# The First International Conference on Energy and AI iceaj 2020 | Program





January 9-12, 2020

Tianjin, China

energy-ai.org



## Foreword

Dear Friends and Colleagues,

Welcome to the First International Conference on Energy and AI (ICEAI, 2020), to be held in Tianjin on January 9-12, 2020.

The First International Conference on Energy and AI (ICEAI 2020) is hosted by Tianjin University. It aims to provide an authoritative platform for leading scientists and researchers to exchange and share the latest research progress in the cross-disciplinary area of energy and AI, focusing on the innovative applications of AI to address the critical challenges in energy systems, energy materials, energy chemistry, energy utilization & conversion, energy & society, as well as other important pressing issues. The conference also aims to promote the development of AI technologies for advancing the energy, decarbonization and sustainable development, such as data-driven approaches, optimization algorithms and AI ethics. There will also be a focus on building up links for future collaborations.

We also invite you to explore Tianjin, Tianjin is one of the four municipalities directly under the central government of China, with the highest density and higher education in China, and to experience the development of Chinese traditional culture.

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#### **Conference Co-chairs:**

Raffaella Ocone Kuí Jíao Jín Xuan

January 1, 2020





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## **Conference Co-chairs**



**Prof. Raffaella Ocone** *Heriot-Watt University, UK* 



**Prof. Kui Jiao** *Tianjin University, China* 



**Prof. Jin Xuan** Loughborough University, UK





## **International Advisory Committee**

Adrian Bejan (US)	Jae Wan Park (US)
Wenmiao Chen (China)	Zhiguo Qu (China)
Daniele Marchisio (Italy)	Saher Al Shakhshir (US)
Qing Du (China)	Gequn Shu (China)
Fei Gao (France)	Mirosław J. Skibniewski (US)
Jinlong Gong (China)	Andrea Tonello (Austria)
Zhongjun Hou (China)	Fang Wang (China)
Hong Geun Im (Saudi Arabia)	Hai Wang (US)
Donghan Jin (China)	Huizhi Wang (UK)
Markus Kraft (UK)	Yun Wang (US)
Chung K. Law (USA)	Billy Wu (UK)
Xianguo Li (Canada)	Fu Xiao (China)
Yufeng Li (China)	Hui Xie (China)
Shengchun Liu (China)	Mingfa Yao (China)
Shuangxi Liu (China)	Nada Zamel (Germany)
Henrik Madsen (Denmark)	Jiujun Zhang (China)
Rui Ma (China)	Junhong Zhang (China)
John McPhee (Canada)	Ziliang Zhao (China)
Pingwen Ming (China)	Bingfeng Zu (China)
Meng Ni (China)	



## **Local Organizing Committee**

**Fugiang Bai,** *Tianjin Internal Combustion Engine Research Institute* Shuai Deng, *Tianjin University* Cheng Fan, Shenzhen University Ting Guo, China Automotive Technology and Research Centre Ning Han, *Tianyuan Power* **Qian Liang,** *Tianjin University* **Jiewei Lin,** *Tianjin University* Haifeng Liu, *Tianjin University* **Zhi Liu,** *Tianjin University* **Yanzhou Qin,** *Tianjin University* Hua Tian, *Tianjin University* **Bowen Wang,** *Tianjin University* Yulin Wang, Tianjin University of Commerce **Yifan Xu,** *Tianjin University* **Yan Yin,** *Tianjin University* Fan Zhang, *Tianjin University* Junfeng Zhang, *Tianjin University* 





## **Sponsors**



**State Key Laboratory of Engines** 

**Tianjin Internal Combustion Engine Research Institute** 



🕞 中国一芝 China FAW Group

**捷氫科技** SHPT Shanghai Hydrogen Propulsion Technology



**CATARC** Automotive Engineering Research Institute



**CATARC** Automotive Test Center (Tianjin)



**China North Engine Research Institute** 



Elsevier



**Tianyuan Power Technology** 



**Yinlong Energy** 



**Blooking Energy Technology** 



Ningbo Bate Technology



## **Conference Venue**

Society Hill International Conference Center Hotel(社会山国际会议中心酒店)

**Room A:** The No.1 Banquet Hall, 1<sup>st</sup> Floor.

Room B: The No.3 Function Room, 4<sup>th</sup> Floor.

Room C: The No.5 Function Room, 4<sup>th</sup> Floor.

Buffet Restaurant: Romano Buffet Restaurant, 2<sup>nd</sup> Floor

#### Address: 198 Zhijing Road, Xiqing District, Tianjin

(天津市西青区知景道198号)









## Agenda Overview

#### 9<sup>th</sup>-12<sup>th</sup> January, Tianjin, China

Date	Time	Activities	Location
9 <sup>th</sup> January, 2020	10:00-21:00	Conference Registration	Society Hill International Conference Center Hotel
	8:20-8:40	Opening Ceremony	Room A
10 <sup>th</sup> January, 2020	8:40-11:50	Plenary Lecture	RoomA
	13:30-18:10	Oral Presentation	Room A & B & C
11 <sup>th</sup> January, 2020	8:20-12:00	Plenary Lecture	Room A
	13:15-16:15	Oral Presentation	Room A
	13:15-16:10	Oral Presentation	Room B & C
	16.25 17.25	Plenary Lecture	P
	16:25-17:35	Closing Ceremony	Kööni A
12 <sup>th</sup> January, 2020	9:00-11:00	Campus Visit	Tianjin University





## Program

#### 9<sup>th</sup> January, 2020, Thursday, 10:00-21:00 Society Hill International Conference Center Hotel Subject: Registration

