	Design methodologies for automotive structures and systems	*Gyung-Jin Park*, Hanyang University *Yingchun Bai*, Beijing Institute of Technology *Huiming Ning*, Chongqing University
MS6	Data assimilation and inverse problems for dynamical systems	*Roland Potthast*, Deutscher Wetterdienst (DWD)
MS7	Statistical inference and uncertainty quantification	*Daniel Watzenig*, Graz University of Technology
MS9	Inverse problems and optimization meet the geosciences	*Zuhair Nashed*, University of Central Florida

MS10	Inverse problems in finance and economics	*Sergey Kabanikhin*, Russian Academy of Sciences *Shuhua Zhang*, Tianjin University of Finance and Economics
MS12	Recent findings in inverse heat transfer problems	*Haitian Yang*, Dalian University of Technology *Miao Cui*, Dalian University of Technology
MS13	New trends in structural optimization for additive manufacturing	*Shutian Liu*, Dalian University of Technology *Qi Wang*, Dalian University of Technology
MS14	Accelerated iterative regularization methods and applications	*Bo Han*, Harbin Institute of Technology *Yong Chen*, Harbin Institute of Technology
MS15	Inverse problems in nonlocal models and related topics	*Gongsheng Li*, Shandong University of Technology *Zhiyuan Li*, Shandong University of Technology
MS16	Novel methods in the design of functional materials and structures	*Zhihai Xiang*, Tsinghua University *Xiaoming Zhou*, Beijing Institute of Technology *Yiqian He*, Dalian University of Technology
MS17	Structural uncertainty analysis and reliability design	*Chao Jiang*, Hunan University *Bingyu Ni*, Hunan University
MS18	Data-driven surrogate modeling techniques for inverse and other engineering problems	*Hu Wang*, Hunan University *Haobo Qiu*, Huazhong University of Science and Technology *Jian Zhang*, Jiangsu University
MS19	Recent regularization methods for dynamic load identification	*Tommy H.T. Chan*, Queensland University of Technology *Zhen Chen*, North China University of Water Resources and Electric Power *Jie Liu*, Hunan University *Baijie Qiao*, Xi'an Jiaotong University
MS20	Detection data intelligent analysis and parameter identification	*Qian Zhang*, Tianjin University
MS22	Integrated design of material and structure	*Bo Wang*, Dalian University of Technology *Jihong Zhu*, Northwestern Polytechnical University *Zhanli Liu*, TsingHua University *Shujuan Hou*, Hunan University
MS23	Novel system identification methods in civil engineering	*Yong Ding*, Harbin Institute of Technology *Dongyu Zhang*, Harbin Institute of Technology
MS24	Recent methods for multidisciplinary design and optimization	*Jianguo Zhu*, University of Sydney *Shiyou Yang*, Zhejiang University *Yongjian Li*, Hebei University of Technology
MS25	Inverse analysis of responses for interrogating structural damage	*Maosen Cao*, Hohai University *Qiang Wang*, Nanjing University of Posts and Telecommunications *Wei Xu*, Hong Kong Polytechnic University

6. CONFERENCE PROGRAM

Overview of Scheduled Presentations in Different Meeting Rooms

	Time	Room A	Room B	Room C	Room D	Foyer	Cafeteria
Day 1 September 24 Tuesday	08:30-08:45	Opening ceremony					
	08:45-9:30	PL-1					
	09:30-10:15	PL-2					
	10:15-10:30						
	10:30-10:45					Coffee break	
	10:45-11:30	PL-3					
	11:30-12:15	PL-4					
	12:15-13:30						Buffet lunch
	13:30-15:30		MS20	MS10	MS16		
	15:30-15:45					Coffee break	
	15:45-18:30		MS12	MS13	MS14		
	18:30-20:30						Buffet dinner
Day 2 September 25 Wednesday	08:30-09:00		KL-1	KL-2	KL-3		
	09:00-10:45		MS1	MS19	MS5		
	10:45-11:00					Coffee break	
	11:00-12:15		MS1	MS19	MS15		
	12:15-13:30						Buffet lunch
	13:30-15:30		MS1	MS19	MS7		
	15:30-15:45					Coffee break	
	15:45-17:30		MS1	MS17	MS18		
	17:30-18:30		IOSO Training				
	19:00-20:30	IPDO banquet					
Day 3 September 26 Thursday	08:30-09:00		KL-4	KL-5	KL-6		
	09:00-10:45		MS4	MS3	MS22		
	10:45-11:00					Coffee break	
	11:00-12:15		MS4, MS9	MS3, MS6	MS22		
	12:15-13:30						Buffet lunch
	13:30-15:45		MS23	MS24	MS25		
	17:30-20:00						Buffet dinner

Detailed Program

Time / Date	Sep. 23, 2019, Monday	Sep. 24, 2019, Tuesday			Sep. 25, 2019, Wednesday			Sep. 26, 2019, Thursday		
8:30-8:45		**Opening**			**KL-1**	**KL-2**	**KL-3**	**KL-4**	**KL-5**	**KL-6**
8:45-9:00		**PL-1**								
9:00-9:15					MS1	MS19	MS5, MS15	MS4, MS9	MS3, MS6	MS22
9:15-9:30					**MS1-15**	**MS19-1**	**MS5-3**	MS4-3	MS3-1	**MS22-6**
9:30-9:45		**PL-2**			MS1-1	MS19-2	MS5-1	MS4-4	MS3-2	**MS22-9**
9:45-10:00					MS1-2	MS19-3	MS5-4	MS4-5	MS3-3	MS22-10
10:00-10:15					MS1-3	MS19-5	MS5-5	MS4-6	MS3-4	MS22-1
10:15-10:30		**Group photo**			MS1-4	MS19-6	MS5-6	MS4-7	MS3-5	MS22-2
10:30-10:45		**Coffee break**			MS1-5	MS19-7		MS4-8	MS3-6	MS22-3
10:45-11:00		**PL-3**			**Coffee break**					
11:00-11:15					MS1-6	MS19-8	MS15-3	MS9-1	MS3-7	MS22-4
11:15-11:30					MS1-7	MS19-9	MS15-4	MS9-2	MS3-8	MS22-5
11:30-11:45		**PL-4**			MS1-8	MS19-10	MS15-5		MS3-9	MS22-8
11:45-12:00					MS1-9	MS19-11	MS15-6		MS6-1	MS22-11
12:00-12:15					MS1-10	MS19-12			MS6-2	MS22-12
12:15-13:30		**Lunch**								
13:30-13:45	Registration	MS20	MS10	MS16	MS1	MS19	MS7	MS23	MS24	MS25
13:45-14:00		**MS20-5**	MS10-1	**MS16-3**	MS1-11	MS19-13	MS7-1	**MS23-1**	**MS24-1**	**MS25-1**
14:00-14:15		**MS20-6**	MS10-2	MS16-2	MS1-12	MS19-14	MS7-2	MS23-2	MS24-2	MS25-2
14:15-14:30		MS20-1	MS10-3	MS16-4	MS1-13	MS19-15	**MS7-3**	MS23-3	MS24-3	MS25-3
14:30-14:45		MS20-3	MS10-4	MS16-7	MS1-14	MS19-17	MS7-4	MS23-4	MS24-4	MS25-4
14:45-15:00		MS20-4	MS10-5	MS16-1	MS1-16	MS19-18	MS7-5	MS23-5	MS24-5	MS25-5
15:00-15:15		MS20-2	MS10-6	MS16-5	MS1-17	MS19-19	MS7-6	MS23-6	MS24-6	MS25-6
15:15-15:30					MS1-18	**MS19-4**	MS7-7	MS23-7	MS24-7	MS25-7
15:30-15:45		**Coffee break**						MS23-8		MS25-8
15:45-16:00		MS12	MS13	MS14	MS1	MS17	MS18	**Coffee break**		
16:00-16:15		**MS12-7**	**MS13-7**	**MS14-7**	MS1-19	**MS17-5**	**MS18-9**			
16:15-16:30		MS12-1	**MS13-9**	MS14-2	MS1-20	MS17-1	**MS18-6**			
16:30-16:45		MS12-3	MS13-2	MS14-3	MS1-21	MS17-2	MS18-1			
16:45-17:00		MS12-4	MS13-3	MS14-4	MS1-22	MS17-3	MS18-2			
17:00-17:15		MS12-5	MS13-4	MS14-5	MS1-24	MS17-4	MS18-3			
17:15-17:30		MS12-6	MS13-5	MS14-6	MS1-25	MS17-6	MS18-4			
17:30-17:45		MS12-8	MS13-6	MS14-8		MS17-9	MS18-5			
17:45-18:00		MS12-9	MS13-8	MS14-9	IOSO Training	MS17-11	MS18-7			
18:00-18:15		MS12-10		MS14-1		MS17-12	MS18-8			
18:15-18:30		MS12-11					MS18-10			

