IEEE PES Subcommittee on Big Data & Analytics for Power Systems

Big Data Webinar Working Group Report

2023 IEEE PES-GM
Orlando, Florida

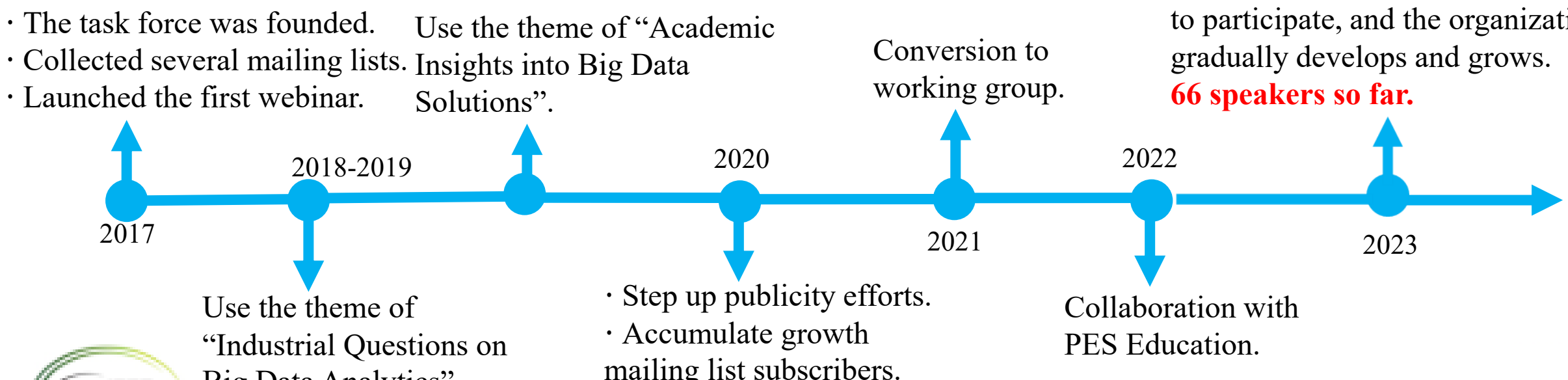
- Presenter: Qiushi Cui, Yang Weng, Zhuoheng Wang, Haoran Li, Jingyi Yuan, and Jiaqi Wu

Introduction-Summary of the Past Work

The original goal:

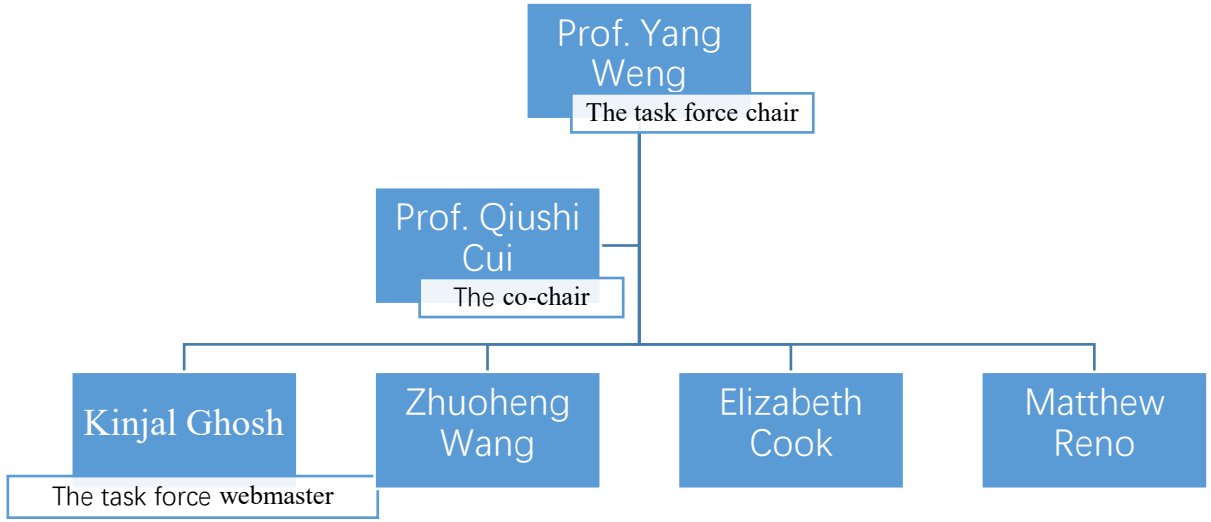
- Bring together leaders and luminaries.
- Improve the analytical methods in power system operations.
- Share innovations with professionals and educate students.