Time	Program
10:00-21:00	Conference Registration
18:30-20:30	Buffet Dinner

## 10<sup>th</sup> January, 2020, Friday, 8:20-11:50 Room A

#### Subject: Opening Ceremony & Plenary Lectures

Time	Program	Chair	
8:20-8:40	<b>Opening Ceremony</b>		
8:40-9:20	<b>Plenary – 1:</b> Energy 4.0: Evolution and Revolution of Energy Systems	Prof. Kui Jiao	
	Speaker : Prof. Xianguo Li, University Of Waterloo		
9:20-9:50	Group Photo & Coffee Break		
9:50-10:30	<ul> <li>Plenary – 2: Accelerating the Green Transition Using AI and Energy Systems Integration</li> <li>Speaker : Prof. Henrik Madsen, Technical University of Denmark</li> </ul>		
10:30-11:10	Plenary -3: Publishing in Energy & AI: Trends and       Perspectives         Speaker : Ms. Debora Logan, Elsevier	Prof. Jin Xuan	
11:10-11:50	<ul> <li>Plenary – 4: Electrochemical Batteries and Lithium Batteries</li> <li>for New Energy Electric Vehicles: Status, Challenges,</li> <li>Perspectives</li> <li>Speaker : Prof. Jiujun Zhang, Shanghai University</li> </ul>		
11.50-13.20	Buffet Lunch and Rest		

## 10<sup>th</sup> January, 2020, Friday, 13:30-18:10 Room A

Subject-1: AI for Electrochemical Energy-1

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#### Co-Chairs: Jae Wan Park & Zhengkai Tu & Dongda Zhang & Zhigang Zhan

Time	ID	Author	Title
13:30-13:50	V1	<b>Jae Wan Park</b> University of California, Davis, USA	<b>Invited:</b> Development and demonstration of microgrid system utilizing second-life electric vehicle batteries
		Zhengkai Tu	
		Huazhong	Invited. Liferran mediation of a EC vahiala based
13:50-14:10	V2	University of	on data analysis
		Science and	
		Technology, China	
14:10-14:25	R1	Yupeng Wang	Application of digital technology in the development of fuel cell system
		Yanzhou Qin,	
14:25-14:40	R2	Guokun Liu,	Control strategy of fuel cell electric vehicle
		Yifan Yin	
14:40-14:55	R3	Qiang Li, Anyu Bai, Sun Hong	Preparation of sulfur and nitrogen co-doped reduced graphene oxide modified graphite felt electrode and its electrocatalytic activity towards VO <sup>2+</sup> /VO <sup>2+</sup> reaction
14:55-15:10	R4	Xianda Sun, Yinshi Li, Mingsheng Hao,	Direct ethanol fuel cell with the carbon-decorated anode and ordered cathode
		Y uxuan Lou, Lu Li	
15:10-15:25	R5	Yuhui Ma	Floating parallel high-gain converter with switched capacitor for fuel cell application
15.25-15.40	R6	Xuan Zhao,	Effect of cathode humidification degree on
15.25 15.40	KO	Hong Sun	PEMFC under preloading force
15:40-16:00			Coffee Break
16:00-16:20	V3	<b>Dongda Zhang</b> University of Manchester, UK	<b>Invited:</b> Machine learning techniques for chemical and biochemical process digitalisation
		Zhigang Zhan	
16:20-16:40	V4	Wuhan University of	<b>Invited:</b> PEM fuel cell modeling and engineering
1000	1	Technology, China	application



16:40-16:55	R7	Haoran Xu, Jingbo Ma, Meng Ni	Combined multi-physics simulation and artificial neural network model for fast and accurate online optimization in SOFC operation
16:55-17:10	R8	Lei Chen, Yi-Fan Wang, and Wen- Quan Tao	Experimental study on the effect of temperature and water on the thermal conductivity of gas diffusion layers in proton exchange membrane fuel cell
17:10-17:25	R9	Ying Liu, Hong Sun, Tianyu Zhang, Qiang Li, Song Li	The influence of wave channel flow field plate on the performance of HT-PEMFC
17:25-17:40	R10	Chengyuan Gong, Jun Shen, Yi Yu, Kaiqiang Wang, Zhengkai Tu, Siew Hwa Chan	A novel radiator structure for enhanced heat transfer used in PEM fuel cell automobile
17:40-17:55	R11	Guobin Zhang, Kui Jiao	Flow field optimization in proton exchange membrane fuel cell utilizing machine learning
17:55-18:10	R12	Yuesong Wang, Hong Sun, Song Li, Qiang Li	Research on optimization design and application of flow field plate structure for VRFB
18:30-20:00	Buffet Dinner		

#### 10<sup>th</sup> January, 2020, Friday, 13:30-18:10 Room B

#### Subject-2: AI for Power Machinery-1 Co-Chairs: Daniele Marchisio & Hongtao Xu & Jiao Yu & Hong Sun

Time	ID	Author	Title
		Daniele Marchisio	Invited: Application of multiscale modelling and
13:30-13:50	V5	Politecnico di	deep learning tools for the simulation of multiphase
		Torino, Italy	polydisperse flows
		Hongtao Xu	
		University of	Invited: The 3D information-integrated system
13:50-14:10	V6	Shanghai for	development for industrial and utility boilers based
		Science and	on the VR technology
		Technology, China	



			Modeling and dynamic simulation of a hybrid
14:10-14:25 R13	R13	Gao Yan	electric vehicle coupled with waste heat recovery
			system
		Tao Chen, Hui Xie,	
14.25 14.40	D14	Shengwen Tong,	Establishment and application of intelligent twin
14.23-14.40	K14	Hao Zhang,	model of hybrid power system
		Bencong Yang	
		Xueqing Fu, Jianjun	
		Yang, Shuangxi Liu,	A mile based meal time aparaty management
14.40 14.55	D15	Haiyang Gao,	A fulle-based feat-time energy management
14:40-14:55	K13	Baosen Wang,	strategy for P2 hybrid electric venicle optimized by
		Yongfei Ma,	dynamic programming
		Xianfeng Zhang	
		Kun Fu, Haiyang	
		Lin,Mengna Mao,	
14:55-15:10 I	R16	Haotian Wu, Qie	Multi-agent based analysis about vehicle-to-grid
		Sun, Ronald	capacity and output
		Wennersten	
		Xun Liu,	
		Zuguo Shen,	Study on an integrated system with automotive
15:10-15:25	R17	Yadong Deng,	thermoelectric generator and localized
		Chuqi Su,	thermoelectric cooling air conditioner based on a
		Yiping Wang	commercial vehicle
			Effect of graphene doped multi-walled carbon
15:25-15:40	R18	Yang Zheng,	nanotubes cathode materials on discharge capacity
		Hong Sun	of lithium air battery
15:40-16:00			Coffee Break
		Jiao Yu	
1 < 00 1 < 00		Shanghai Palcan	Invited: Reformed methanol fuel cell technology
16:00-16:20	$\mathbf{V}'$	New Energy, Co.,	and its application in intelligent energy
		Ltd, China	
16:20-16:40		Hong Sun	
	V8	Shenvang Jianzhu	<b>Invited:</b> Mass transfer and structure design of
	•0		• 1 44



