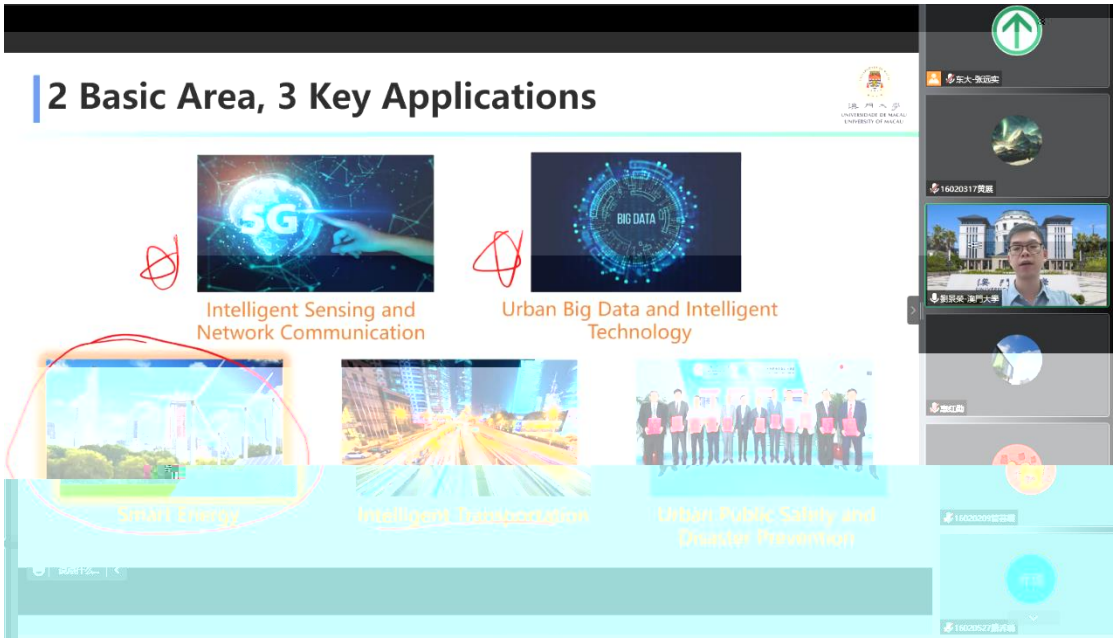
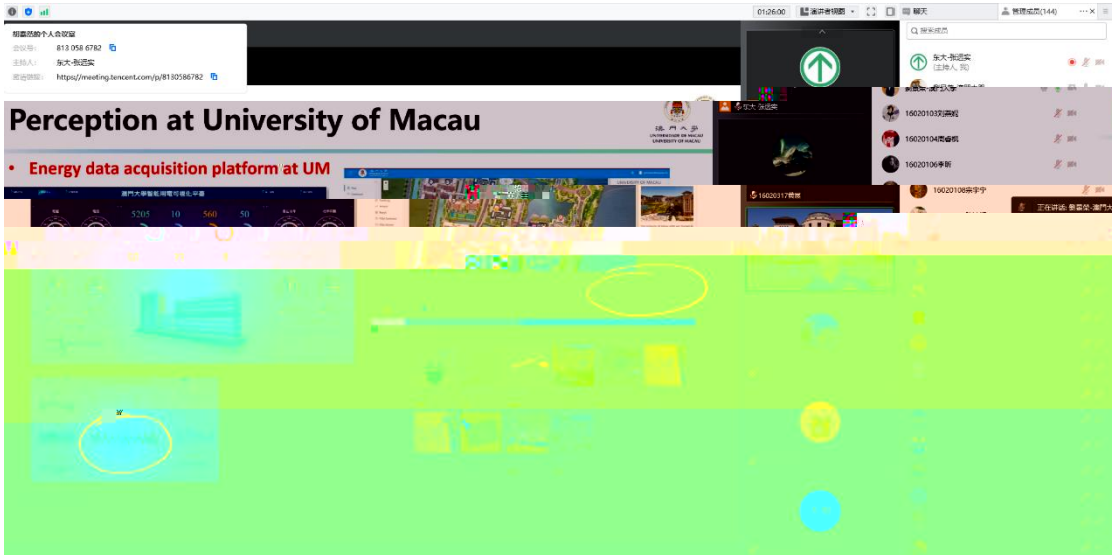
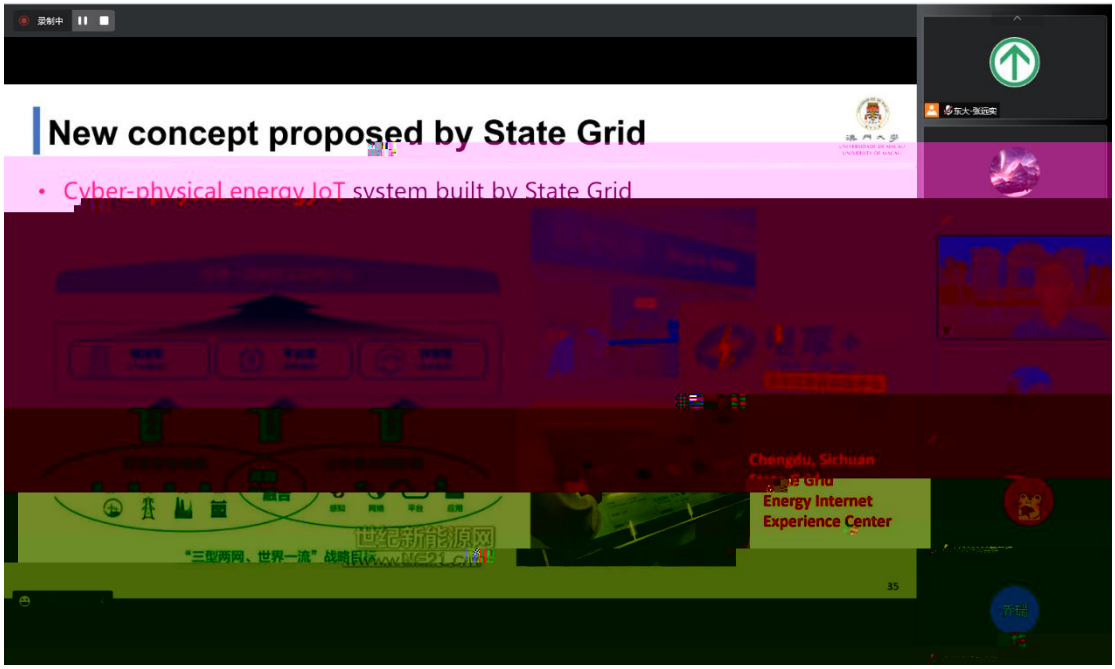
2022

