INDUSTRIAL ENGINEERING AND ENTERPRISE MANAGEMENT IN THE INDUSTRY 4.0 ERA

林國平

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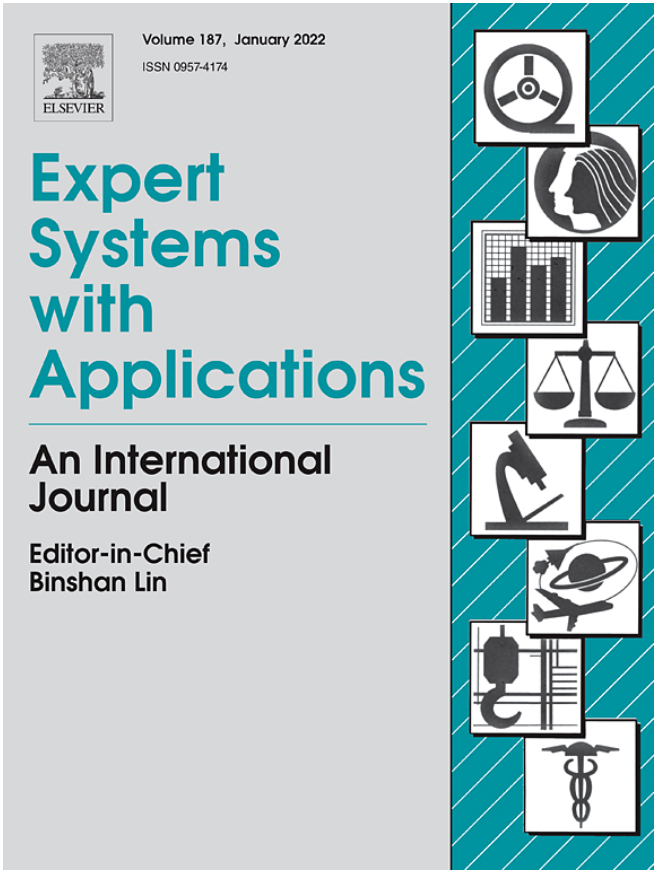
- Ph.D. IE (THU, Taiwan)
- Distinguished Professor, Business Administrator Dept. , Asia U 2018.08-2019.07
- Deputy Director, Institute of Innovation and Circular Economy,Asia U 2018.08-2019.07
- Chair of D. Information Management (Lunghwa U. of Sci. and Tech., Taiwan) 2014.02-2015.08
- Dean, college of Management(Lunghwa U. of Sci. and Tech., Taiwan) 2015.09-2018.02
- **70+** publications (SCISCIE Journal Papers),
- Recipient of multiple awards from **TIIM, MOST, MOE,** and **ORSTW**
- Senior Member, **IEEE,** Member, **ORSTW, CMA, CIIE**
- **Board member of Asia-Pacific Region, International Foundation for Production Research**
- **Deputy Secretary General, Chinese Institute of Industrial Engineers**
- **Associated editor, Expert system with applications (SCI)**
- **Guest editor, Journal of Imaging Science and Technology (SCI), IJPE(SCI)-ICPRVSI**
- **Editor board, Forecasting (ESCI)**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Binshan Lin


Topics
MDPI
Multi-Criteria Decision Making
Topic Board:
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Topic Board Member
Deadline for abstract submissions:
30 September 2022
Deadline for manuscript submissions:
30 December 2022
Message from the Topic Board
Dear Colleagues,
Multi-criteria decision-making (MCDM) needs to consider multiple functions/attributes/criteria/objectives and conflicts with the real world at the same time in management decision-making. MCDM problems can be roughly divided into two categories: planning/design/optimization problems and evaluation/selection/improvement problems (multi-attribute decision-making MADM). The problem types include evaluation problems, planning/design problems, ranking selection problems, and improvement problems. Many industries have been using the MCDM method to solve actual problems, such as those from medicine, supply chain, industrial ecology, energy, manufacturing, engineering, and various industries. Extrapolative analysis and methodology include an analytic hierarchy process, data envelopment analysis, ELECTRE, PROMETHEE, techniques for order preference by similarity to ideal solution, etc. Furthermore, big data/ Machine Learning/Artificial Intelligence have also been successfully applied in MCDM models, and the MCDM method can effectively make decisions in Industry 4.0. We are looking for new research based on the novel MCDM method for solving actual problems.
Participating Journals:
Applied Sciences, Mathematics, Symmetry, IJERPH, Forecasting

What is Industrial Engineering?