16:40-16:55	R19	Yanxiang Yang, Yuanqing Zhang, Changwen Liu, Fuqiang Bai, Lian Xie, Hongtao Zhang	Smart control of exhaust after-treatment system development for a ship engine to get better fuel economy and emission
16:55-17:10	R20	Tao Lai, Jianfei Zhang, Zhiguo Qu	GPU accelerated numerical simulation of the effective thermal conductivity for 3D fibrous materials using Lattice Boltzmann method
17:10-17:25	R21	Jinpeng Wang, Jie Li, Sidan Liu, Hong Sun	First-principles study of catalytic oxygen reduction reaction on Si doped MoS <sub>2</sub> monolayer
17:25-17:40	R22	Qianlong Wang, Zhen Li, Haifeng Liu, Mingfa Yao, Tao Ren	A novel machine learning approach to recover complete flame temperature field in soot radiation- based thermometry
17:40-17:55	R23	Zhezhe Han, Md. Moinul Hossain, Yuwei Wang, Chuanlong Xu	Burner condition monitoring of 300MW coal-fired boiler through flame imaging and deep neural network
17:55-18:10	R24	Yanqing Cui, Zunqing Zheng, Mingsheng Wen, Qinglong Tang, Chao Geng, Qianlong Wang, Haifeng Liu, Mingfa Yao	Optical diagnostics on the effects of reactivity stratification on flame development in dual-fuel combustion
18:30-20:00			Buffet Dinner



#### 10<sup>th</sup> January, 2020, Friday, 13:30-18:10 Room C

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Subject-3: AI for Energy Systems-1 Co-Chairs: Fu Xiao & Jun Cai & Yinshi Li & Akeel Shah

Time	ID	Author	Title
		Fu Xiao	
12.20 12.50	VO	The Hong Kong	Invited: Big data and AI for smart energy efficient
15.50-15.50	V 9	Polytechnic	buildings
		University, China	
		Jun Cai	
12.50 14.10	V10	Shanghai Hydrogen	Invited: The ABC's application in fuel cell system
15:50-14:10	V10	Propulsion	development-AI, big data and cloud
		Technology, China	
14.10 14.25	D25	Qiong Wang,	Understanding of the inhomogeneous compressed
14:10-14:23	K23	Huizhi Wang	electrode in flow battery
		Xuewei Shi,	Identification of gas-oil-water three phase flow
14:25-14:40	R26	Chao Tan,	pattern with ultrasonic doppler and conductance
		Feng Dong	sensor
		Xuelong Zhou,	
14.40 14.55	D27	Xiangyang Zhang,	Towards AI-assisted electrode design for high-
14:40-14:55	K27	Yunhui Lv,	power all vanadium flow batteries
		Qixing Wu	
		Kangcheng Wu,	Application of neural networks in proton exchange
14:55-15:10	R28	Bingfeng Zu,	membrane fuel cell: Predicting electrochemical
		Jin Xuan, Kui Jiao	active surface area and water content curves
		Yan Yin, Shiyu Wu,	
		Suhui Ma, Yuwen	Effect of trapezoidal baffle block tilted angles on
15:10-15:25	R29	Liu, Qiaoyu Guo,	quantitative reactant gas flux and performance of
		Junfeng Zhang,	PEM fuel cell
		Yanzhou Qin	
		Hong Sun,	Masassania simulation analysis of graphana
15:25-15:40	R30	Shen, Jie Li,	nositive electrode of lithium air battery
		Sidan Liu	positive electrode of nunum-an battery
15:40-16:00	5:40-16:00 Coffee Break		
		Yinshi Li	Invited Banafits achieved from intelligent
16:00-16:20	<b>V</b> 11	Xi'an Jiaotong	algorithm in solar energy utilization
1330	1	University, China	agonum in solar energy utilization



16:20-16:40	V12	<b>Akeel Shah</b> Chongqing University, China	<b>Invited:</b> Shared-latent surrogate for high-dimensional stochastic input simulation
16:40-16:55	R31	Mengna Mao, Haotian Wu, Kun Fu, Qie Sun, Ronald Wennersten	Multi-objective scheduling of wind power- integrated energy system–application of the pseudo-weighted vector method
16:55-17:10	R32	Yu Liu, Liang Gong, Minghai Xu, Zhang Bai	Alternative design and dynamic evaluation of the mid-low temperature solar receiver/reactor for methanol decomposition
17:10-17:25	R33	S. Sadek, Shuai Deng, Mohamed E. Zayed	A review on adsorption-based atmospheric water harvesting systems driven by solar energy
17:25-17:40	R34	Ruiguo Yu, Yingzhou Sun, Xuewei Li, Jian Yu, Jie Gao, Zhiqiang Liu, Mei Yu	A cross-correlation encoder for wind power prediction
17:40-17:55	R35	Minjun Zeng, Jianfei Zhang, Zhiguo Qu	Effects of configuration parameters on ionic wind characteristics for electronics cooling
17:55-18:10	R36	Ligeng Li, Hua Tian, Lingfeng Shi, Gequn Shu, Hongfei Zhang, Jingyu Wang	Parametric analysis on CO <sub>2</sub> transcritical power cycle based on split concept in engine waste heat recovery
18:30-20:00			Buffet Dinner