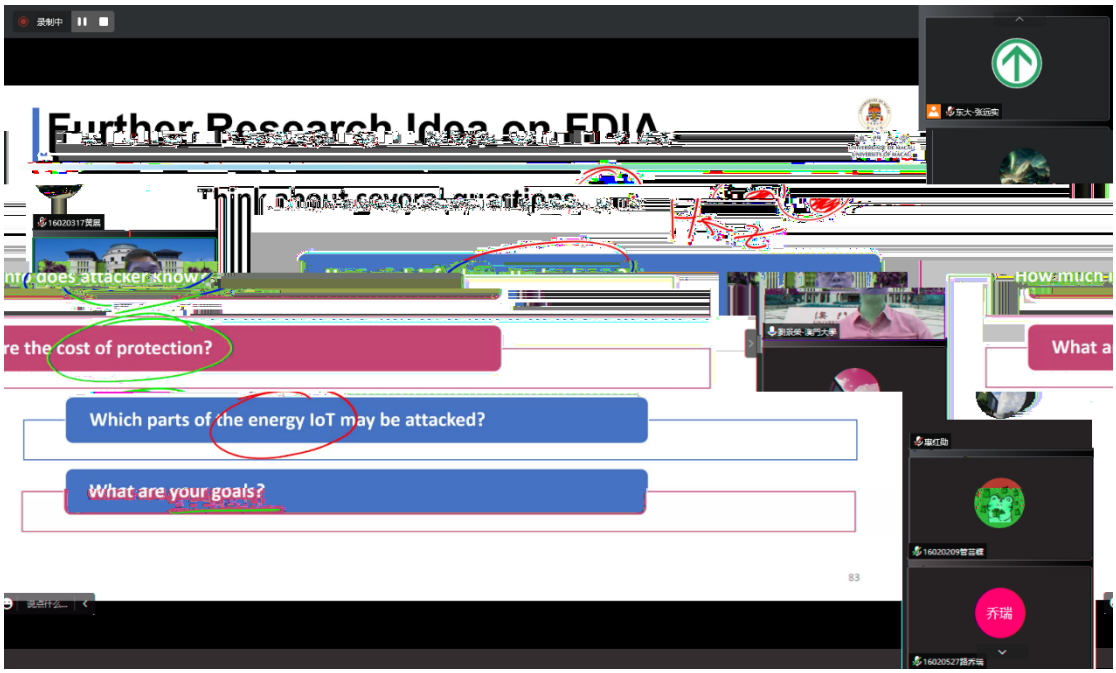
Final Report of SEU EE International Summer School Program