Plenary Lectures and Keynote Lectures

Day 1 Plenary Lectures: Tuesday, September 24, 2019
8:30-8:45 Opening Ceremony: Room A
Day 1 Plenary Lectures: Tuesday, September 24, 2019

Time	ID	Title / Presenter
Room A, Chair: Prof. Qing Li		
8:45-9:30	PL-1	Interaction of inverse problems, design and optimization / *George S. Dulikravich*
9:30-10:15	PL-2	Topology optimization via sequential integer programming and discrete sensitivity analysis / *Gengdong Cheng*
Room A, Chair: Prof. Marcelo J. Colaco		
10:45-11:30	PL-3	Customized optimization for practical problem solving / *Kalyanmoy Deb*
11:30-12:15	PL-4	Modelling of boundary uncertainties in inverse problems / *Jari Kaipio*

Day 2 Keynote Lectures: Wednesday, September 25, 2019

Time	ID	Title and Presenter
Room B, Chair: Prof. Yanfei Wang		
8:30-9:00	KL-1	A priori and a posteriori error estimation for solutions of ill-posed problems / *Anatoly G. Yagola*
Room C, Chair: Prof. Shujuan Hou		
8:30-9:00	KL-2	An optimization procedure for parametric identification of complex structural systems / *Qing Li*
Room D, Chair: Prof. Haitian Yang		
8:30-9:00	KL-3	Nonlinear static/dynamic response structural optimization / *Gyung-Jin Park*

Day 3 Keynote Lectures: Thursday, September 26, 2019

Time	ID	Title and Presenter
Room B, Chair: Prof. Ting Wei		
8:30-9:00	KL-4	Inverse problems for degenerate parabolic equations / *Daniel Lesnic*
Room C, Chair: Prof. Shutian Liu		
8:30-9:00	KL-5	IOSO optimization technology: main possibilities and examples usage for real-life problems in different area / *Igor N. Egorov*
Room D, Chair: Prof. Anatoly G. Yagola		
8:30-9:00	KL-6	Sparse regularization and optimization methods for seismic data processing and imaging / *Yanfei Wang*

Parallel Sessions

Day 1: Room B Parallel Sessions: Tuesday - September 24, 2019

Session 1B1

MS20 Detection data intelligent analysis and parameter identification

-Chair: Qian Zhang

Time	ID	Title / Author(s)
13:45-14:00	MS20-5	**Invited report:** Theoretical analysis and numerical calculation *Xide Li*
14:00-14:15	MS20-6	**Invited report:** Enhanced damage detection method by principal component analysis with spatial and temporal windows *Licheng Zhou, Liqun Tang, Zejia Liu, Ge Zhang*
14:15-14:30	MS20-1	The wear prediction of constant cross section disc cutter based on energy wear theory and field data analysis *Lihui Wang, Yilan Kang, Haipeng Li*
14:30-14:45	MS20-3	Experimental characterization of damage evolution in rock materials based on full-field data analysis *Haipeng Song, Hao Zhang, Yilan Kang*
14:45-15:00	MS20-4	Geological type recognition based on intelligent analysis of field measured data of tunnel boring machine *Kaihong Yang, Siyang Zhou, Qian Zhang*
15:00-15:15	MS20-2	Theoretical analysis on engineering detection data and its application on torque estimation of tunneling machines *Siyang Zhou, Wencong Qi, Kang Yilan*

Session 1B2

MS12 Recent findings in inverse heat transfer problems

-Chairs: Haitian Yang, Miao Cui

Time	ID	Title / Author(s)
16:00-16:15	MS12-7	**Invited report:** Two-way trumpet nets for real-time inverse identification of parameters *Shuyong Duan, Zhanming Zhang, Xu Han, Guirong Liu*
16:15-16:30	MS12-1	An efficient numerical method to solve inverse fuzzy-uncertain viscoelastic problems of parameters estimation *Ruifei Peng, Yiqian He, Haitian Yang*
16:30-16:45	MS12-3	Research and application of inverse heat conduction problems for aerothermodynamics analysis of high speed flight vehicle *Weiqi Qian, Yu Zhou, Yuanpei Shao*
16:45-17:00	MS12-4	Surface heat flux estimation error from the interaction between thermocouple and heat shield *Yu Zhou, Weiqi Qian, Yuan-pei Shao*

17:00-17:15	MS12-5	A new method for solving the two-dimensional inverse heat conduction problem *Bowen Zhang, Jie Mei, Chunyun Zhang, Haifeng Peng, Miao Cui, Xiaowei Gao*
17:15-17:30	MS12-6	A reduced-order modeling for real-time identification of damages in the multi-layer thermal protection system *Yu Liang, Xiaowei Gao, Miao Cui*
17:30-17:45	MS12-8	Novel interval parameter calibration methods for transient heat conduction *Lisha Tan, Zhongmin Deng*
17:45-18:00	MS12-9	Localized method of fundamental solutions for the inverse cauchy problems of three-dimensional anisotropic heat conduction problems *Fajie Wang, Yan Gu, Chia-Ming Fan, WenZhen Qu*
18:00-18:15	MS12-10	An efficient numerical method to solve inverse fuzzy-uncertain nonlinear convection-diffusion heat transfer problems *Ruifei Peng, Linlin Zhang, Yang Yu, Haitian Yang*
18:15-18:30	MS12-11	A gradient based algorithm to solve inverse hyperbolic heat conduction problems *Bicheng Liu, Yiqian He, Haitian Yang, Ran Chunjiang*

Day 1: Room C Parallel Sessions: Tuesday - September 24, 2019

Session 1C1

MS10 Inverse problems in finance and economics

-Chairs: Sergey Kabanikhin, Shuhua Zhang

Time	ID	Title / Author(s)
13:45-14:00	MS10-1	Modern optimization methods for solving inverse and ill-posed problems of epidemiology, social processes and economics *Olga Krivorotko, Sergey Kabanikhin, Shuhua Zhang*
14:00-14:15	MS10-2	Digital earth and inverse epidemiology problem solution for prediction of tuberculosis in russian federation regions *Sergey Kabanikhin, Olga Krivorotko, Igor Marinin, Victoriya Kashtanova*
14:15-14:30	MS10-3	From direct to inverse cost index computation for commercial flight management *Lunlong Zhong, Hamdam Alfazari, Sibusiso Moyo, Luis Gustavo Zelaya cruz, Felix Mora-Camino*
14:30-14:45	MS10-4	Supercomputer algorithm for solving inverse problem for stochastic differential equations with applications in financial mathematics *Ekaterina Kondakova, Mikhail Marchenko, Olga Krivorotko*
14:45-15:00	MS10-5	Solving an inverse problem for the spatial solow mathematical model *Sergey I. Kabanikhin, Maktagali A. Bektemessov, Olga I. Krivorotko, Zholaman M, Bektemessov, Shuhua Zhang*
15:00-15:15	MS10-6	Applied inverse problems for parabolic equations *Maxim Shishlenin, Sergey Kabanikhin*