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#### 11<sup>th</sup> January, 2020, Saturday, 8:20-12:00 Room A Subject: Plenary Lectures

Time	Program	Chair
8:20-9:00	<ul><li>Plenary – 5: Artificial Leaf</li><li>Speaker : Prof. Jinlong Gong, Tianjin University</li></ul>	
9:00-9:40	<ul><li>Plenary – 6: Intelligent Decarbonisation</li><li>Speaker : Prof. Markus Kraft, University of Cambridge</li></ul>	Prof. Qing Du
9:40-10:00	Coffee Break	
10:00-10:40	<ul> <li>Plenary – 7: Big Data Based Safety Design and Engineering Application of Traction Battery for Automotive Application</li> <li>Speaker : Dr. Ziliang Zhao, China FAW Group</li> </ul>	
10:40-11:20	<ul> <li>Plenary –8: Fuel Cell Activities in SAIC and Technical Challenge for PEMFCs</li> <li>Speaker : Dr. Zhongjun Hou, Shanghai Hydrogen Propulsion Technology</li> </ul>	Prof. Raffaella Ocone
11:20-12:00	<ul><li>Plenary -9: Self-optimization Method of HEV Energy Management with Reinforcement Learning</li><li>Speaker : Prof. Hui Xie, Tianjin University</li></ul>	
12:00-13:20	Buffet Lunch and Rest	

## 11<sup>th</sup> January, 2020, Saturday, 13:15-17:35 Room A

#### Subject-4: AI for Electrochemical Energy-2 Co-Chairs: Zhiguo Qu & Nada Zamel & Chao Tan

Time	ID	Author	Title
		Zhiguo Qu	Invited: Numerical and deep learning study on
13:15-13:35	V13	Xi'an Jiaotong	multi-scale problem for adsorption and diffusion
		University, China	processes in porous media



		Nada Zamel	
13:35-13:55	3714	Fraunhofer Institute	Invited: Production of catalyst coated membranes
	V 14	for Solar Energy	for low temperature PEM fuel cells
		Systems, Germany	
		Chao Tan	<b>Invited:</b> Intelligent monitoring and measurement
13:55-14:15	V15	Tianjin University, China	of industrial multiphase flow
14:15-14:30	R37	Yulin Wang, Tao Liu, Hua Li, Shixue Wang	Investigation of cathode catalyst layer with through-plane and in-plane ionomer-gradient distributions for polymer electrolyte membrane fuel cells
14:30-14:45	R38	Yueqi Luo, Song Zhang, Weiming Liang	Data-driven fuel economy evaluation method for automated vehicles
		Bowen Wang,	Data-driven model of internal multi-physical
14:45-15:00	R39	Jin Xuan,	quantities prediction of proton exchange
		Kui Jiao	membrane fuel cell
		Jie Li,	Study on mass transfer and performance of lithium
15:00-15:15	R40	Fangzheng Yan,	air battery with different preload
		Hong Sun	
		Yan Yin, Ruitao Li,	
15 15 15 20	R41	Xiaoyu Qiu,	The mechanism of crack evolution in catalyst layer
15:15-15:30		Yanzhou Qin,	for fuel cell
		Junieng Znang,	
		Tao Liv	
		Tao Liu, Vulin Wang	Dynamic behaviors of multiple droplets on gas
15:30-15:45	R42	Tunn Wang,	diffusion layer surface of different pore size
		Shenchun Liu	distribution
		Rui Wang Vinshi	
		Li Xianhua Wu	High-performance flow battery coupling mass
15:45-16:00	R43	Zhilong Zhao.	transport and redox reaction for large-scale energy
		Haiying Liu	storage





16.00 16.15		Tianyu Zhang,		
	R44	Jie Li, Qiang Li,	Mesoscopic dynamics simulation	on of lithium air
10.00-10.15		Mingfu Yu,	battery: An electrolyte mass tran	sfer study
		Hong Sun		
16:15-16:25			Coffee Break	
16:25-17:05	Plenary-10: Responsible Technology: Are We Ready for It?       Chair:         Speaker: Prof. Raffaella Ocone, Heriot-Watt University       Prof. Kui Jiao			
17:05-17:35	Closing Ceremony			
18:30-20:00			Buffet Dinner	

## 11<sup>th</sup> January, 2020, Saturday, 13:15-16:10 Room B

Subject-5: AI for Power Machinery-2 Co-Chairs: Yun Wang & Billy Wu

Time	ID	Author	Title
13:15-13:35	V16	<b>Yun Wang</b> University of California, USA	<b>Invited:</b> Machine learning in dynamics and power management of PEM fuel cell
13:35-13:55	V17	<b>Billy Wu</b> Imperial College London, UK	<b>Invited:</b> Battery digital twins: The fusion of data, models and artificial intelligence for next generation electric vehicles
13:55-14:10	R45	Xiaoti Cui, Vincenzo Liso, Søren Knudsen Kær	Applications of artificial intelligence in the power- to-methanol process and fuel cells: a short discussion
14:10-14:25	R46	Hui Wang, Xinyu Hui, Zhiguo Qu, Junqiang Bai	Physics-informed deep learning framework for flow prediction in energy saving airfoil design
14:25-14:40	R47	Wei Wang, Shuai Deng, Dongpeng Zhao, Li Zhao, Shan Lin, Mengchao Chen	Protons: A general methodology based on artificial intelligence for prediction and optimization of the thermodynamic cycle performance—a case study of ORC