Improving processes or designing things that are more efficient and waste less money, time, raw resources, man-power and energy.

- Production and Operations planning
- International production and operation management
- Materials handling
- Logistics and Operations scheduling

http://www.ie.thu.edu.tw/front/news/newborn/news.php?ID=dGh1X2VlJm5ld2Jvcm4=&Sn=2513

What is Industrial 4.0?

1st Industrial Revolution

Steam power and **mechanisation of production**.

2nd Industrial Revolution

Henry Ford (1863-1947) took the idea of **mass production** from a slaughterhouse in Chicago. **Significantly faster** and at **lower cost**.

3rd Industrial Revolution

mory-programmable controls and **computers**.

4th Industrial Revolution

information and **communication technologies** to **industry**

https://www.youtube.com/watch?v=m6sl8KMsm5Q

What you should learning in the Era?

- Lean Production
  https://www.youtube.com/watch?v=xkUjX_c32c8
- Intelligent manufacturing

Production Management, Operation Research, Supply Chain Management, AI algorithm, Internet of Things, Data analysis, Quality Management, Could system

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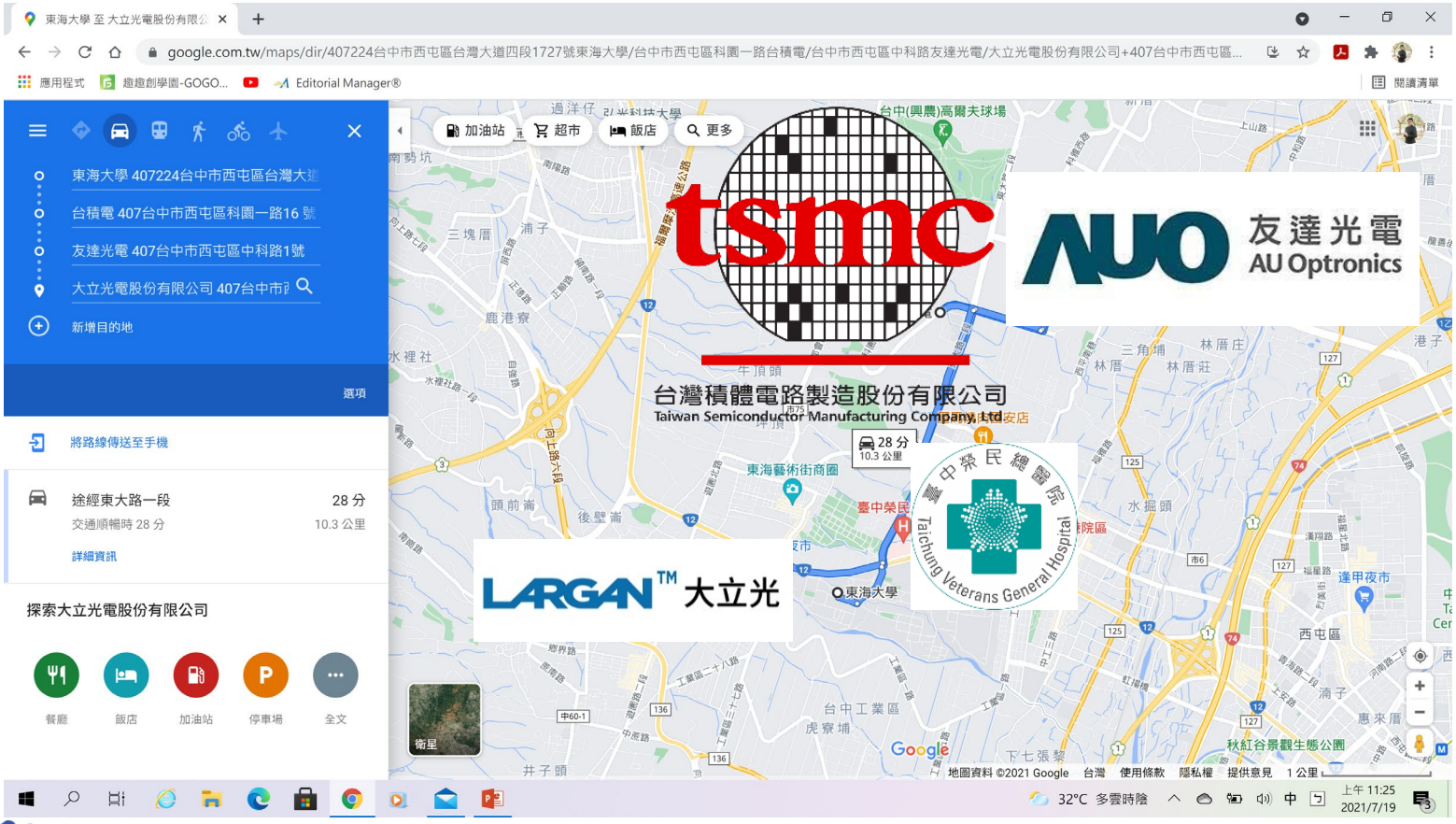
Reasons To Study Industrial Engineering