2 Basic Area, 3 Key Applications
5G
BIG DATA
Intelligent Sensing and Network Communication
Urban Big Data and Intelligent Technology
SMART Energy
Intelligent Transportation
Urban Public Safety and Disaster Prevention


Many countries have installed a large number of smart meters, and basically completed the construction of smart meter infrastructure.
SMART ENERGY


Perception at University of Macau
• Energy data acquisition platform at UM


New concept proposed by State Grid
• Cyber-physical energy IoT system built by State Grid
Chengdu, Sichuan
Energy Internet
Experience Center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Further Research Idea on FDIA
Think about several questions
does attacker know?
How much
re the cost of protection?
What a
Which parts of the energy IoT may be attacked?
What are your goals?
83
乔瑞


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01:22:56
演讲者视图
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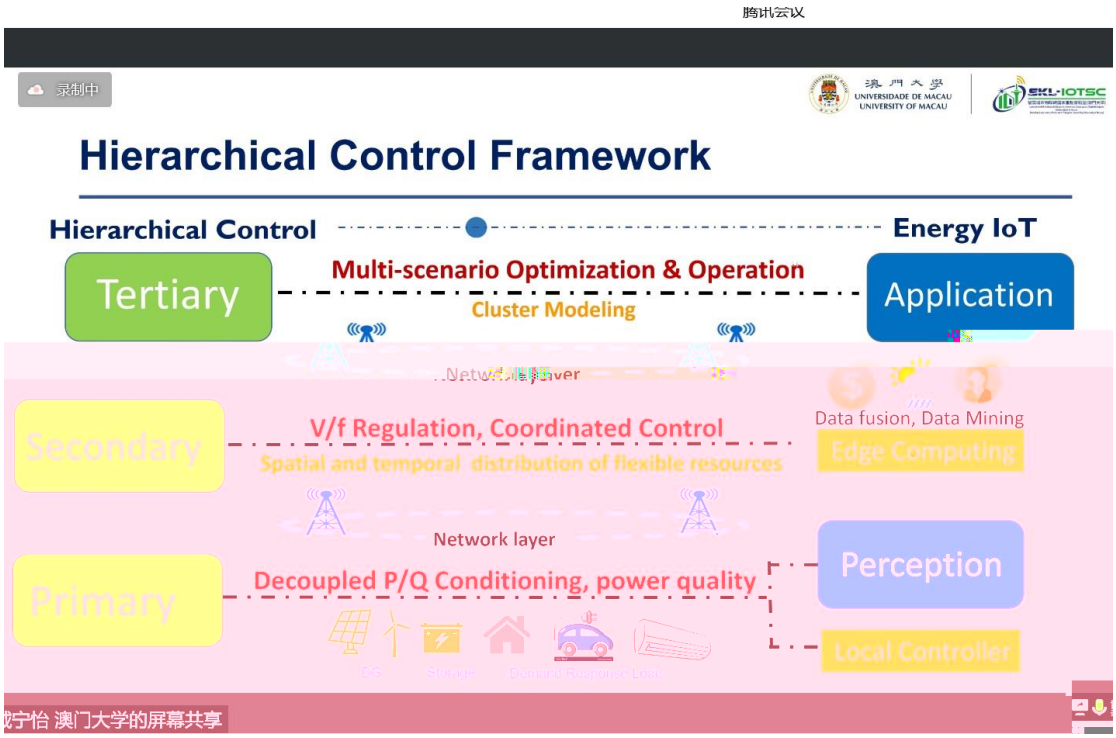
澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU
Modeling and Control of Power Converters in a Power Electronics Dominated Urban Distribution System
Prof. Ning-Yi Dai
SKL of Internet of Things for Smart City
Univereity of Macau
16th August, 2022
澳大