Summary of the past work:



Current Status of the Working Group

Staff:



The subscription webpage:

- Upcoming webinars are presented, and the past webinars are well documented.
- Provide the title, date, speaker bio, and the abstract.
- Provide slides, open-source code (if any), webinar videos, and an offline Q&A section.

Latest webinar:

1.Setting Up a Data-Driven Culture: Exelon's Analytics Academy

March 20, 2023

Ankush Agarwal

The importance of data-driven.

2. Data-Driven Prognostics and Health Management for Predictive Maintenance of Power Components and Systems.

July 28, 2023

Enrico Zio

Frequently-cited papers.

3. Data Analytics for Condition and Health Monitoring of Power Electronic System.

May 29, 2023

Huai Wang

Frequently-cited papers.

4. Data-Driven Solutions for Power System.

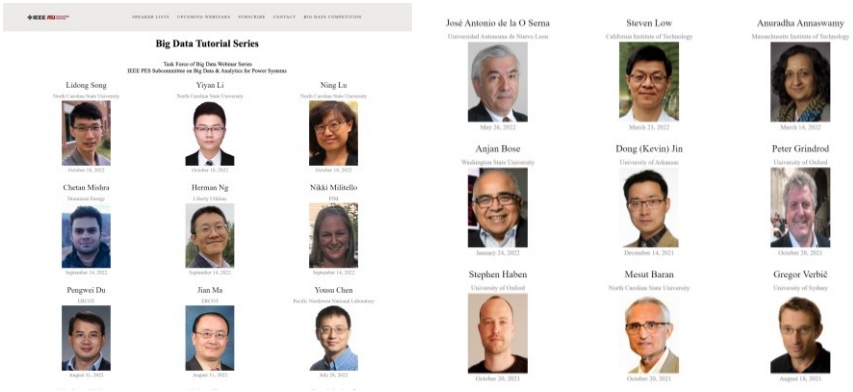
October 20, 2021

Mònica Aragüés Peñalba

Female speakers with high page views.

Innovative Ways to Recruit Speakers

- Create a webpage and website links for each speaker and list his/her publications.



- Help the speakers collect associated statistics for funding applications.
- Provide a support letter for the speaker's proposal, educational impact, and global sustainability.
- Advocate the speakers for their future competitions, tutorials, and papers.

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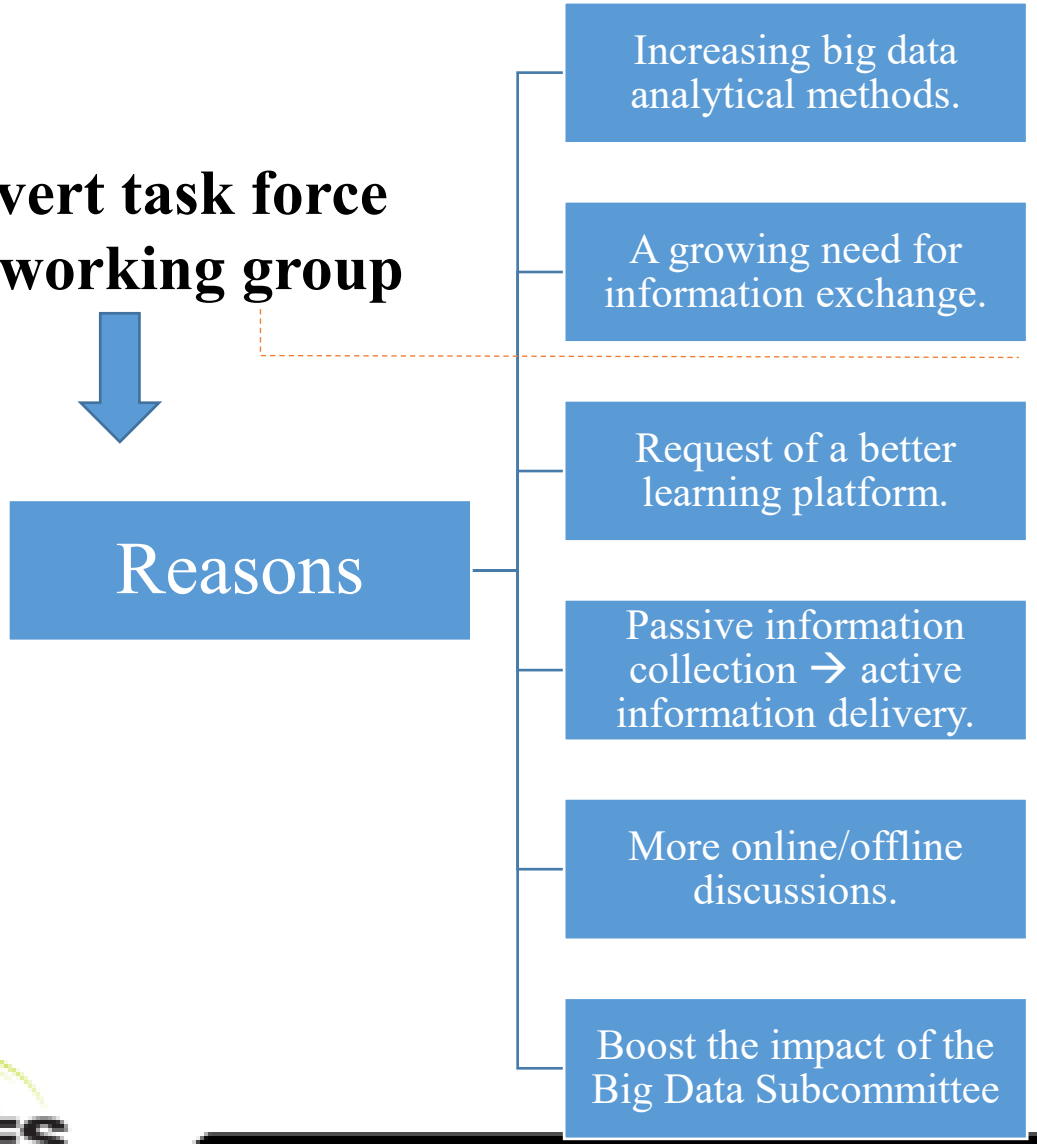
Reasons Behind the Elevation Request