What you should know in the Era?

What you should know in the Era?

Statistic
Data analysis
Production Management
Quality Management
Manufacturing process

Big Data Case Study

Walmart uses ***Data Mining*** to discover patterns

Big data solutions at Walmart are developed with the intent of redesigning global websites and building innovative applications to customize the shopping experience for customers whilst increasing logistics efficiency.

Big Data Case Study

Machine learning algorithms are considered to determine where the demand is strong.

In the short term, surge pricing affects the rate of demand, while long term use could be the key to retaining or losing customers.

Big Data Case Study

Netflix has been determined to be able to predict what exactly its customers will enjoy watching with Big Data.

Netflix's recommendation engines and new content decisions are fed by data points such as what titles customers watch, how often playback stopped, ratings are given, etc.

Netflix shows us that knowing exactly what customers want is easy to understand

Big Data Case Study

A big technical challenge for eBay as a data-intensive business to exploit a system that can rapidly analyze and act on data as it arrives (streaming data).

The company has been at the forefront of using big data solutions and actively contributes its knowledge back to the open-source community

Big Data Case Study

P&G has put a strong emphasis on using big data to make better, smarter, real-time business decisions.

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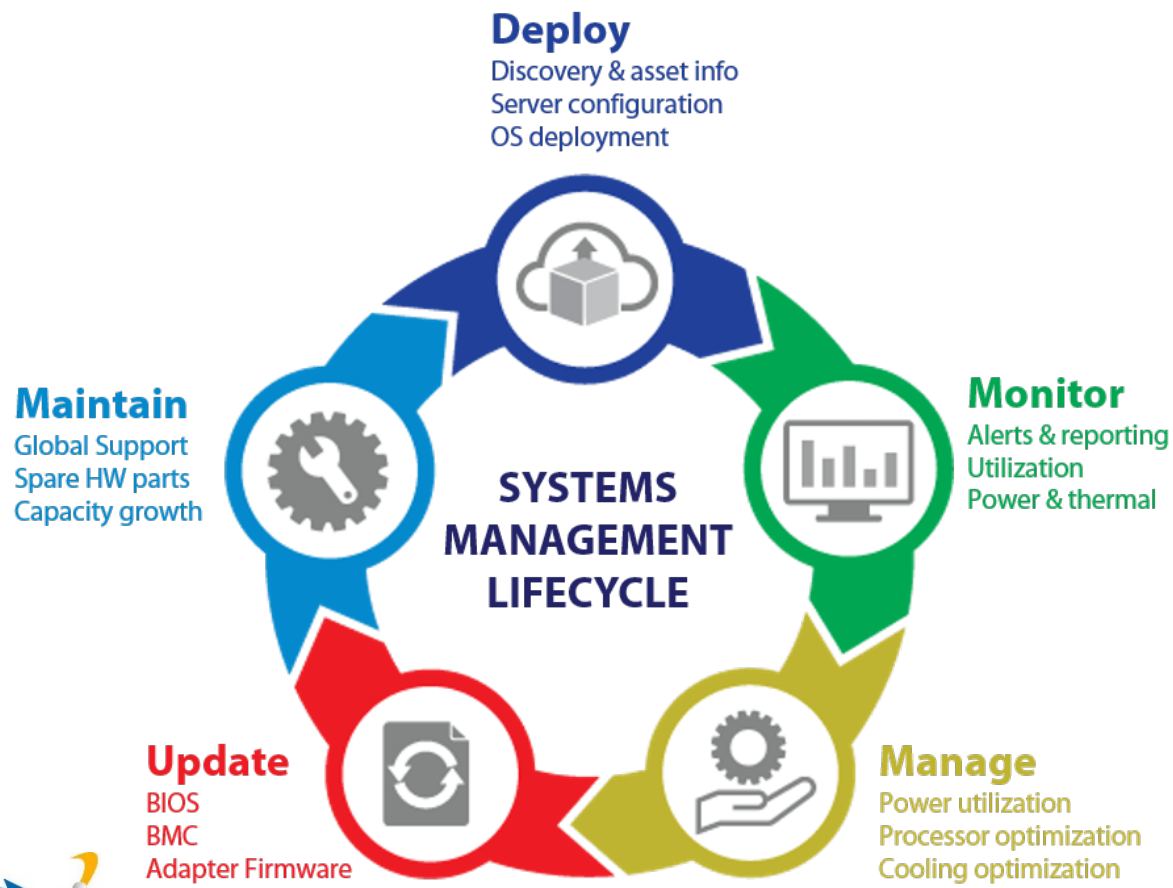
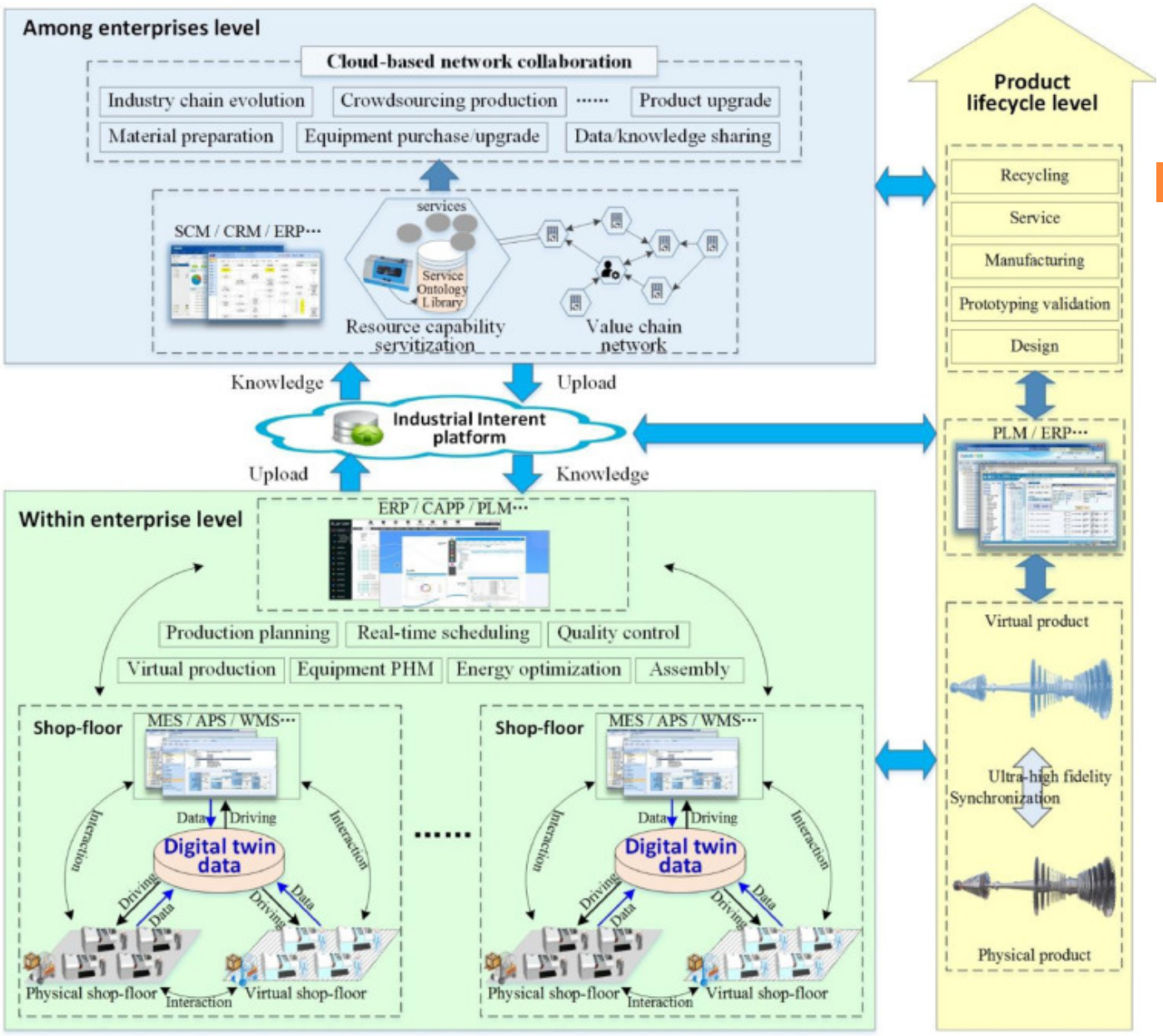
Big Data=Systems Management