		Chen Zhao,	
		Bingfeng Zu,	
14.40 14.55	<b>D</b> 49	Yuliang Xu,	Analysis of an engine-start control process for
14.40-14.55	K40	Zhen Wang,	single-shaft parallel HEV
		Jianwei Zhou,	
		Lina Liu	
		Xu Ping,	
		Fubin Yang,	Summing the summing of the sum to be suming
14.55 15.10	<b>D</b> 40	Hongguang Zhang,	Supervised regression of thermodynamic
14:55-15:10	K49	Baofeng Yao,	parameters of organic rankine cycle based on least
		Chongyao Wang,	squares method for basis function
		Xin Shi, Yuting Wu	
15.10 15.25	D50	Feng Li, Chao Tan,	V-net imaging method for electrical resistance
15:10-15:25	K30	Feng Dong	tomography
		Dongpeng Zhao,	
	R51	Shuai Deng,	
15.25 15.40		Li Zhao,	A review on computational intelligence for
15:25-15:40		Weicong Xu,	thermodynamic system design
		Wei Wang,	
		Mengchao Chen	
		Jingrui Li,	Vinctic study of ignition process of methons/n
15.40 15.55	D52	Haifeng Liu,	kinetic study of ignition process of methane/ii-
15.40-15.55	K32	Ying Ye, Hu Wang,	injustion anging like condition
		Mingfa Yao	injection engine-like condition
		Shichun Yang, Yang	
		Hua, Fei Chen,	Frachling digital achieve for bottom, fall lifesnon
15:55-16:10	R53	Xiaoyu Yan,	Enabling digital solution for battery full-mespan
		Yaoguang Cao,	management
		Xinhua Liu	
16:10-16:25		Coffee 3	Break (please go to Room A)
18:30-20:00	Buffet Dinner		



## iceei 2020

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#### 11<sup>th</sup> January, 2020, Saturday, 13:15-16:10 Room C

Subject-6: AI for Energy Systems-2 Co-Chairs: Bing Xu & Yanli Liu

Time	ID	Author	Title
13:15-13:35	V18	<b>Bing Xu</b> Heriot-Watt University, UK	<b>Invited:</b> Global oil market uncertainty and oil prices: Data-centric solutions
13:35-13:55	V19	<b>Yanli Liu</b> Tianjin University, China	<b>Invited:</b> Data-analytics for enhanced situational awareness of the smart grid
13:55-14:10	R54	Cheng Fan	Development of deep transfer learning-based methodology for short-term building energy predictions
14:10-14:25	R55	Kang Song	Intelligent disturbance rejection-based path- following control of unmanned rollers
14:25-14:40	R56	Rune Grønborg Junker, Dominik Franjo Dominković, Henrik Madsen	Unlocking the flexibility from integrated energy and water systems
14:40-14:55	R57	Chang Su, Zhenyuan Xu, Justin NW Chiu	Building heat atlas of China: An application of spatial data science
14:55-15:10	R58	Haotian Wu, Mengna Mao, Xiao Zhang, Qie Sun, Ronald Wennersten	Prediction of building energy consumption– application of a particle swarm optimization- integrated long short-term memory method
15:10-15:25	R59	Xiaohai Zhang, Long Wang, Geng Chen, Mingtao Li	A new semi-supervised clustering method for household electricity load clustering





18:30-20:00	Buffet Dinner		
16:10-16:25	Coffee Break (please go to Room A)		
15:55-16:10	<b>K</b> 02	Yan Yin, Michael D. Guiver	layers for anion exchange membrane fuel cells
15.55 16.10	D62	Weikang Zhu, Junfeng Zhang,	The structure-function relationship of
15:40-15:55	R61	Zhihao Guo, Shuai Deng, Li Zhao, Shuangjun Li	Two-stage optimization design of adsorption carbon capture based on GA-CFD-ANN
15:25-15:40	R60	Zhenyu Du, Shuai Deng, Li Zhao, Xianhua Nie, Shuangjun Li, Yue Zhang, Jie Zhao	High-throughput energy-efficiency performance screening on MOFs for CO <sub>2</sub> capture: A combination of molecular simulation and machine learning

#### 12<sup>th</sup> January, 2020, Sunday, 9:00-11:00 Tianjin University Subject: Campus Visit

Time	Program
9:00-11:00	Visit History Museum of Tianjin University





#### **Plenary speaker**



#### **Raffaella Ocone**

Institution Heriot-Watt University, UK Email r.ocone@hw.ac.uk

#### **Short Biography**

Raffaella Ocone obtained her first degree in Chemical Engineering from the Università di Napoli, Italy and her MA and PhD in Chemical Engineering from Princeton University, USA. She holds the Chair of Chemical Engineering in the School of Engineering and Physical Sciences at Heriot-Watt University (HWU) since 1999. She is a Fellow of the Royal Academy of Engineering, the Royal Society of Edinburgh, the Institution of Chemical Engineers, and the Royal Society of Chemistry. In 2007 she was appointed Cavaliere (Knight) of the Order of the Star of Italian Solidarity by the President of the Italian Republic. In The Queen's 2019 New Year Honours she was appointed OBE for services to Engineering. Recently she has been announced as one of the top 100 Most Influential Women in the Engineering Sector.

At HWU, she is the Head of the Multiphase Multiscale Engineering Modelling (MMEM) research group. Raffaella has worked in a number of highly recognised international Institutions such as the Università di Napoli (Italy); Claude Bérnard Université, Lyon (France); Louisiana State University (USA); Princeton University (USA). She was the first engineering "Caroline Herschel Visiting Professor" at RUHR Universität, Bochum, Germany (July-November 2017) and the recipient of a Visiting Research Fellowship from the Institute for Advanced Studies, Università di Bologna, Italy (March-April 2018). Raffaella's main area of research is in the field of modelling complex (multi-phase) reactive systems. Raffaella has taken a leading role in debating the role that ethics plays in engineering. Currently she is the EPSRC Established Career Fellow in Particle Technology.



#### **Responsible Technology: Are We Ready for It?**

#### Abstract

Technology is at the heart of the world where we live providing, among other things, energy solutions, assuring food and drinking water, generating electricity, goods and services. Emerging technologies rise fast carrying the potential to deliver economic and social benefits to a world that is challenged to sustain 10 billion people. Technological and scientific achievements pose challenges and opportunities. The exponential growth of computers, communication and artificial intelligence, for example, is changing the way we work and think, impacting on human activities and ways of living. This talk will explore how global responsibility is embedded in technological solutions and how the ethical dimension affects the way scientists and engineers work and operate.