Session 1C2

MS13 New trends in structural optimization for additive manufacturing

-Chairs: Shutian Liu, Qi Wang

Time	ID	Title / Author(s)
16:00-16:15	MS13-7	**Invited report**: Convective heat transfer enhancement by novel honeycomb-core in sandwich panel exchanger fabricated by additive manufacturing *Dekui Kong, Yongcun Zhang, Shutian Liu*
16:15-16:30	MS13-9	**Invited report**: The parameterized level set method for topology optimization and additive manufacturing *Peng Wei, Zirun Jiang, Zuyu Li*
16:30-16:45	MS13-2	Topological design of lattice structures for additive manufacturing *Yu Wang, Dezheng Hu, Hailin Wang, Tinghao Zhang*
16:45-17:00	MS13-3	Feto method for ship structure design with auxetic metamaterials considering vibration reduction and load bearing capacity *Deqing Yang, Haoxing Qin*
17:00-17:15	MS13-4	B-spline post processing of structural topology optimization using micromechanics constitute *Haipeng Jia, Qunying Men, Anil Misra, Wenrui Ma*
17:15-17:30	MS13-5	Structural topology optimization using micromechanics constitute and isogeometric analysis *Haipeng Jia, Wenrui Ma, Anil Misra, Qunying Men*
17:30-17:45	MS13-6	An evolutionary design approach to shell-infill structures *Wenke Qiu, Liang Xia*
17:45-18:00	MS13-8	Configuration smoothing and grid reconstruction of structural topology optimization for 3D printing *Tao Liu, Zhijie Feng, Jianbin Du*

Day 1: Room D Parallel Sessions: Tuesday - September 24, 2019

Session 1D1

MS16 Novel methods in the design of functional materials and structures

-Chairs: Zhihai Xiang, Xiaoming Zhou, Yiqian He

Time	ID	Title / Author(s)
13:45-14:00	MS16-3	**Invited report**: Macroscale superlubricity achieved by optimal design of surface structures *Weifeng Yuan, Di Yuan*
14:00-14:15	MS16-2	An interval effective independence method for optimal sensor placement based on non-probabilistic approach *Chen Yang, Lei Wang, Xinyu Geng*

14:15-14:30	MS16-4	Comparison of the virtual fields method and the gradient based optimization method to charecterize nonhomogeneous mechanical property distribution of solds *Yue Mei, Yanli Sun, Stéphane Avril*
14:30-14:45	MS16-7	Numerical prediction of viscoelastic property for heterogeneous materials based on a quadtree sbfem with piecewise adaptive algorithm in time domain *Yiqian He, Jin Guo, Haitian Yang*
14:45-15:00	MS16-1	Identify the distribution of 2d residual stresses based on the willis-form equations *Zhihai Xiang, Jianing Xie, Jinlong Zhao*
15:00-15:15	MS16-5	Broadband elastic black hole based on the transformation method *Hexuan Gao, Zhihai Xiang*

Session 1D2

MS14 Accelerated iterative regularization methods and applications

-Chairs: Bo Han, Yong Chen

Time	ID	Title / Author(s)
16:00-16:15	MS14-7	**Invited report:** Second order asymptotical regularization methods for inverse problems in partial differential equations *Ye Zhang, Rongfang Gong*
16:15-16:30	MS14-2	Fast subspace optimization method for nonlinear inverse problems in banach spaces with uniformly convex penalty terms *Ruixue Gu, Bo Han, Yong Chen*
16:30-16:45	MS14-3	Analysis of a heuristic rule for the iteratively regularized gauss-newton method in banach spaces *Zhenwu Fu, Qinian Jin, Zhengqiang Zhang, Bo Han, Yong Chen*
16:45-17:00	MS14-4	A proximal regularized gauss-newton-kaczmarz method and its acceleration for nonlinear ill-posed problems *Haie Long, Bo Han, Shanshan Tong*
17:00-17:15	MS14-5	An accelerated iterative regularization method for nonlinear ill-posed problems *Shanshan Tong, Bo Han, Haie Long, Ruixue Gu*
17:15-17:30	MS14-6	Reparameterizating full waveform inversion under the framework of deep neural networks *Qinglong He, Yanfei Wang*
17:30-17:45	MS14-8	An iteration regularization method with general convex penalty functions for nonlinear inverse problems in banach spaces *Jing Wang, Wei Wang, Bo Han*
17:45-18:00	MS14-9	A multi-scale radial basis function method for severely ill-posed problems on spheres *Min Zhong, LeGia Q.T, Sloan I.H*
18:00-18:15	MS14-1	Full waveform inversion with group-sparsity regularization *Hongsun Fu, Xiaolin Li, Mingyue Ma*

Day 2: Room B Parallel Sessions: Wednesday - September 25, 2019

Session 2B1

MS1 Computational methods for inverse problems and applications

-Chairs: Anatoly G. Yagola, Yanfei Wang

Time	ID	Title / Author(s)
9:15-9:30	MS1-15	**Invited report:** Regularized ab initio molecular force fields for key biological molecules: melatonin and pyridoxal-5'-phosphate methylamine shiff base (vitamin B6) *Gulnara M. Kuramshina, Igor V.Kochikov, Svetlana A.Sharapova*
9:30-9:45	MS1-1	Solution of a three-dimensional inverse elastography problem for parametric classes of inclusions *A. S. Leonov, A. N. Sharov, A. G. Yagola*
9:45-10:00	MS1-2	Joint migration velocity analysis of P- and Sv-waves for vti media using a hybrid regularization method *Yanfei Wang, Caixia Yu*
10:00-10:15	MS1-3	An inverse method for distributed dynamic load identification of structures with interval uncertainties *Yaru Liu , Chen Yang, Lei Wang*
10:15-10:30	MS1-4	Uniqueness and stability of solutions of fredholm-stieltjes linear integral equations of the first kind with two variables *Avyt Asanov, Zuur A.Kadenova*
10:30-10:45	MS1-5	Computational methods for two inverse problems in geophysics *Yuri V. Glasko*
11:00-11:15	MS1-6	Quadtree meshes in the scaled boundary finite element method for geometry identification *Bo Yu, Pengmin Hu, Geyong Cao, Wenjian Sun*
11:15-11:30	MS1-7	Focusation of the electroencefalography data via the solution of the cauchy problem for the Laplace's equation *Nikolay A. Koshev*
11:30-11:45	MS1-8	Structural health monitoring of offshore platforms based on deep learning algorithms *Xiaomei Wang, Jian Zhang*
11:45-12:00	MS1-9	Panteleev's corrective filtering as the regularizing algorithm for the earth's chandler wobble excitation reconstruction *Leonid Zotov*
12:00-12:15	MS1-10	The application of wasserstein metric in tem *Xiaomeng Sun, Yanfei Wang*

Session 2B2

MS1 Computational methods for inverse problems and applications

-Chairs: Anatoly G. Yagola, Yanfei Wang

Time	ID	Title / Author(s)
13:45-14:00	MS1-11	Mathematical theory of resolution limit and super-resolution *Ping Liu, Hai Zhang*
14:00-14:15	MS1-12	Theoretical basis and numerical experiments of qualitative approach for the elastic scattering problem with mixed obstacles *Jianli Xiang, Guozheng Yan*
14:15-14:30	MS1-13	Calibration for the volatility smile based on entropy binomial tree method *Wenxiu Gong, Zuoliang Xu, Qinghua Ma*
14:30-14:45	MS1-14	Determination of an unknown time-dependent heat source from a nonlocal measurement by finite difference method *Zewen Wang, Zhousheng Ruan, Helu Huang, Shufang Qiu*
14:45-15:00	MS1-16	Inertial proximal peaceman-rachford splitting methods for sparse signal recovery and image denoising *Huiyun Li, Xinwei Liu*
15:00-15:15	MS1-17	Estimation of thermal contact conductances on irregular interfaces using the generalized integral transform technique and the reciprocity functional method *Guilherme C. Freitas, Marcelo J. Colaço*
15:15-15:30	MS1-18	Computerized investigation of real tooth contact analysis of face-milled spiral bevel gears *Guanglei Liu, Mingwei Li*
16:00-16:15	MS1-19	Truncated singular value decomposition (tsvd) method for regularization of ill-poesd problems in image reconstruction *Xu Han, Botao Yang, Shuyong Duan, Guirong Liu*
16:15-16:30	MS1-20	Proximal gradient algorithm with extrapolation for l_1 regularized logistic regression and quadratic problem *Bo Wen*
16:30-16:45	MS1-21	An inexact projected gradient method for sparsity constrained quadratic measurements regression *Jun Fan, Liqun Wang, Ailing Yan*
16:45-17:00	MS1-22	An ineqaulity for longest common sequence and its application in inverted sentence detection *Zijun Zheng*
17:00-17:15	MS1-24	Dynamic load identification based on the cuckoo search algorithm *Wenjing Gao, Huanlin Zhou*
17:15-17:30	MS1-25	On the inverse problem of the ultrasound waves propagation *Nikita Novikov, Maxim Shishlenin, Dmitry Klyuchinskiy*
17:45-18:30	IOSO Training	*Igor Nikolayevich Egorov* and his team