What you should know in the Era?



https://www.sciencedirect.com/science/article/abs/pii/S0736584519300602

SAP solution

Moving beyond the factory with Industry 4.0

https://www.sap.com/products/supply-chain-management/industry-4-0.html

UP-Level

- Product Quality and Reliability
- Machine learning to accurately model and predict equipment, process and product results
- Process Control and Capability with alerting
- Equipment maintenance: Predictive, condition-based and scheduled with alerting
- Factory Monitoring including Management dashboards , KPI charts and OEE.
- Supply Chain: Demand forecasting, inventory optimization, supplier performance
- Resource modeling and optimization
- Customer Analytics – customer & product segmentation, cross-sell / up-sell opportunities
- Sales - Pricing optimization and Account management
- Yield Prediction, Predictive Maintenance, Virtual Metrology
- Uni / Multi-variate Control Charts, Time Series
- Anomaly Detection – AI: Deep Learning

Manufacture-Level

- Image & Pattern Classification
- Defect image classification, Wafermap patterns
- Multi-image, Multi-media, equipment sounds
- AI: Deep Learning
- Advanced Process Control: Sensor Analytics & IoT
- Fault Defect Classification, Run-to-Run Control
- Equipment Health Monitoring
- Factory Map Dashboards & Alerting

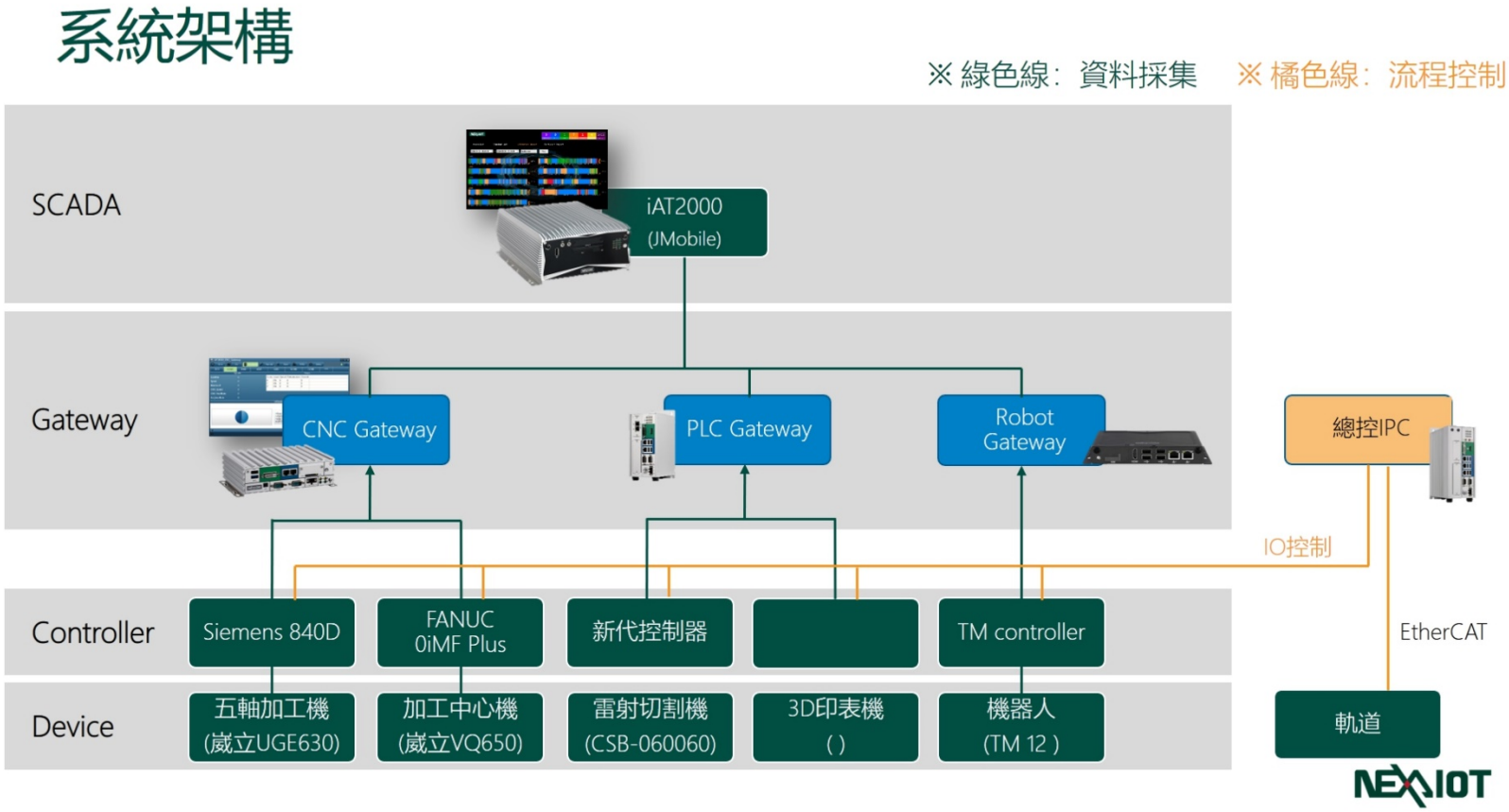
Digital Factory Platform-Level

- Data Integration: Historical & Streaming data
- Interactive Visual Analytics & Dashboards
- AI & Machine Learning: no-code visual workflows
- Edge & Sensor Analytics