#### **Plenary speaker**



#### **Jinlong Gong**

Institution **Tianjin university, China** Email **jlgong@tju.edu.cn** 

#### **Short Biography**

Jinlong Gong was born in Lanzhou, Gansu Province. He received B.S. (2001) and M.S. (2004) degrees from Tianjin University and a Ph.D. (2008) degree from the University of Texas at Austin (with C. B. Mullins), all in chemical engineering. He was a visiting scientist at the Pacific Northwest National Laboratory in 2007. After a stint with Professor George M. Whitesides as a postdoctoral research fellow at Harvard University, he joined the faculty of the School of Chemical Engineering and Technology at Tianjin University, where he currently holds a Cheung Kong Chair Professorship. Professor Gong is the Provost of Tianjin University.

#### **Artificial Leaf**

#### Abstract

"Artificial Leaf" is a promising route for the efficient conversion of CO<sub>2</sub> and H<sub>2</sub>O into chemicals and fuels such as methanol and methane. To construct an efficient artificial leaf, it is necessary to find suitable catalysts to solve the important problems of carbon dioxide reduction reaction (CO<sub>2</sub>RR) system: reaction kinetics, CO<sub>2</sub> activation, stability and selectivity. Here, we study the metal electrocatalysts (PdAu and AuCu) and metal oxides catalysts (Sn-based oxides and Cu-based oxides) systematically. Through the guidance of Density Functional Theory, the reaction kinetics can be enhanced though synergistic ensemble and ligand effects, which utilizes neighboring Pd-Au sites and electron transfer between them. Meanwhile, CO<sub>2</sub> can be activated efficiently via the construction of Cu vacancies at an abrupt surface over a dealloyed AuCu catalyst, as well as the introduction of oxygen vacancies over SnO<sub>2</sub>. Moreover, maintaining a



moderate surface coverage of hydroxyl could solve the stability problem, since an appropriate amount of surface hydroxyl groups offers effective sites to boost  $CO_2$  adsorption via hydrogen bond and  $CO_2$  aqueous solution, which stabilizes surface hydroxyl groups on cathode. Finally, the selectivity of specific products can be improved via the adjustment of adsorption strength of key intermediates. By achieving a balanced adsorption of H over CO on Cu, the selective formation of CH<sub>3</sub>OH could be promoted significantly. These findings revealed that the process of catalyst design could be largely simplified by theoretical calculations, which also suggests a logical extension to other catalysts for  $CO_2RR$ .





## **Plenary speaker**



**Zhongjun Hou** 

Institution Shanghai Hydrogen Propulsion Technology Com. Ltd., China Email hou\_zhongjun@shpt.com

#### **Short Biography**

Dr. Zhongjun Hou received his doctor degree in chemical engineering from Dalian institute of chemical physics, CAS in 2003. He spent his career in the field of fuel cell technology, including being Chief Engineer and Deputy General Manager at Sunrise Power & National Engineering Research Center of Fuel Cell & Hydrogen Technology until 2018, and Vice general manager of Shanghai Hydrogen Propulsion Technology. He is the Winner of the national leader in science and technology innovation in the "Ten Thousand People Plan", and the State Council government special allowance experts. He had finished several Chinese "863 project" and participated in one Chinese "973 project". He had published and co-published more than 20 papers and 60 patents.

#### **Fuel Cell Activities in SAIC and Technical Challenge for PEMFCs** Abstract

The development of fuel cell electric vehicles (FCEVs) was performed in Shanghai Automotive Industry Company (SAIC) for nearly two decades. The performance, durability and reliability of the FCEVs were validated to meet the requirement of commercial application. To promote the FCEVs' market extension, the cost, durability and performance of fuel cell should be further improved. The challenges against the fuel cell technology's enhancement were discussed accordingly.



#### **Plenary speaker**



**Markus Kraft** 

Institution University of Cambridge, UK Email mk306@cam.ac.uk

#### **Short Biography**

Prof Markus Kraft is a Fellow of Churchill College Cambridge and Professor in the Department of Chemical Engineering and Biotechnology. He is the director of CARES, the Singapore-Cambridge CREATE Research Centre, and Principle Investigator of C4T the "Cambridge Centre for Carbon Reduction in Chemical Technology", which is a CARES research programme. Professor Kraft obtained the academic degree 'Diplom Technomathematiker' at the University of Kaiserslautern in 1992 and completed his Doctor rerum naturalium in Chemistry at the same University in 1997. Subsequently, he worked at the University of Karlsruhe and the Weierstrass Institute for Applied Analysis and Stochastics in Berlin. In 1999 he became a lecturer in the Department of Chemical Engineering, University of Cambridge. In 2012 he obtained a ScD form the same University. He has a strong interest in the area of computational modelling and optimisation targeted towards developing CO2 abatement and emissions reduction technologies for the automotive, power and chemical industries.

#### **Intelligent Decarbonisation**

#### Abstract

Global warming caused by greenhouse gases have caused great concern for a number of reasons. It is clear that drastic changes have to be implemented in the near future to reduce or stop the increase of average temperature and the many negative consequences that go with it. In my talk I shall concentrate on AI-based Cyberphysical systems and knowledge graphs. The decarbonisation of energy provision is key to managing global greenhouse gas emissions and hence mitigating climate change. Digital technologies

such as big data, machine learning, and the Internet of Things are receiving more and more attention as they can aid the decarbonisation process while requiring limited investments. The orchestration of these novel technologies, so-called cyber-physical systems (CPS), provides further, synergetic effects that increase efficiency of energy provision and industrial production, thereby optimising economic feasibility and environmental impact. This comprehensive review article assesses the current as well as the potential impact of digital technologies within CPS on the decarbonisation of energy systems. Ad-hoc calculation for selected applications of CPS and its subsystems estimates not only the economic impact but also the emission reduction potential. This assessment clearly shows that digitalisation of energy systems using CPS completely alters the marginal abatement cost curve (MACC) and creates novel pathways for the transition to a low-carbon energy system. Moreover, the assessment concludes that when CPS are combined with artificial intelligence (AI), decarbonisation could potentially progress at an unforeseeable pace while introducing unpredictable and potentially existential risks. The cyber-physical system we are currently developing is called J-Park Simulator (JPS) which is the signature project in the C4T programme of CARES at the University of Cambridge and part of the http://www.theworldavatar.com/ project. JPS consists of a network of IRIs comprising domain ontologies, a knowledge base and different types of agents. One important application is the modelling and optimisation of eco-industrial parks. This includes the electrical grid, various networks of materials, for example, waste heat network along with a detailed model of each industrial process. In my talk I shall explain how JPS works and show a couple of examples.