腾讯会议
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Hierarchical Control Framework
Hierarchical Control
Energy IoT
Tertiary
Multi-scenario Optimization & Operation
Cluster Modeling
Application
Network layer
Secondary
V/f Regulation, Coordinated Control
Spatial and temporal distribution of flexible resources
Data fusion, Data Mining
Edge Computing
Network layer
Primary
Decoupled P/Q Conditioning, power quality
Perception
Local Controller
DG
Storage
Demand Response Load
宁怡 澳门大学的屏幕共享


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Proposed control parameter optimization
Training Phase
A. Generation of N data
Simulation in RTDS
2nd
B. Training the NN based on the input
Optimization Phase
Trained model
P(t)
Q(t)
C. Finding the optimal solution in different scenario
Using GA as the searching tool
Kp1 Kp2 Ki1 Ki2
Evaluation Phase
Kp1 Kp2 Ki1 Ki2
D. Applying the result in a Hardware-in-loop platform
RTDS + Rtunit (controller)
Control hardware in loop
Data from physical system

2)

Curriculum Design of Low Carbon Energy Systems (Seminar)

Courses	Presenters	Time
Utilizing demand-side generalized energy storage to decarbonize future smart cities	Dr. Hongcai Zhang (University of Macau)	8.15 Mon. 14:00-15:00
Real-time Simulation of Power System with High Penetration of Renewable Energy Resources	J **(**OPAL-RT **)**	6 /5 /38 . - 16:00
AI and Data Analytics for Smart Energy Towards Low Carbon Future	B A	