Convert task force to a working group



Successful stories:

Power system communications and cybersecurity committee move its S8 task force to a working group to develop a cybersecurity standard.

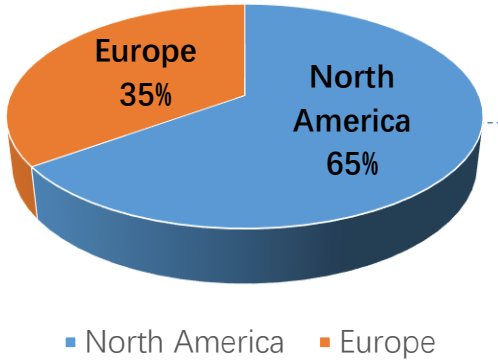
Current Status of the Task Force

So far, 66 webinars were successfully organized.

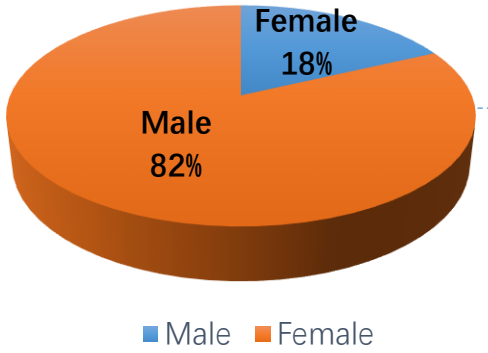
66 webinars

- (1) Location of speakers' affiliation
- (2) Gender of speakers
- (3) Speaker background
- (4) Age of speakers
- (5) Highest degree of speakers

(1) Location of speakers' affiliation



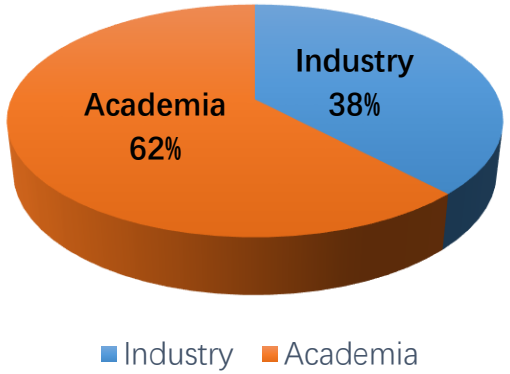
(2) Gender of speakers



Analysis:
Compared to 2022, there is an increasing number of female participants, and the region is not limited to North America, but also Europe.