Day 2: Room C Parallel Sessions: Wednesday - September 25, 2019

Session 2C1

MS19 Recent regularization methods for dynamic load identification

-Chairs: Tommy H.T. Chan, Zhen Chen, Jie Liu, Baijie Qiao

Time	ID	Title / Author(s)
9:15-9:30	MS19-1	**Invited report:** Comparative studies on the selection methods of regularization parameters based on moving force identification *Zhen Chen, Zhen Wang, Zhihao Wang, Tommy H.T. Chan*
9:30-9:45	MS19-2	Dynamic load identification for structures with interval parameters based on dimension-wise analysis and regularization method *Nan Jiang, Menghui Xu, Yang Zhang, Wuchao Qi*
9:45-10:00	MS19-3	A new computational inverse algorithm for dynamic load identification of stochastic structure *Linjin Wang, Jinwei Liu, Haihua Wu*
10:00-10:15	MS19-5	Sparse regularization-based scheme for estimating unknown moving forces and initial conditions *Chudong Pan*
10:15-10:30	MS19-6	One identification method of distributed dynamic load based on modal coordinate transformation *Jinhui Jiang, Huangfei Kong, Ke Wang*
10:30-10:45	MS19-7	Research on identification methods of excitation forces based on system response amplitudes *Yechi Ma, Xiao-ang Liu*
11:00-11:15	MS19-8	A quick identification method for impact load *Jianlin Meng, Ruoyu Chen, Shilin Xie*
11:15-11:30	MS19-9	A probabilistic framework for stochastic dynamic load identification on uncertain structure *Shaoqing Wu, Yanwei Sun*
11:30-11:45	MS19-10	Identification of the annularly distributed dynamic load at the interface between satellite and rocket *Jian Yin, Shaoqing Wu*
11:45-12:00	MS19-11	A distributed dynamic load identification approach based on sub-region interpolation *Yi Zheng, Shaoqing. Wu*
12:00-12:15	MS19-12	Research on the non-iterative inversion method for identifying dynamic loads *Yue Wu, Bo Yu*

Session 2C2

MS19 Recent regularization methods for dynamic load identification

-Chairs: Tommy H.T. Chan, Zhen Chen, Jie Liu, Baijie Qiao

Time	ID	Title / Author(s)
13:45-14:00	MS19-13	Inverse analysis of the surface wind pressure on structure through strain gauge *Chung-Yue Wang, Muhammad Ibnu Syamsi, S. H. Chen, Chia-Ren Chu*
14:00-14:15	MS19-14	Sparse regularization for impact force identification *Baijie Qiao, Xuefeng Chen*
14:15-14:30	MS19-15	Simultaneous identification of moving vehicle forces and lanes using sparse regularization and dictionary *Huanlin Liu, Ling Yu*
14:30-14:45	MS19-17	Research on periodic and impact load identification technology based on different regularization *Bingrong Miao, Yaoxiang Luo, Feng Zhou, Chuanying Jiang, Qiming Peng*
14:45-15:00	MS19-18	On the axisymmetric torsional vibration analysis of composite bars *Longtao Xie, Ji Wang*
15:00-15:15	MS19-19	Identification and sparse representation of time-space coupled distributed dynamic load *Kun Li, Jie Liu, Xu Han*
15:15-15:30	MS19-4	**Invited report:** Health monitoring of composite structures based on impact force identification *Ning Hu, Hisao Fukunaga, Yaolu Liu, Huiming Ning*

Session 2C3

MS17 Structural uncertainty analysis and reliability design

-Chairs: Chao Jiang, Bingyu Ni

Time	ID	Title / Author(s)
16:00-16:15	MS17-5	**Invited report:** Direct probability integration method in computational stochastic mechanics *Guohai Chen, Dixiong Yang, Wenpei Wang*
16:15-16:30	MS17-1	Pid parameters tuning of system with interval uncertainties based on simulated annealing optimization algorithm *Jiaxiang Liu, Chen Yang, Lei Wang*
16:30-16:45	MS17-2	A three-dimensional probabilistic fracture mechanics method for brittle structures considering random field fracture properties *Kai Liu, Xiangyun Long, Chao Jiang*
16:45-17:00	MS17-3	A new reliability-based design optimization framework for complex structures via isogeometric analysis *Hao Peng, Yutian Wang, Bo Wang, Gang Li*

17:00-17:15	MS17-4	Damage identification method for high arch dam based on seismic damage mode *Yuanyuan Huang, Chun Zhang, Dengpeng Li, Yun Chen*
17:15-17:30	MS17-6	Isogeometric analysis of stochastic plate structures using variational collocation method *Wenpei Wang, Dixiong Yang*
17:30-17:45	MS17-9	Field optimization model and simulation-based optimization method *Bingyu Ni, Chao Jiang*
17:45-18:00	MS17-11	An efficient strategy for non-probabilistic reliability-based multi-material topology optimization with evidence theory *Qinghai Zhao, Hongxin Zhang, Tiezhu Zhang, Qingsong Hua*
18:00-18:15	MS17-12	An improvement of probabilistic feasible region method *Zihao Wu, Ge Chen, Zhenzhong Chen, Xuehui Gan, Xiaoke Li, Shenze Wang*

Day 2: Room D Parallel Sessions: Wednesday - September 25, 2019

Session 2D1

MS5 Design methodologies for automotive structures and systems

-Chairs: Gyung-Jin Park, Yingchun Bai, Huiming Ning

Time	ID	Title / Author(s)
9:15-9:30	MS5-3	**Invited report:** A finite element model for the thermo-stamping of woven fabric thermoplastic composite *Youkun Gong, Huiming Ning, Ning Hu, Zengrui Song*
9:30-9:45	MS5-1	Mechanical behavior of single hat-shaped composite t-joint for lightweight automobile structures *Wenbin Hou, Xianzhe Xu, Liyong Tong*
9:45-10:00	MS5-4	Experimental investigation of vibration performance of a lightweight hybrid joint - seam-welded aluminum bonded by composites *Yingchun Bai, Chuanliang Fu*
10:00-10:15	MS5-5	Multi-objective robust design optimization of a two-dimensional tri-axial braided hollow pillar using an evolutionary algorithm *Jishi Yang, Dongyang Sun, Ning Hu, Huiming Ning, Jianyu Zhang, Wei Ye, Jian Wu*
10:15-10:30	MS5-6	Multi-scale numerical simulations of thermal expansion properties of cnt/polymer nanocomposite *Teng Xiao, Alamusi, Huiming Ning, Liangke Wu*