#### **Plenary speaker**



Xianguo Li

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#### **Short Biography**

Dr. Xianguo Li is a Professor of Mechanical and Mechatronics Engineering, and a University Research Chair, at the University of Waterloo. Dr. Li is internationally recognized for his research in the area of fuel cells, liquid fuel atomization and sprays, and green energy systems. His book, Principles of Fuel Cells, is the world's first textbook on fuel cells and is used worldwide. Dr. Li has more than 210 journal and 240 conference publications. He has also authored/co-authored 4 books, over 20 book chapters, and 13 patent applications. His published articles have received extensive citations, with an H index of over 60. Dr. Li serves as the editor in chief for the International Journal of Green Energy, and also established the International Green Energy Conference series. He serves on the editorial/advisory board for more than 20 journals, book series, encyclopedia and handbooks. He is the founding division chair for the CSME Advanced Energy Systems Division, CSME Vice President Technical Program; President of the Fuel Cell Division of the International Association for Hydrogen Energy, and has also served as guest editors for a number of journals. He is a fellow of Canadian Academy of Engineering, Engineering Institute of Canada, and Canadian Society for Mechanical Engineering (CSME).

#### **Energy 4.0: Evolution and Revolution of Energy Systems** Abstract:

Energy is essential for the very existence, development and prosperity of human society and human civilization. The evolution and revolution of energy systems have been accompanied with every significant improvement (or quantum jump) in human

civilization. However, energy is a double-edge sword, while it brings wealth and welfare to our society, its side effect has significant negative social, economic and environmental impact, including the pressing issue of climate change encompassing global warming and climate variability leading to extreme weather conditions with severe damages. The energy system has evolved through three stages that is being referred to as Energy 1.0, 2.0 and 3.0; and is in the transition process to Energy 4.0 where energy resources are efficiently utilized with cost effectiveness, sustainability and environmentally friendliness, energy connectivity and energy-mass (materials) interconnection and interchange – all these can be achieved through hydrogen as the carrier for both energy and materials. Hydrogen provides the possibility of clean, efficient, reliable and versatile connection to meet the need of future civilization for sustainable human civilization.





#### **Plenary speaker**



**Deborah Logan** 

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#### **Short Biography**

Deborah Logan is Publishing Director for Elsevier's Energy & Earth journals' programme, which is the largest global publishing programme in the energy and earth sciences, and which includes many flagship titles publishing world-class content. Over the past few years, Deborah has looked to develop extensive publishing collaborations with China, with a strong focus on recruiting journal editors with high standards of excellence and in launching new journals that will shape and serve the future energy needs of our global society. Deborah is based in Paris and has been working with Elsevier since 2006. Before then, she worked at Oxford University Press in UK; at a non-governmental agency in Kenya; with the Japanese Ministry of Education; and at Sony in Japan. Deborah's passions lie in raising standards, championing excellence, and promoting greater diversity in science.

#### Publishing in Energy & AI: Trends and Perspectives Abstract

The way science is disseminated is changing, with journal publishing seeing significant changes in recent years. These changes have a noticeable impact on how academic research will be written, published, promoted, and used in the future. Artificial Intelligence in the energy research field is a fast-growing area with strong support from government policy and funding bodies. Strong content growth from published research is expected in the coming years.

Understanding publishing trends and developments in this exciting new area is an important part of the energy research cycle. This talk will cover 3 areas that can equip



researchers with more insight on energy and AI trends; some factors to consider when presenting your work; and current and future developments in publishing. Deborah Logan will cover specific elements of each area and point participants to tools available for further guidance.





#### **Plenary speaker**



#### Henrik Madsen

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#### **Short Biography**

He got a PhD in Statistics at the Technical University of Denmark in 1986. He was appointed Ass. Prof. in Statistics in 1986, Assoc. Prof. in 1989, and Professor in Mathematical Statistics with a special focus on Stochastic Dynamical Systems in 1999. In 2017 he was appointed Professor II at NTNU in Trondheim. His main research interest is related to analysis and modelling of stochastic dynamics systems. This includes signal processing, time series analysis, identification, estimation, grey-box modelling, forecasting, optimization and control. Since 1992 he has been the leader of one of the most active research groups in Europe in relation to wind and solar power forecasting, as well as methods for operation of power system with a large penetration of fluctuating renewable energy production.

He has got several awards. Lately, in June 2016, he has been appointed Knight of the Order of Dannebrog by Her Majesty the Queen of Denmark, and he was appointed Doctor HC at Lund University in June 2017.

He has authored or co-authored approximately 550 papers and 12 books. The most recent books are Time Series Analysis (2008); General and Generalized Linear Models (2011); Integrating Renewables in Electricity Markets (2013), and Statistics for Finance (2015).