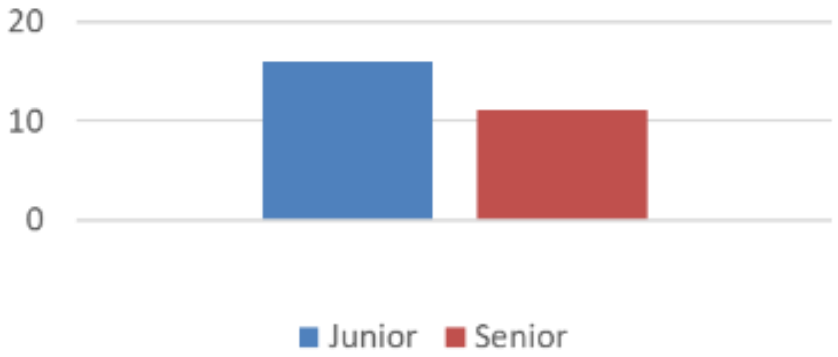
Current Status of the Task Force

(3) Speaker background



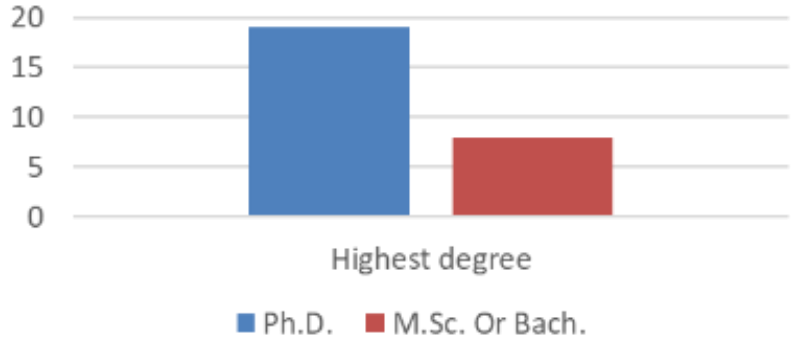
Analysis:
66 invited speakers from both industry and academia.

(4) Junior or Senior



Analysis:
Junior and senior researchers and engineers are both active in the field.

(5) Highest degree of speakers



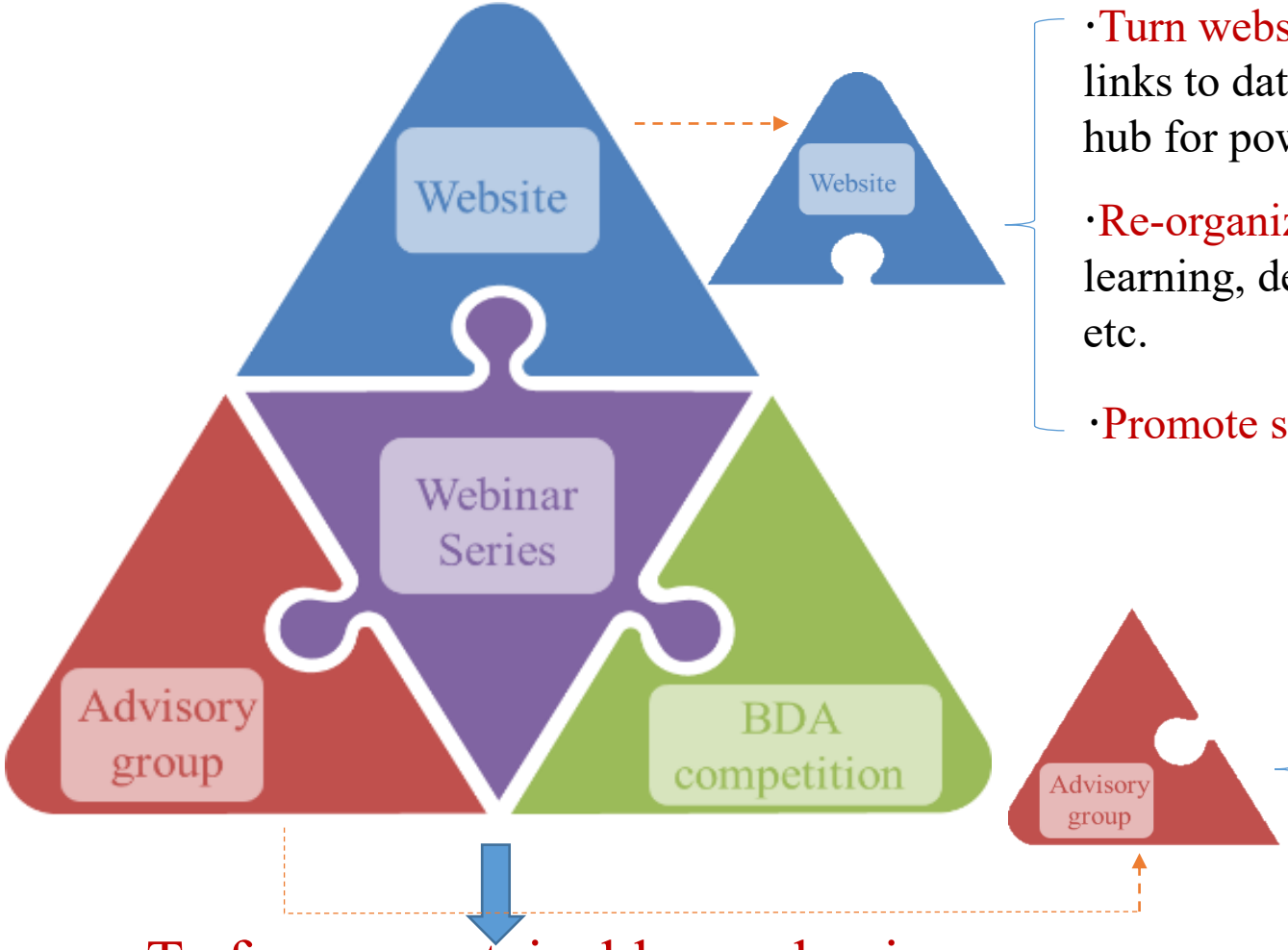
Analysis:
The speakers with Ph.D. degree are more than two times of the ones with Master's degree.