Session 2D2

MS15 Inverse problems in nonlocal models and related topics

-Chairs: Gongsheng Li, Zhiyuan Li

Time	ID	Title / Author(s)
11:00-11:15	MS15-3	Infinite dimensional approximate error bayes' approach for inverse scattering problems of fractional helmholtz equations *Junxiong Jia, Shigang Yue, Jigen Peng, Jinghuai Gao*
11:15-11:30	MS15-4	Recovering an unknown source in a fractional diffusion problem *Zhidong Zhang*
11:30-11:45	MS15-5	Unique determination of several coefficients in a fractional diffusion(-wave) equation by a single measurement *Yavar Kian, Zhiyuan Li, Yikan Liu, Masahiro Yamamoto*
11:45-12:00	MS15-6	Recovering the time-dependent potential function in a multi-term time-fractional diffusion equation *Liangliang Sun*

Session 2D3

MS7 Statistical inference and uncertainty quantification

-Chair: Daniel Watzenig

Time	ID	Title / Author(s)
13:45-14:00	MS7-1	Tomographical detector for gas distributions in exhaust pipes considering noise in the measurement chain *Bernhard Fischbacher, Bernhard Lechner, Bernhard Brandstätter*
14:00-14:15	MS7-2	Bayesian analysis and design of experiments of biofilms over space and time *Al Parker*
14:15-14:30	MS7-3	**Invited report:** Statistical inference for a high-fidelity lithium-ion cell model *Matthias K. Scharrer, Franz Pichler, Daniel Watzenig*
14:30-14:45	MS7-4	Bayes-optimal filtering for nonlinear dynamical systems *Colin Fox, Sergey Dolgov, Malcolm E. K. Morrisonc, Timothy C. A. Molteno*
14:45-15:00	MS7-5	Sequential estimation of the kidney metabolic heat generation rate with bayesian filters *Felipe Y. Magalhães, Helcio R. B. Orlande, Nelson A. Lutaif, José A. Gontijo*
15:00-15:15	MS7-6	A study of initial imperfection influence on structural buckling load by stochastic computing *Jianyu Li, Kaijie Wei*
15:15-15:30	MS7-7	The coupled Pod-Mcmc estimation of parameters of the nonequilibrium porous media model based on the real data *Zbigniew Buliński, Helcio R.B. Orlande, Tomasz Krysiński, Sebastian Werle, Łukasz Ziółkowski*

Session 2D4

MS18 Data-driven surrogate modeling techniques for inverse and other engineering problems

-Chairs: Hu Wang, Haobo Qiu, Jian Zhang

Time	ID	Title / Author(s)
16:00-16:15	MS18-9	**Invited report:** Extended two-layer adaptive surrogate-assisted evolutionary algorithm for high-dimensional computationally expensive constrained optimization problems *Zan Yang, Haobo Qiu, Chen Jiang, Liming Chen*
16:15-16:30	MS18-6	**Invited report:** A unified ensemble of surrogates with global and local measures for engineering design and optimization *Jian Zhang, Jiajia Qiu, Xinxin Yue*
16:30-16:45	MS18-1	Image-based reconstruction for the impact problems by using DNNs *Yu Li, Hu Wang, Kangjia Mo, Xinchao Jiang*
16:45-17:00	MS18-2	Identification of material parameters for 18650 lithium-ion battery using a novel Vae-based approximate bayesian computation method *Jiaquan Wang, Hu Wang, Yang Zeng, Enying Li, Guangyao Li*
17:00-17:15	MS18-3	High-low level gaussian process regression prediction approach (Gl-gpr) for insitu data modeling with input parameters of unequal sample sizes *Maolin Shi, Wei Sun, Liye Lv, Xueguan Song, Hongyou Li*
17:15-17:30	MS18-4	Aerodynamic optimization of tail-board in heavy-duty truck based on approximate model *Xiaoping Xie, Hongbo Wang, Kaige Zhang*
17:30-17:45	MS18-5	How many doe numbers are required for estimating accuracy of a surrogate model *Yin Liu, Shuo Wang, Liye Lv, Xueguan Song*
17:45-18:00	MS18-7	An inaccurate search technique enhanced sequential approximate optimization for black-box optimization *Zeping Wu, Donghui Wang , Weihua Zhang, Jiawei Yang, Kun Zhao*
18:00-18:15	MS18-8	Determination of mechanical parameters for geomaterial by particle swarm optimization and multi-output support vector machine *Hongbo Zhao, Changxing Zhu*
18:15-18:30	MS18-10	Control optimization for cubesats via variable mass displacements based on surrogate model *Jiaxin Li, Ke Peng, Weihua Zhang, Zeping Wu*

Day 3: Room B Parallel Sessions: Thursday - September 26, 2019

Session 3B1

MS4 Inverse coefficient identification problems

-Chair: Daniel Lesnic

MS9 Inverse problems and optimization meet the geosciences

-Chair: Zuhair Nashed

Time	ID	Title / Author(s)
9:15-9:30	MS4-3	Identification of anisotropic nonlinear thermal conductivity using combined optimization method *Chenxu Jiang, Jianyao Yao, Linlin Wang, Zeyu Deng*
9:30-9:45	MS4-4	Determination of the heat transfer coe cient at the interface of an inhomogeneous Bi-material *Lijun Zhuo, Daniel Lesnic, Songhe Meng*
9:45-10:00	MS4-5	A multi-objective identification of discrete element model parameters for rock-like materials *Rui Chen, Jisheng Li, Yong Wang, Ruitao Peng, Ziheng Zhao, Shengqiang Jiang*
10:00-10:15	MS4-6	Determination of unknown time-dependent heat source in an inverse problem under nonlocal boundary conditions by using finite integration method based on a trapezoid rule *Areena Hazanee*
10:15-10:30	MS4-7	Identification of time-dependent convection coefficient in a time-fractional diffusion equation *Liangliang Sun, Xiongbin Yan, Ting Wei*
10:30-10:45	MS4-8	An two-stage genetic algorithm (Ga) for inverse determination of molding parameters for curing composite laminates with minimized warping *Xuerui Li, Shuyong Duan, Zhanming Zhang, Guirong Liu*
11:00-11:15	MS9-1	Automatic random seismic noise elimination based on the curvelet transform *Jingjie Cao, Zhicheng Cai*
11:15-11:30	MS9-2	Inverse characterization of carbonate reservoirs with fractal geometry *Susana Gomez, Carlos Minutti, Gustavo Ramos, Rodolfo Camacho*

Session 3B2

MS23 Novel system identification methods in Civil Engineering

-Chairs: Yong Ding, Dongyu Zhang

Time	ID	Title / Author(s)
13:45-14:00	MS23-1	**Invited report:** A load identification method for nonlinear structures with orthogonal polynomial decomposition *Yong Ding, Lina Guo, Peng Lang*
14:00-14:15	MS23-2	Identification method of load and parameters based on nonlinear structural FE model *Lina Guo, Zhonghao Zhang, Xinyan Shao*
14:15-14:30	MS23-3	Improving substructure identification accuracy of shear structures with synthesized reference responses *Zhiqiang Zhang, Dongyu Zhang*
14:30-14:45	MS23-4	Real-time hybrid simulation with online model updating by unscented kalman filter of buckling-restraint-brace frame structure *Xizhan Ning, Yong Ding, Zhen Wang, Bin Xu*
14:45-15:00	MS23-5	The improved time domain response sensitivity enhancement method for damping identification *Kun Liu, Guibo Nie*
15:00-15:15	MS23-6	Sparse bayesian learning and dual kalman filter implementation for input and state estimation via output-only acceleration measurements *Yong Huang, Hui Li, James L. Beck*
15:15-15:30	MS23-7	Vcs based substructure identification for shear structures *Dongyu Zhang, Zhiqiang Zhang, Yong Ding*
15:30-15:45	MS23-8	Monitoring and analysis of ancient building columns on the basis of relative dynamic method *Xiufang Wang, Guohua Li, Jun Dong, Yaowei Huang*

Day 3: Room C Parallel Sessions: Thursday - September 26, 2019

Session 3C1

MS3 Optimization problems for real-life objects

-Chair: Igor Nikolayevich Egorov

MS6 Data Assimilation and Inverse Problems for Dynamical Systems

-Chair:

Time	ID	Title / Author(s)
9:15-9:30	MS3-1	The concept of centrifugal compressor optimization using multi-level models *Evgeny Yu. Marchukov, Igor N. Egorov, Grigorii M. Popov, Oleg V. Baturin, Vasilii M. Zubanov, Andrei A. Volkov*
9:30-9:45	MS3-2	Optimization of the three-stage gas turbine by gas-dynamic efficiency and strength *Evgeny Yu. Marchukov, Igor N. Egorov, Grigorii M. Popov, Anton V. Salnikov, Evgenii S. Goriachkin, Daria A. Kolmakova*
9:45-10:00	MS3-3	Optimization of axial multi-shaft compressor of industrial gas turbine plant by engine parameters *Igor N. Egorov, Grigorii M. Popov, Oleg V. Baturin, Evgenii S. Goriachkin, Yulia D. Novikova*
10:00-10:15	MS3-4	Optimization of muzzle brake recoil force reduction by using flowvision cfd coupled with IOSO optimization *Aksenov A, Babiy Yu, U. Ozturk, Chuan J.Yu*
10:15-10:30	MS3-5	Innovation digital technology for design air engine next generation *Eu.U. Marchukov, Igor N. Egorov*
10:30-10:45	MS3-6	Concept of numerical engine models as element of virtual prototyping and digital twins of modern different aircraft *M.A Pogosyan, Eu.U. Marchukov, Igor N. Egorov, Dm. U Strelec*
11:00-11:15	MS3-7	Numerical multi-disciplinary optimization elements of modern civil engine using 3D codes *A.A Inozemcev, Eu.U. Marchukov, Igor N. Egorov, S.A Harin, V.K Sichev, A.A Shvirev*
11:15-11:30	MS3-8	Numerical technology for modern helicopter engine based on the multi-level concept, vector identification and multi-objective optimization *A.V Grigoriev, E. Yu Marchukov, Igor N. Egorov, A.V Solov'eva*
11:30-11:45	MS3-9	The optimization of four-stage low pressure turbine with outlet guide vane *Yu.S Eliseev, Igor N. Egorov, G.M Popov, A. V Shatsky*
11:45-12:00	MS6-1	Discrete inverse problem of neural conductances determination *Jemy A. Mandujano Valle*
12:00-12:15	MS6-2	Application of regularization techniques in satellite data assimilation for improving numerical weather prediction *Wei Han , Xueshun Shen, Niels Bormann*

Session 3C2

MS24 Recent methods for multidisciplinary design and optimization

-Chairs: Jianguo Zhu, Shiyou Yang, Yongjian Li

Time	ID	Title / Author(s)
13:45-14:00	MS24-1	**Invited report:** Application-oriented design optimization of electrical drive systems *Jianguo Zhu, Gang Lei, Bo Ma*
14:00-14:15	MS24-2	Robust design optimization: uncertainty quantization and numerical solution methodology *Shiyou Yang, Qiang Zhou*
14:15-14:30	MS24-3	Magnetic leakage field and local overheating in dry-type transformer based on 2d magneto-thermal-fluid coupling method *Yongjian Li, Xinxiao Yan, Changgeng Zhang*
14:30-14:45	MS24-4	Topology optimization design of nonlinear two-dimensional non-pneumatic tire *Dengfeng Huang, Xiaolei Yan, Ju He*
14:45-15:00	MS24-5	Multi-physics analysis and mechanical state evaluation of power transformer *Shuang Wang, Shuhong Wang, Naming Zhang, Song Wang*
15:00-15:15	MS24-6	An improved firefly algorithm with dynamic and adaptive strategy *Ran Tao, Huanlin Zhou, Zeng Meng*
15:15-15:30	MS24-7	A hybrid algorithm for many-objective optimization *Sohail R. Reddy,George S. Dulikravich*

Day 3: Room D Parallel Sessions: Thursday - September 26, 2019

Session 3D1

MS22 Integrated Design of Material and Structure

-Chairs: Bo Wang, Jihong Zhu, Zhanli Liu, Shujuan Hou

Time	ID	Title / Author(s)
9:15-9:30	MS22-6	**Invited report:** Designing phononic crystal with anticipated band gap through a deep learning based data-driven method *Zhanli Liu, Xiang Li, Shaowu Ning, Ziming Yan, Chengcheng Luo, Zhuo Zhuang*
9:30-9:45	MS22-9	**Invited report:** Structural shape preserving design using topology optimization *Jihong Zhu, Yu Li, Weihong Zhang*
9:45-10:00	MS22-10	Design optimization of stiffened plate structures subjected to dynamic loads *Jiaming Yan, Kaituo Xu, Yuming Mao, Bin Niu*
10:00-10:15	MS22-1	Identification of thermal properties of metal materials using infrared thermography *Thiago G. Semann, Luis M. Moura, Stephan H. Och*
10:15-10:30	MS22-2	A new two-scale topology optimization method for maximum natural frequency *Xiaolei Yan, Qiwang Xu*

10:30-10:45	MS22-3	A novel subdomain level set method for structural topology optimization *Hui Liu, Hongming Zong, Ye Tian, Qingping Ma, Michael Yu Wang*
11:00-11:15	MS22-4	Structure optimization of pentamode wave contorl based on Pso algorithm *Chao Sun, Han Zhang, Yang Jun*
11:15-11:30	MS22-5	Data-driven topology optimization of hierarchical lattice structures *Zhen Liu, Liang Xia*
11:30-11:45	MS22-8	Bio-inspired composite material design under crashworthiness criterion *Chuanhao Lu, Shujuan Hou, Xu Han*
11:45-12:00	MS22-11	Zone folding induced tunable topological interface states in one-dimensional phononic crystal plates *Hongbo Zhang, Bilong Liu, Xilong Zhang*
12:00 -12:15	MS22-12	Mechanical analysis and design of Graphene/PEEK nano-composite *Tong Li, Ke Zhang, Bo Wang*

Session 3D2

MS25 Inverse analysis of responses for interrogating structural damage

-Chairs: Maosen Cao, Qiang Wang, Wei Xu

Time	ID	Title / Author(s)
13:45-14:00	MS25-1	**Invited report:** Comprehensive geophysical monitoring technology for ground deformation and destruction during underground engineering excavation *Shuigen Hu*
14:00-14:15	MS25-2	An array of coupled vibro-acoustic excitation for nonlinear identification of “breathing” delamination in composite laminates: a numerical study *Wei Xu, Zhongqing Su, Meri Cvetkovska, Maosen Cao*
14:15-14:30	MS25-3	Lamb wave based crack damage detection using adjusted tomography method *Qiang Wang, Jing Xu, Shaodong Zhang*
14:30-14:45	MS25-4	An enhanced spectral element method for evaluation of high-order modes of multi-crack beams *Zongmei Xu, C X Liu, Maosen Cao, Wei Xu*
14:45-15:00	MS25-5	Real Time Identification of Instantaneous Tension by Vibration Monitoring Data Based on Synchrosqueezing Wavelet Packet Transform: Algorithm And Applications *Xin Zhang, Jiayi Peng, Maosen Cao, Meri Cvetkovska*
15:00-15:15	MS25-6	Bridge Damage Localization Using the Mode Shape Estimated from A Passing Vehicle *Wen-Yu He, Jian He, Wei-Xin Ren*
15:15-15:30	MS25-7	Sensitivity of Surface-Boned Active Pzt Sensor for Plate Damage Detection *Binkai Shi, Guangquan Zhao, Maosen Cao, Zijian Wang*
15:30-15:45	MS25-8	Identification of Seismic Damage in Curved Continuous Girder Bridges using Wavelet Packet Singular Entropy *Tongfa Deng, Dayang Li*

Plenary Lecture 1

Prof. George S. Dulikravich

Department of mechanical and materials engineering, Florida International University, USA