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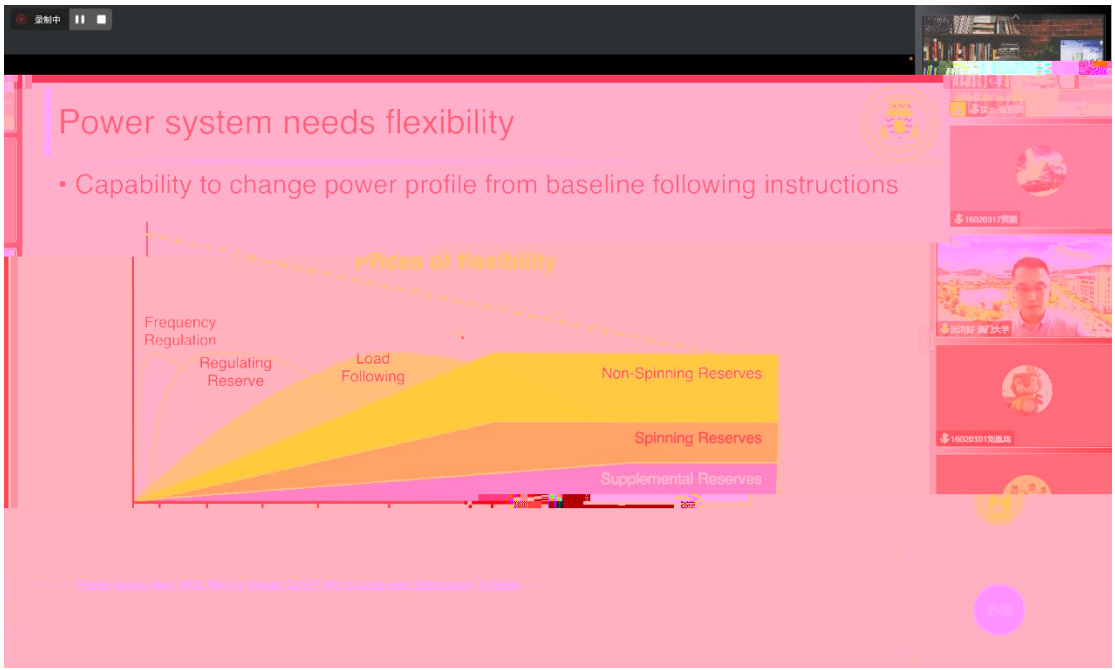
Power system needs flexibility
• Capability to change power profile from baseline following instructions
Frequency Regulation
Regulating Reserve
Load Following
Non-Spinning Reserves
Spinning Reserves
Supplemental Reserves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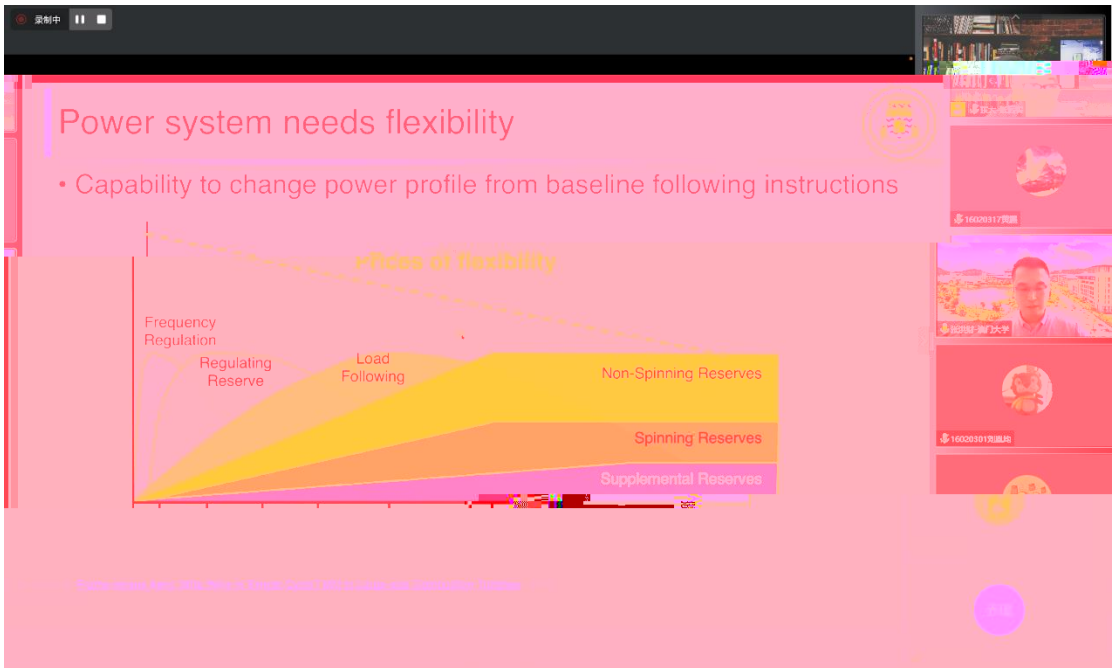
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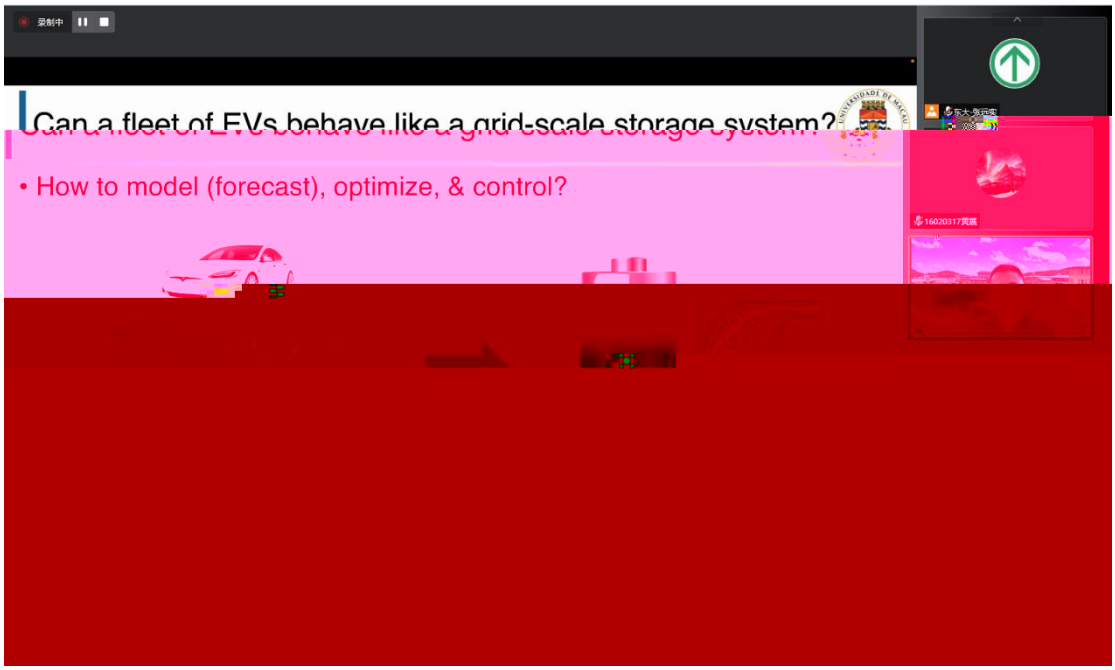