The number of online audience:

More than 50 people each time since December 2019.

421 audience till April 2023.

Webinar Series Structure



·Turn website group into an educational group → provides some links to data analytics basics from various website → an educational hub for power engineers and students.

·Re-organize the current talks into different topics, e.g., (un)supervised learning, deep learning, semi-supervised learning, reinforcement learning, etc.

·Promote some talks to advanced topics.

·Offline activities like Q&A will be thriving → periodically collect questions for our speakers to answer.

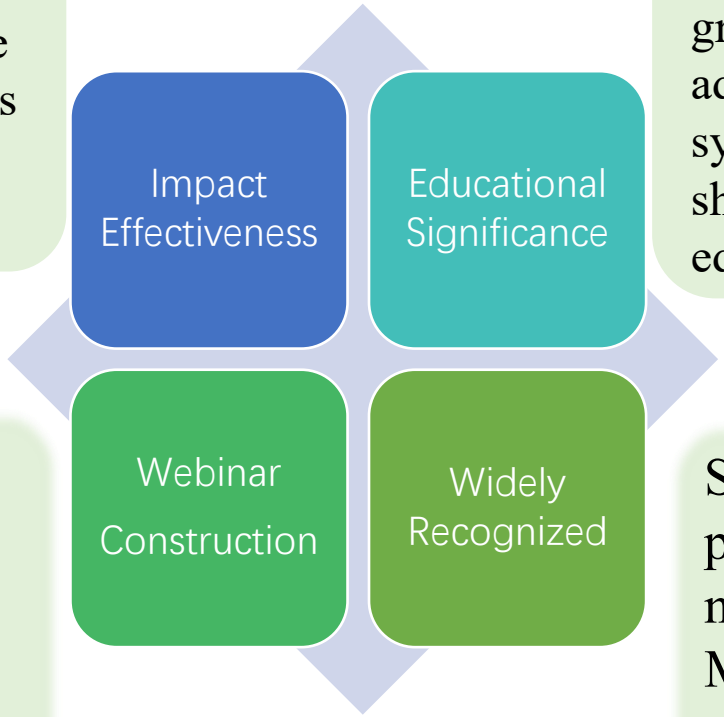
·Write white papers and publish educational papers → highlight the observation that our subcommittee finds.

To form a sustainable mechanism

Goals We Have Achieved

Almost every month, we regularly invite speakers to conduct webinars related to the topic. The proportion of female scientists is gradually expanding, and speakers are no longer limited to North America. ✔

We use machine learning, data mining, and graphical interface design methods to address various challenges in the power system. The audience is diverse, and we share innovations with professionals and educate students. ✔



Each speaker has their own webpage and introduction links. Dedicated live and playback channels to assist scholars/students in learning and discussing. ✔

So far, our webinars have gained the popularity among the audience and are noticed by the IEEE PES officers. Moreover, more and more speakers are participating our webinar. ✔

Organization Activities and Target Outlook

- What we are proud of ?

  The assistance of data-power-based competitions. Currently, we are sponsoring the RTE international competition (Dr. Weng's group – 2nd place last year).

- what can we do ?

a) In order to sustain the learning environment, we turn passive learning into active learning.

b) Based on the RTE competitions, we organize related webinars and tutorials.

c) We have different subarea topics for all by-products (philosophy, webpages, codes, etc.).

- What will we do?

a) We create resource pages for students to learn data scientists' work to help power grid operations.

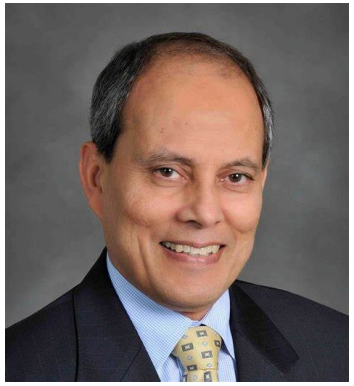
b) We let power engineers know more related opportunities to broaden their career view.

c) We reversely contact data-power companies to support the competitions we are proposing.