Lecture Title: ***Interaction of inverse problems, design and optimization***

Abstract: Analysis (or direct) problems are mathematically defined and numerically solvable if the following information is provided: 1) shape and size of domain, 2) boundary and initial conditions, 3) sources/sinks spatial and temporal distribution, 4) physical properties of the media in the domain, and 5) governing equation(s). Inverse (or reverse) problems are mathematically defined as de facto analysis problems when one or more of these five pieces of information are not available. Inverse problems are numerically solvable if sufficient pertinent additional information is provided. Design is generally understood as a set of methods used to achieve new creative solutions that uses either the subjective experience of the designer or maximizes certain desired features of the solution. Inverse design involves finding values of the design variables that will create a product with specific desired features. For example, determine the shape of a wing that will have a specified desired pressure distribution on its surface. That is, determine geometric parameters that will create the shape of a wing and its airfoils that will produce this specified surface pressure distribution. Design optimization involves finding values of the design variables that will create a product with either one (single-objective) or simultaneously many (multi-objective) features that are either maximized or minimized, subject to user-specified constraints. For example, find a set of geometric parameters defining an airplane wing shape that will have minimum drag, while maintaining the specified values of lift and wing interior volume for fuel tanks. Optimization requires a very large number of analysis results of mathematical system where design variables are randomly perturbed within specified ranges of magnitudes. Since numerical methods for obtaining high accuracy (high fidelity) analysis results are the most time consuming step in the overall design process, orders of magnitude faster approximate methods (metamodels) for performing analyses having acceptably lower accuracy are required. For example, using a set of high fidelity analysis results, develop and use a multi-dimensional hypersurface (response surface) fitting these data, or, develop a fast input-output relation (artificial neural network, machine learning, reduced order modeling, etc.). Thus, links among analysis, inverse problems and design have been well established. However, direct interaction between inverse problems, design and optimization is still an open avenue for research. For example, when performing an iterative inverse shape design of an airplane wing, a relatively large number of incrementally updated wing shapes need to be aerodynamically analyzed using high fidelity analyses which is very costly. At the end of such an inverse design process, the resulting shape might not be manufacturable because of the designers specified desired surface pressure distribution. On the other hand, if a brute force design optimization of the wing shape is performed, it will still require a large amount of computing time to analyze aerodynamic features of a relatively large number of randomly created wing configurations in order to then create metamodels so that actual optimization can be performed efficiently. This suggests that inverse design should be combined with optimization in order to utilize the experience of the designer(s) in order to avoid analyzing numerous configurations that are obviously aerodynamically meaningless.

Plenary Lecture 2

Prof. Gengdong Cheng

State Key Laboratory of Structural Analysis for Industrial Equipment, Dalian University of Technology, China

Lecture Title: ***Topology Optimization via Sequential Integer Programming and Discrete Sensitivity Analysis***

Abstract: The mathematical essence of structural topology optimization is large-scale nonlinear integer programming. To overcome its huge computational burden, the popular way is to relax the 0-1 variable constraints and transform the integer programming to continuous variable programming. To cope with the variable transformation, the well-know SIMP (Solid Isotropic Material with Penalty) method introduces the interpolation schemes for the material properties versus design variables with penalty and achieves great success and popularity. However, there is no doubt that directly tackling the large-scale nonlinear integer programing is very important. This paper solves the structural topology optimization problems with single or multiple constraints by applying the Canonical Dual Theory together with Sequential Approximate Programming approach under the classic structural topology optimization formulations.

The present paper firstly present a new study on the discrete sensitivity analysis, with which the explicit and separable approximate Sequential Quadratic Integer Programming (SQIP) or Sequential Linear Integer Programming (SLIP) subproblems are constructed. And then, the subproblems are solved by applying the Canonical relaxation algorithm based on CDT theory. Their special mathematical structures are exploited to develop analytic solution of Khun-Tucker condition of the dual programming. Numerical experiments of two linear and quadratic integer programming problems with random coefficients show that the Canonical relaxation algorithm can get approximate solutions with good properties very efficiently and the dual gap is negligible when the number of design variables increases.

Two different move limit strategies within the new method are presented. The new method first solves a set of classic topology optimization problems with only material usage constraint, including minimum structural compliance design under constant load, maximum heat transfer efficiency for the heat conduction problem. And then we apply the method to the topology optimization problems with multiple constraints, including minimum structural compliance design under an additional local displacement constraint and minimum structural compliance design under infill constraints. The results of these problems demonstrate that the new method can efficiently solve the discrete variable structural topology optimization problems with multiple nonlinear constraints or many local linear constraints in a unified and systematic way and can get integer solutions when combined with the move limit strategy of controlling the volume fraction parameter. It can deal with much more design variables than the general branch and bound method.

Plenary Lecture 3

Prof. Kalyanmoy Deb

Electrical and Computer Engineering, Michigan State University, USA

Lecture Title: ***Customized Optimization for Practical Problem solving***

Abstract: Practitioners are often reluctant to use a formal optimization method for routine design and other practical applications, mainly due to the general perception of requiring a large computational time and ending up with a specialized and often "brittle" solution. Optimization methods have come a long way and are made flexible to handle various practicalities including reduction of solution time, handle large dimensions, search for robust and reliable solutions, and discover useful knowledge understanding intricacies of the problem. In this talk, we shall emphasize the importance of customized optimization algorithms in handling various practicalities. A few case studies from industries involving an extreme scale (billion-dimensional) problem and computationally expensive (consuming two days per evaluation) will be presented to demonstrate the usefulness of computational intelligence methods.

Plenary Lecture 4

Prof. Jari Kaipio

Department of Mathematics, University of Auckland, New Zealand

Lecture Title: ***Modelling of boundary uncertainties in inverse problems***

Abstract: A large class of inverse problems are induced by partial differential equations and the related initial-boundary value problems. In many cases, the exact shape of the domains is only approximately known [1]. Furthermore, domain truncation is also often carried out for computational reasons. On these truncation boundaries, the boundary conditions are unknown [2, 3]. In this talk, we consider the modelling of such boundary uncertainties [4].

[1] A Nissinen, V Kolehmainen, JP Kaipio. Compensation ofmodelling errors due to unknown domain boundary in electricalimpedance tomography. IEEE Transactions on Medical Imaging, 2011, 30: 231-242.
[2] D Calvetti, PJ Hadwin, JMJ Huttunen, D Isaacson, JP Kaipio, D McGivney, E Somersalo, J Volzer. Artificial boundary conditionsand domain truncation in electrical impedance tomography, Part I: Theory and preliminary results. Inverse Problem Imaging, 2015, 9: 749-766.
[3] D Calvetti, PJ Hadwin, JMJ Huttunen, JP Kaipio, E Somersalo. Artificial boundary conditions and domain truncation inelectrical impedance tomography. Part II: Computational results. Inverse Problem Imaging, 2015, 9: 767-789.
[4] JP Kaipio, V Kolehmainen. Approximate marginalization overmodeling errors and uncertainties in inverse problems. Bayesian Theory and Applications, Oxford University Press, 2013.

Keynote Lecture 1

Prof. Anatoly G. Yagola

Department of Mathematics, Faculty of Physics, Lomonosov Moscow State University, Russia

Lecture Title: ***A Priori and a Posteriori Error Estimation for Solutions of Ill-posed Problems***

Abstract: In order to calculate a priori or a posteriori error estimates for solutions of an ill-posed operator equation with an injective operator we need to describe a set of approximate solutions that contains an exact solution. After that we have to calculate a diameter of this set or maximal distance from a fixed approximate solution to any element of this set. I will describe three approaches for constructing error estimates and also their practical applications.