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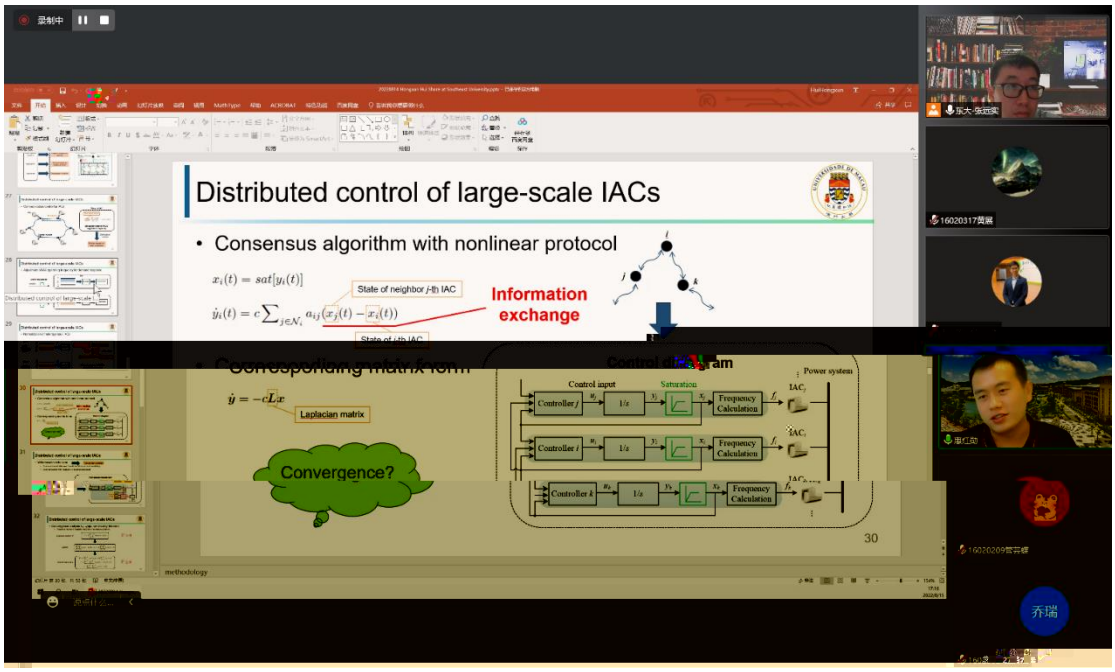
Can a fleet of EVs behave like a grid-scale storage system?
• How to model (forecast), optimize, & control?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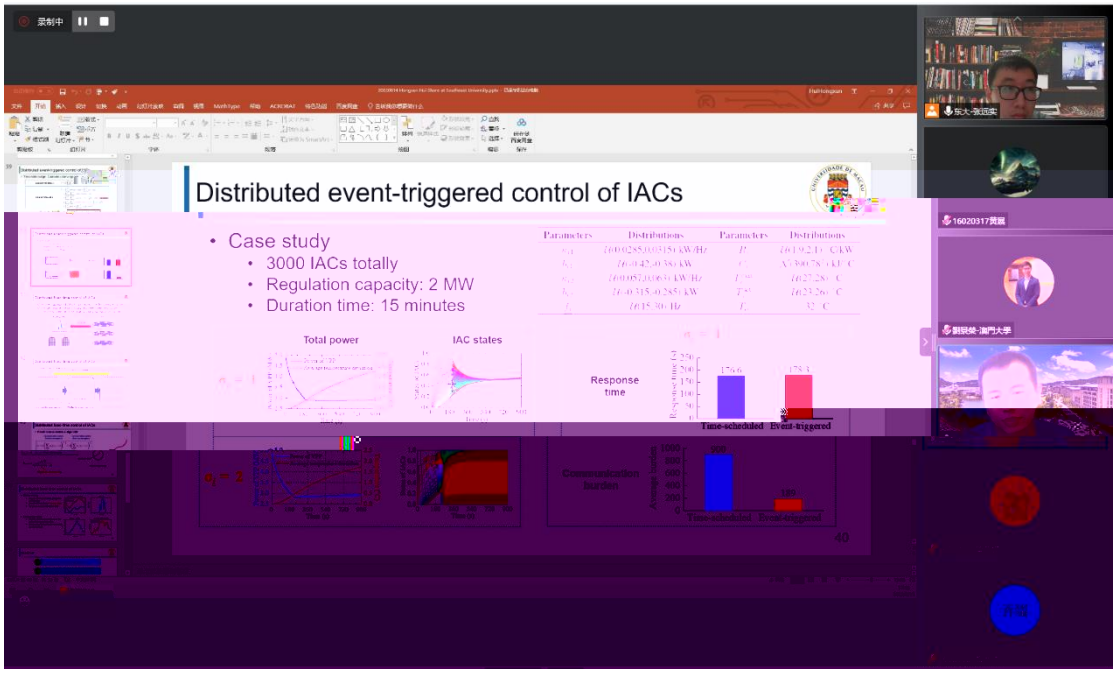
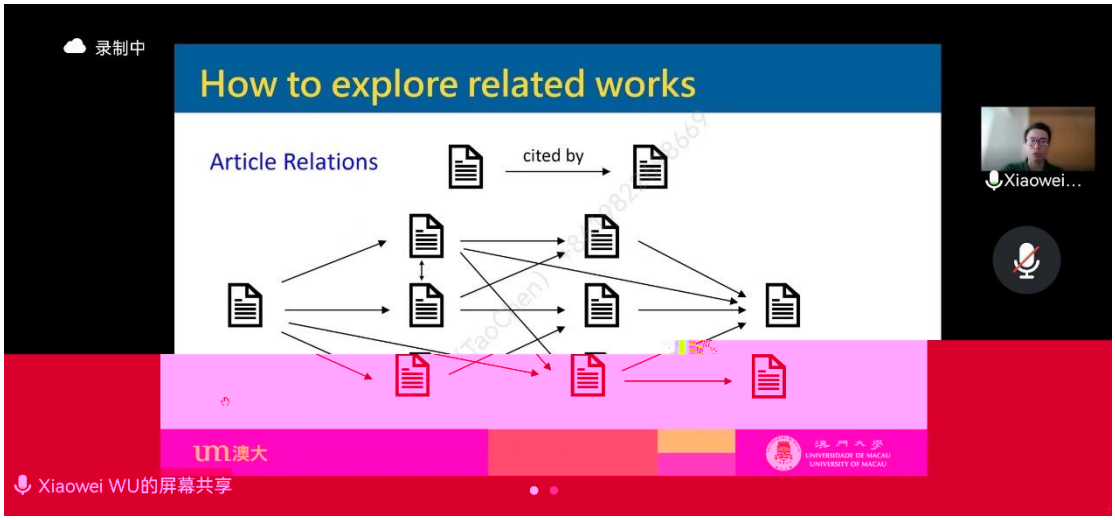
Distributed control of large-scale IACs
• Consensus algorithm with nonlinear protocol
$x_i(t) = sat[y_i(t)]$
$\dot{y}_i(t) = c\sum_{j\in N_i} a_{ij}(x_j(t) - x_i(t))$
State of neighbor j-th IAC
State of i-th IAC
Information exchange
$\dot{y} = -c\tilde{L}x$
Laplacian matrix
Convergence?
Control input
Saturation
Power system
Controller j
Controller i
Controller k
Frequency Calculation
30
methodology



3)

Academic Writing (Seminar)

Courses	Presenters	Time
How to Write Academic Paper in English	Dr. Yulin Chen (University of Macau)	8.26 Fri. 08:00-9:00
How to Explore Academic Information	Dr. Xiaowei Wu (University of Macau)	8.16 Tue. 14:00-15:00
How to Write Academic Paper in Chinese	Dr. Hongxun Hui (University of Macau)	8.23 Tue. 14:00-15:00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