Future Work and Arrangement

Preparation work for the Asian Pacific webinar:

1. **Select well-known universities from countries in the Asia-Pacific region (China, Japan, South Korea, Australia, New Zealand, Singapore, etc.).**
2. **Connect with well-known professors and scholars in related fields of these universities.**
3. **Professors and scholars give lectures on the direction of big data and energy research.**



Saifur Rahman
IEEE President
Research Interests:
Alternate energy, Smart grid, Uncertainty evaluation, Environmental impacts, etc.

We plan to invite IEEE President Saifur Rahman to be our opening speaker, kicking off the first Asian-Pacific BDA tutorial.

Future Work and Arrangement

Big data webinar in Asia Pacific: Next, we will invite more speakers in the Asia-Pacific region

China

Qixin Chen
Tsinghua University

Electricity market, energy Internet, big data technology

Zhiyi Li
Zhejiang University

New power system planning, operation and market mechanism design

Tao Ding
Xi'an Jiaotong University

Optimize the operation of energy and power systems, energy policy and low-carbon economy

South Korea

Park Jung-wook
Yonsei University

Power System - Dynamics, Planning, Operation Smart Grid / Microgrid

Japan

Makoto Hagiwara
Tokyo Institute of Technology

Battery energy storage systems, electric vehicles, renewable energies

New Zealand

Dulsha Kularatna-Abeywardana
University of Auckland
energy storage, conversion, delivery and consumption in electronics

Singapore

Tan Yap Peng
Nanyang Technological University

Pattern Recognition; Machine Learning, Data Analytics.

Australia

Jin Ma
University of Sydney
Smart grid, power system analysis

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Future Work and Arrangement

Big data webinar around the world:

We are planning……

- Asia pacific Big Data webinar
- Involve more utilities to join the webinar
- Create interactions between utilities and universities

In the future, the Big data webinar will go to the world and gather electrical experts and scholars from all over the world to make contributions to the world's power and energy industry.

BDA Webinar Participant List

IEEE BDA Tutorial Series: Big Data & Analytics for Power System

Pierre Huyn
Hitachi America, Ltd.,
Big Data Laboratory

2017.6.27

Title: An Energy IoT Platform for Real-time Production and Delivery of Wind Power Generation Forecasts

Chandrasekar Venkatraman
Hitachi America, Ltd.,
Big Data Laboratory

2017.6.28

Title: An Energy IoT Platform for Real-time Production and Delivery of Wind Power Generation Forecasts

Mike Zhou
Chief Scientist,
State Grid EPRI China

2017.11.21

Title: Application of Machine Learning to Power Grid Analysis

Jim Parks
Sacramento Municipal Utility Department

2017.11.28

Title: SMUD's Data Analytics Initiatives

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Frank M. Gonzales
Southern California Edison

2017.12.5

Title: Analytics Use Cases and Foundational Components

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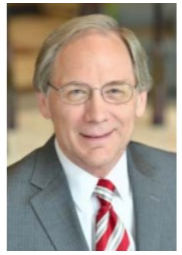


John D. McDonald
Smart Grid Business Development Leader, GE Power

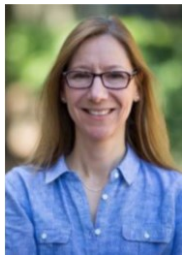
2019.1.11

Title: Big Data, Enterprise Data Management, and IT/OT Convergence

Ali Vojdani
CEO, GridBright

2019.3.18

Title: Finding the Right Grid Model for Your Research in the GRID DATA Repository Using Big Data Semantic Search



Sila Kiliccote
Staff Scientist and Managing Director, SLAC National Accelerator Laboratory and Stanford University

2019.7.6

Title: Visualization and Analytics for high penetration of Distributed Energy Resources (VADER)

Zhenyu (Henry) Huang
Laboratory Fellow/Technical Group Manager, Pacific Northwest National Laboratorys

2019.10.30

Title: Big Data Access, Analytics, and Sense-Making

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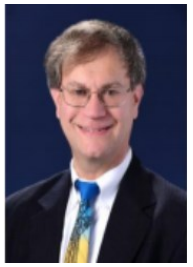

Jeffrey S. Katz
Head of Grid Technology,IBM

2019.11.26

Title: Between Big Data and Analytics: What to Do and What Not to Do?