Keynote Lecture 2

Prof. Qing Li

School of Aerospace, Mechanical and Mechatronic Engineering, the University of Sydney, Australia

Lecture Title: ***An Optimization Procedure for Parametric Identification of Complex Structural Systems***

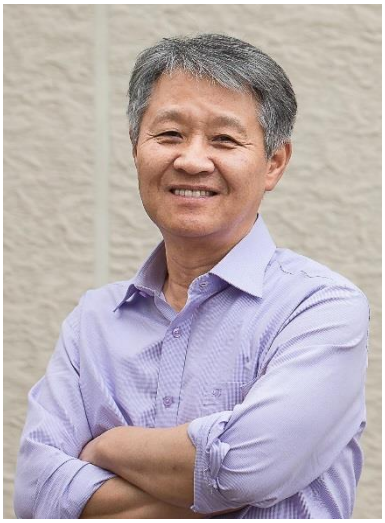
Abstract: Determination of structural and material parameters signifies a class of critical problems in engineering, which enables to model complex systems accurately. In this regard, inverse identification techniques are commonly adopted by minimizing the difference of structural responses obtained from the experiments and numerical model. In this paper, an optimization based inverse problem is first constructed by formulating the difference between the experimental data and the finite element (FE) modeling responses in terms of these unknown parameters. To overcome the non-uniqueness issue of the parameters identified, various functional constraints are imposed to tighten the design space. Subsequently, different optimization algorithms are used to solve for the unknown structural and/or material parameters. Finally, the identified parameters are used in the finite element model to validate its effectiveness.

Two demonstrative examples are presented in this paper. The first aims to identify masticatory muscular forces for an oral reconstruction patient. In spite of critical importance to co-activation of a set of masticatory muscles contributing on the fundamental oral functions, determination of each muscular force remains fairly challenging in vivo; in which the conventional data available may be inapplicable to the patients who experience major oral interventions such as maxillofacial reconstruction. To ensure uniqueness, physiological constraints of the muscle forces to be determined are imposed. The identification results shows fairly good agreement with the experimental data in vivo. The second example aims to identify cell-wall material properties of closed-cell aluminum (Al) foams. The Vickers nano-indentation tests are conducted to measure the localized material properties for the FE modeling of foam materials. It is found however, that the indentation load-depth curve is insufficient and leads to an ill-posed problem for fully identifying nonlinear parameters of foam materials. For this reason, additional experimental data, e.g. pile-up of indentation, is required to provide further information for identification. The determined cell-wall material parameters were then validated by comparing the numerical results with the experimental data in terms of the plastic deformation/failure modes; and excellent agreement is obtained.

The optimization based identification approach is found effective for the complex problems with possible non-uniqueness of the determined parameters. The further study is required to determine the additional information more efficiently.

[1] Keke Zheng, Zhipeng Liao, Nobuhiro Yoda, et al. Investigation on masticatory muscular functionality following oral reconstruction – an inverse identification approach. Journal of Biomechanics, 2019, 90(11): 1-8.

Keynote Lecture 3



Prof. Gyung-Jin Park

Department of Mechanical Design and Production Engineering, College of Engineering, Hanyang University, South Korea

Lecture Title: ***Nonlinear Static/Dynamic Response Structural Optimization***

Abstract: Linear static response structural response has been developed quite well by using the finite element method for linear static analysis. However, development is extremely slow for structural optimization where a nonlinear static analysis technique is required. Optimization methods using equivalent static loads (ESLs) have been proposed to solve various structural optimization disciplines. The disciplines include linear dynamic response optimization, structural optimization for multi-body dynamic systems, structural optimization for flexible multi-body dynamic systems, nonlinear static response optimization and nonlinear dynamic response optimization. The ESL is defined as the static load that generates the same displacement field by an analysis which is not linear static. An analysis that is not linear static is carried out to evaluate the displacement field. ESLs are evaluated from the displacement field, linear static response optimization is performed by using the ESLs, and the design is updated. This process proceeds in a cyclic manner. The method is named as Equivalent Static Loads method for non-linear static response Structural Optimization (ESLSO or ESLM).

Out of various methods of ESLM, nonlinear static/dynamic response optimization is introduced. Nonlinear static/dynamic response analysis is carried out by a commercial system such as LS/DYNA, the ESLs are generated and linear static optimization is performed by a commercial optimization system. The interface module for the software systems is developed. Size and shape optimizations as well as topology optimization are demonstrated by using examples. The installation status of the method in the commercial software systems is shown and the future direction of the method is discussed.

Keynote Lecture 4

Prof. Daniel Lesnic

Department of Applied Mathematics, University of Leeds, United Kingdom

Lecture Title: ***Inverse Problems for Degenerate Parabolic Equations***

Abstract: We consider solving numerically inverse problems of determining the time-dependent thermal conductivity coefficient for a weakly degenerate heat equation, which vanishes at the initial moment of time, and/or the convection coefficient along with the temperature for a one dimensional parabolic equation, from some additional information about the process (the so-called over determination conditions). Although uniquely solvable these inverse problems are still ill-posed since small changes in the input data can result in enormous changes in the output solution. The Crank-Nicolson finite difference method combined with the Tikhonov regularization are employed in order to obtain accurate and stable numerical solutions. The resulting nonlinear minimization problem is computationally solved using the MATLAB toolbox routine lsqnonlin.

Keynote Lecture 5

Prof. Igor N. Egorov

IOSO Technology Center, Russia

Lecture Title: ***IOSO Optimization Technology: Main possibilities and examples usage for real-life problems in different area***

Abstract: We present main possibilities of IOSO Optimization Technology:

-IOSO Optimization Technology - what is it?

-Haw work of IOSO Optimization Technology?

-What show comparative analysis IOSO Optimization Technology with different well-known optimization Technology?

-Haw can be use of IOSO Optimization Technology?

-What different well-known software can be integrating with IOSO Optimization Software? - Where IOSO Optimization Technology can be use?

Keynote Lecture 6

Prof. Yanfei Wang

Institute of Geology and Geophysics, Chinese Academy of Sciences, China

Lecture Title: ***Sparse Regularization and Optimization Methods for Seismic Data Processing and Imaging***

Abstract: We address two main problems in seismic data processing: the first is the compressive seismic acquisition and multi-trace seismic wavefield recovery. This is an ill-posed problem in seismic image processing partly due to limitations of the observations usually yielding incomplete data. To take account of the collective correlation from a given set of seismic samples as well as each individual, a matrix minimization model is presented to jointly representing all the testing samples over the coding bases simultaneously. A generalized matrix norm $l_{2,p} (0<p\leq 1)$ is employed to measure the interrelation of the multiple samples and the entries of each one. Algorithm is developed and the convergence analysis is demonstrated for the range of parameters p\in (0,1]$. The second problem is the seismic imaging. Main techniques are wave-based migration and ray-based migration. We consider seismic migration sing sparse Gaussian beams. Extensive experimental tests are performed to exhibit the efficient performance of the developed methods.

7. SPONSORS

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VISITING TIANJIN

Tianjin is one of the municipality of People's Republic of China, the national center city, the economic center of Bohai, the northern international financial innovation operation demonstration area of reform and opening up, the Asia Pacific Regional Ocean testing evaluation center.

At the same time, Tianjin is a famous historical and cultural city. There are 15 national key cultural relics protection units at present, including the Dule temple, Dagu fort, Wanghailou church, etc.. The ancient Huangyaguan Great Wall was listed as world cultural heritage, there are more than 20 Beacon Tower with various shapes hovering in the mountains, surrounded by picturesque scenery. The city has a nice maritime climate in September every year.

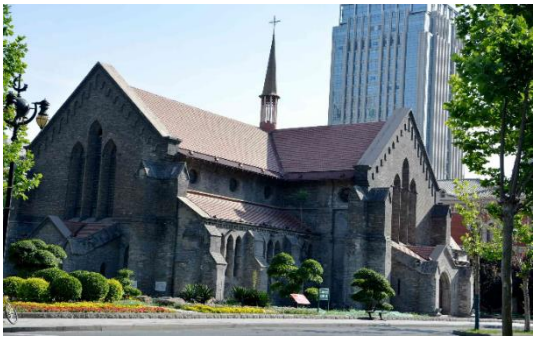
Huangyaguan Great Wall

Dule Temple

Ancient Culture Street

Dagu fort

Tianjin City



Tianjin City