## Accelerating the Green Transition Using AI and Energy Systems Integration

#### Abstract

The energy system needs to undertake a fundamental change from a system where production follows demand to a system where the demand follows the production provided by fluctuating renewable energy sources. This talk describes methodologies for accelerating the green transition using AI, big data analytics, grey-box models, IoT, Edge and Cloud Computing. First of all we shall focus on methods for characterizing and enabling the energy flexibility at the prosumer level, ie. at buildings, supermarkets, wastewater treatment plants, etc. Secondly we will describe a framework, called the Smart-Energy Operating-System, for using this flexibility for controlling the power load in integrated energy systems. Furthermore, this framework contains a set of methodologies which can be used for providing ancillary services (like frequency control, voltage control, and congestion management) for power networks with a large penetration of wind and solar power. The set of methodologies is based on grey-box modeling, forecasting, optimization and control for integrated (power, gas, thermal) energy systems. We will demonstrate that by carefully selecting the cost function associated with the optimal controllers, the system can ensure energy, cost and emission efficiency. Consequently, by using online-predicted values of the CO2 emission of the related power production, the framework provides an AI-based method to accelerate the transition to a fossil-free society.





#### **Plenary speaker**



Hui Xie

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#### **Short Biography**

Prof. Hui Xie received his PhD in propulsion machine and engineering at Tianjin University in 1998, and now he holds a position as professor and vice director in State Key Laboratory of Engines at Tianjin University, also as director of Autonomous Driving Cross-research Platform. His research interests include intelligent control of engine, powertrain and vehicle, autonomous driving vehicle and big data analysis. His research achievements include advanced intelligent control algorithms of engines, multi-core hardware control architecture and self-optimization energy management methods. He published 80+ papers and 30+ authorized invention patents. He got 2014 National Educating Achievement Award, 2018 China machinery industry science and technology award and 2019 Tianjin government science and technology award.

## Self-Optimization Method of HEV Energy Management with Reinforcement Learning

#### Abstract

HEV is an effective powertrain to improve vehicle energy efficiency. How to carry out self-adaptive energy management according to the difference between driver and driving condition is the main challenge for hybrid vehicles to improve energy efficiency. A new energy management framework based on driver behavior observation and driving cycle prediction is proposed, in which, a reinforcement learning method is used to make energy management strategy adapt to the changes of driving cycle, and make the energy efficiency of vehicle system reach optimization by itself. The effectiveness of this method is verified by HIL test.



#### **Plenary speaker**



#### Jiujun Zhang

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#### **Short Biography**

Dr. Jiujun Zhang is a Professor, Dean of the College of Sciences and Dean of Institute for Sustainable Energy at Shanghai University. He is a former Principal Research Officer at the National Research Council of Canada (NRC), Fellow of Academy of Science of the Royal Society of Canada (FRSC-CA), Fellow of International Society of Electrochemistry (FISE), Fellow of the Engineering Institute of Canada (FEIC), Fellow of the Canadian Academy of Engineering (FCAE), Fellow of the Royal Society of Chemistry (FRSC-UK), and the Founder/Chairman of The International Academy of Electrochemical Energy Science (IAOEES). In 2014, 2015, 2016, 2017, 2018 and 2019, Dr. Zhang was ranked as the top 1% of Highly Cited Researchers in the world, has also listed as one of the "3000 World's Most Influential Scientific Minds" by Thomson Reuters in 2014, 2015 and 2016. He was awarded the prize of "Lifetime Achievement" by the International Academy of Electrochemical Energy Science (IAOEES) in 2018. The technical expertise areas of Dr. Zhang are Electrochemistry, Photo electrochemistry, Spectro electrochemistry, Electro catalysis, Fuel cells (PEMFC, SOFC, and DMFC), Batteries, and Super capacitors. Dr. Zhang received his B.S. and M.Sc. in Electrochemistry from Peking University in 1982 and 1985, respectively, and his Ph.D. in Electrochemistry from Wuhan University in 1988. Starting in 1990, he carried out three terms of postdoctoral research at the California Institute of Technology, York University, and the University of British Columbia. Dr. Zhang holds more than 14 adjunct professorships, including one at the University of Waterloo, one at the University of British Columbia and one at Peking University. Up to now, Dr. Zhang has more than 500 publications with approximately 40000 citations, including 350 refereed journal papers, 25 edited /co-authored books, 43 book chapters, 190 conference keynotes and invited oral presentations, as well as over 16 US/EU/WO/JP/CA patents, and produced in excess of 90 industrial technical reports. Dr. Zhang serves as the Editor-

in-Chief of Electrochemical Energy Reviews (Springer Nature), and editor /editorial board member for several international journals as well as Editor for book series (Electrochemical Energy Storage and Conversion, CRC press). Dr. Zhang is also an active member of The Electrochemical Society ECS), the International Society of Electrochemistry (ISE), and the American Chemical Society (ACS, as well as the Canadian Institute of Chemistry (CIC).

## Electrochemical Batteries and Lithium Batteries for New Energy Electric Vehicles: Status, Challenges, Perspectives Abstract

This speech summarizes the current development of new energy in electric vehicles, especially the development of batteries, challenges and perspectives. The summarized batteries include lithium-ion batteries, hydrogen fuel cells, metal-air batteries (lithium and zinc), super Capacitors and lithium-sulfur batteries. This speech is divided into the following sections: (1) trends in the development of new energy vehicles; (2) power batteries for new energy vehicles; (3) development of lithium-ion batteries, current status, challenges and prospects. This speech predicts the development trend of power batteries and points out the directions of future R&D efforts.





#### **Plenary speaker**



#### **Ziliang Zhao**

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#### **Short Biography**

Dr. Ziliang Zhao, born in November 1971, is a senior research engineer of China FAW Group Corp. Dr. Zhao graduated in the vehicle engineering from Jilin University in 2001, and is currently appointed as the director of Battery Research Dept. of Limited New Energy R&D Institute of FAW Corp. He is long involved in the development of electric vehicle products and fuel cell power systems. As the project leader, he has leaded and accomplished a series of "863" special items of developing electric vehicles and FAW product development project.

## **Big Data Based Safety Design and Engineering Application of Traction Battery for Automotive Application Abstract:**

The traction battery is the core component of a new energy vehicle. Its safety problems have gained much attention concerning the sustainable development of new energy vehicles. This report presents an analysis on the vehicle fire caused by the thermal runaway of traction battery. Combined with the big data samples, a novel safety design and engineering application was proposed for the safety improvement of traction battery.





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