Rupen Seoni
Vice President & Practice Leader, Environics Analytics

2019.12.14

Title: Bringing Data to Life in Energy: Using Population Data with Grid Data to Understand Energy Consumers

Nanpeng Yu
University of California, Riverside

2019.5.28

Title: Machine Learning and Big Data Analytics in Power Distribution Systems

Meng Wang
Rensselaer Polytechnic Institute

2019.6.7

Title: PMU Data Analytics Using Low-Dimensional Models

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Anurag K Srivastava
Washington State University

2019.7.19

Title: Cyber-Physical Data Analytics to Enable Resilient Electric Grid

Chen-Ching Liu
Virginia Polytechnic Institute and State University

2019.7.31

Title: Cyber-Physical System Security of the Power Grid

Surya Santoso
University of Texas at Austin

2019.9.5

Title: Power Quality Data Analytics and Applications

Vassilis Kekatos
Virginia Polytechnic Institute and State University

2019.10.17

Title: Learning for Monitoring and Control in Power Distribution Grids

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Zhaoyu Wang
Iowa State University

2019.11.11

Title: Mining Smart Meter Data for Improving Distribution Grid Operation and Resilience

Simon Tindemans
Delft University of Technology

2019.12.2

Title: The Machine Learning Approach to Dynamic Security Assessment

Jochen Cremer
Imperial College London

2019.12.2

Title: The Machine Learning Approach to Dynamic Security Assessment

Ross Baldick
University of Texas at Austin

2020.1.24

Title: Wind Variability and Impact on Markets

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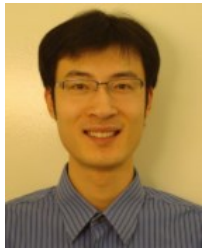
Line Roald
University of Wisconsin-Madison

2020.2.12

Title: Learning Congestion Patterns in Optimal Power Flow Problems



Yue Zhao
Stony Brook University

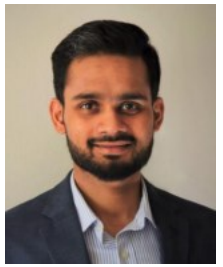
2020.3.26

Title: A Learning-to-Infer Method for Real-Time Power System Monitoring

Spyros Chatzivasileiadis
Technical University of Denmark

2020.4.22

Title: Machine Learning for Power Systems: Physics-Informed Neural Networks and Verification



Deepjyoti Deka
Los Alamos National Laboratory

2020.6.23

Title: Provable Estimation in Distribution Grids: A Physics-informed Statistical Learning Perspective

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Lina Bertling Tjernberg
Royal Institute of Technology

2020.7.2

Title: Infrastructure Asset Management with Power System Applications

Antoine Marot
RTE

2020.7.23

Title: Learning to Run a Power Network in a Sustainable World, Part I: The RTE Competition and Problem Definition

Benjamin Donnot
RTE

2020.8.19

Title: Learning to Run a Power Network in a Sustainable World, Part II: The RTE Competition Tutorial

Matthew Reno
Sandia National Laboratories

2020.9.30

Title: Data-Driven Calibration of Electric Power Distribution System Models

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Logan Blakely
Sandia National Laboratories

2020.9.30

Title: Data-Driven Calibration of Electric Power Distribution System Models

Hao Zhu
The University of Texas at Austin

2020.11.18

Title: Spatial-Temporal Learning for Enhanced Situational Awareness of the Power Grid

Yilu Liu
University of Tennessee and Oak Ridge National Laboratory

2020.12.10

Title: Unlimited Benefit from Grid Edge Synchronized Measurement Data

Wenyuan Tang
North Carolina State University

2021.1.26

Title: Deep Learning for Scenario Generation and Scenario Reduction in Short-Term Power System Operations

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Ali Abur
Northeastern University

2021.4.26

Title: Tracking Faults and Network Model Changes Using Phasor Measurements

Nilanjan Ray Chaudhuri
Pennsylvania State University

2021.4.26

Title: WAMS-Based Mode Meters With Guarantees On Data Recovery Under Corruption

Jhi-Young Joo
Lawrence Livermore National Laboratory

2021.6.2

Title: Unsupervised Anomaly Detection for Identifying Arcing Hazards on Power Distribution Systems

Thomas J. Overbye
Texas A&M University

2021.6.23

Title: New Developments in the Visualization of Wide-Area Electric Grid Information with Application to Grid Interconnection Studies

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Gregor Verbic
University of Sydney

2021.8.18

Title: Aggregation and Control of Distributed Energy Resources: Home Energy Management, Virtual Power Plants and Peer-to-peer Energy Trading

Mesut Baran
North Carolina State University

2021.10.20

Title: Real-Time Monitoring of Distribution Systems: Challenges

Stephen Haben
University of Oxford

2021.10.20

Title: Low Voltage Data Analytics: Roadblocks, Challenges, and Future Opportunities

Peter Grindrod
University of Oxford

2021.10.20

Title: Low Voltage Data Analytics: Roadblocks, Challenges, and Future Opportunities

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Dong (Kevin) Jin
University of Arkansas

2021.12.14

Title: Towards a Secure and Resilient Industrial Control System Using Software-Defined Networking

Anjan Bose
Washington State University

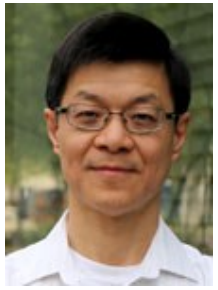
2022.1.24

Title: Increasing Data Streams for Power Grid Operation

Anuradha Annaswamy
Massachusetts Institute of Technology

2022.3.14

Title: Distributed Optimization, Prediction, and Privacy Preservation in Power Grids



Steven Low
California Institute of Technology

2022.3.23

Title: Learning and Control in Power Distribution Grids

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José Antonio de la O Serna
Universidad Autonoma de Nuevo Leon

2022.5.26

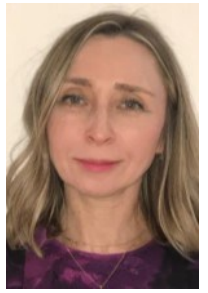
Title: How the Fast Taylor-Fourier Transform (FTFT) will Change the Basic Concepts of Power Systems?

Dominic Groß
University of Wisconsin-Madison

2022.6.27

Title: Control and End-to-end Stability Analysis of Converter Dominated Power Systems

Qiuhua Huang
UtiliData Inc.



Marianna Vaiman
V&R Energy

Yousu Chen
Pacific Northwest National Laboratory

2022.7.28

Title: Convergence of AI, Physics, Computing, and Control for Intelligent Power System Control and Beyond

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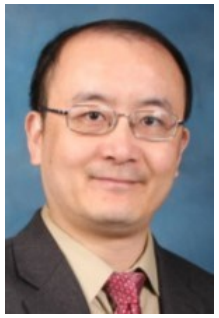

Jian Ma
ERCOT

Pengwei Du
ERCOT

Nikki Militello
PJM

Herman Ng
Liberty Utilities

Chetan Mishra
Dominion Energy

2022.8.31

Title: Machine Learning Applications to Forecasting Operations of Energy Storage Resources and Crypto Loads

2022.9.14

Nikki's Title: PJM's Strategy for Data & Analytics
Herman's Title: Regulated Utilities Analytics: Going from a Black & White TV to 4K
Chetan's Title: Data Driven Grid Dynamics Discovery and Analysis - Challenges and Lessons Learned

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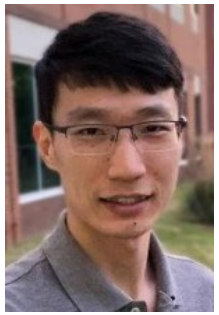
Ning Lu
North Carolina State University

Yiyan Li
North Carolina State University



Lidong Song
North Carolina State University

Hamed Mohsenian
Rad University of California, Rewerside

2022.10.18

Title: Machine Learning Methods for Power System Digital Twin Development

2022.11.30

Title: Synchro-waveform Data Analytics and Applications

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Mario Paolone
Ecole Polytechnique Fédérale de Lausanne

2022.12.19

Title: Learning Power Flow Models and Constraints From Synchrophasors Measurements

David Howey
University of Oxford

2023.1.10

Title: Data-driven Battery Health Diagnosis in Real-world Applications

Ankush Agarwal
Exelon

2023.3.20

Title: Setting Up a Data-Driven Culture: Exelon's Analytics Academy

Enrico Zio
Mines Paris,
PSL University,
France Politecnico di Milano, Italy

2022.7.28

Title: Data-Driven Prognostics and Health Management for Predictive Maintenance of Power Components and Systems

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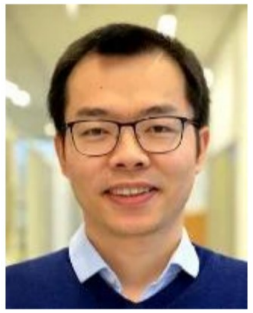

Huai Wang
Aalborg University

Mònica Aragüés Peñalba
Technical University of Catalonia

We believe that with our joint efforts, more and more scholars will participate in IEEE BDA Tutorial Series, and we look forward to your participation.

2023.5.29

Title: Data Analytics for Condition and Health Monitoring of Power Electronic System

2023.6.29

Title: Data-driven Solutions for Power System

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