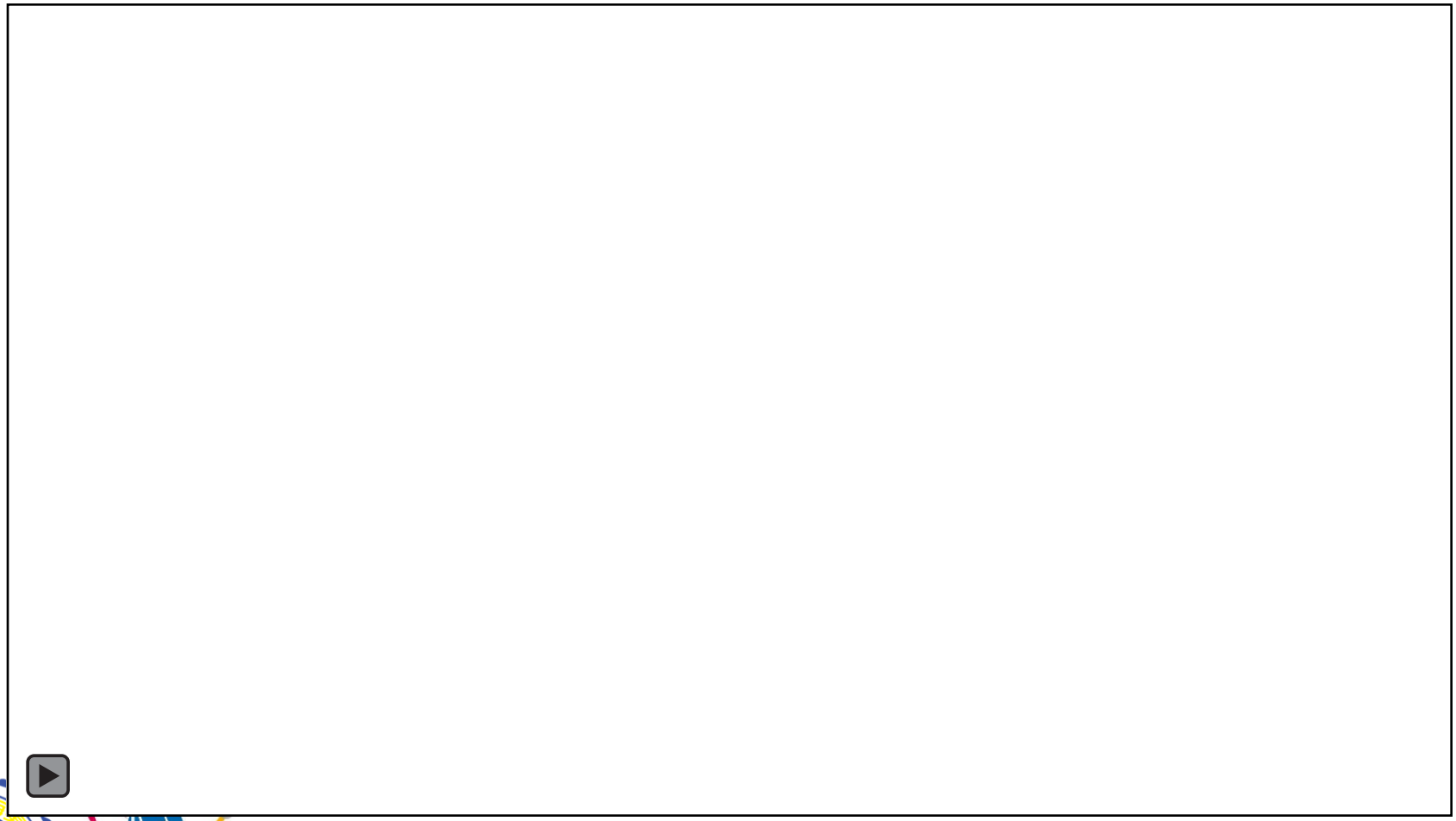
https://www.sap.com/products/supply-chain-management/industry-4-0.html

Thunghai University solution

- IEEI Department (System Frmaework)



Thunghai University solution



What you should know in the Era?

Top 4 applications of AI in medicine (Master program)

Diagnose diseases

Develop drugs faster

Personalize treatment

Improve gene editing

https://www.youtube.com/watch?v=nEahhnk3VvM

Diagnose diseases

- Detecting lung cancer or strokes based on **CT scans**
- Assessing the risk of sudden cardiac death or other heart diseases based on **electrocardiograms** and **cardiac MRI images**
- Classifying skin lesions in **skin images**
- Finding indicators of diabetic retinopathy in **eye images**

More advanced AI diagnostics are coming soon

Develop drugs faster

AI has already been used successfully in all of the **4 main stages in drug development:**

- Stage 1: Identifying targets for intervention

Automatically identify good target proteins

- Stage 2: Discovering drug candidates

Predict the suitability of a molecule based on structural fingerprints and molecular descriptors.

- Stage 3: Speeding up clinical trials

Automatically identifying suitable candidates

- Stage 4: Finding Biomarkers for diagnosing the disease

Provide absolute certainty as to whether or not a patient has a disease

Personalize treatment

- Machine Learning can automate this complicated statistical work – and help **discover which characteristics indicate that a patient will have a particular response to a particular treatment.**

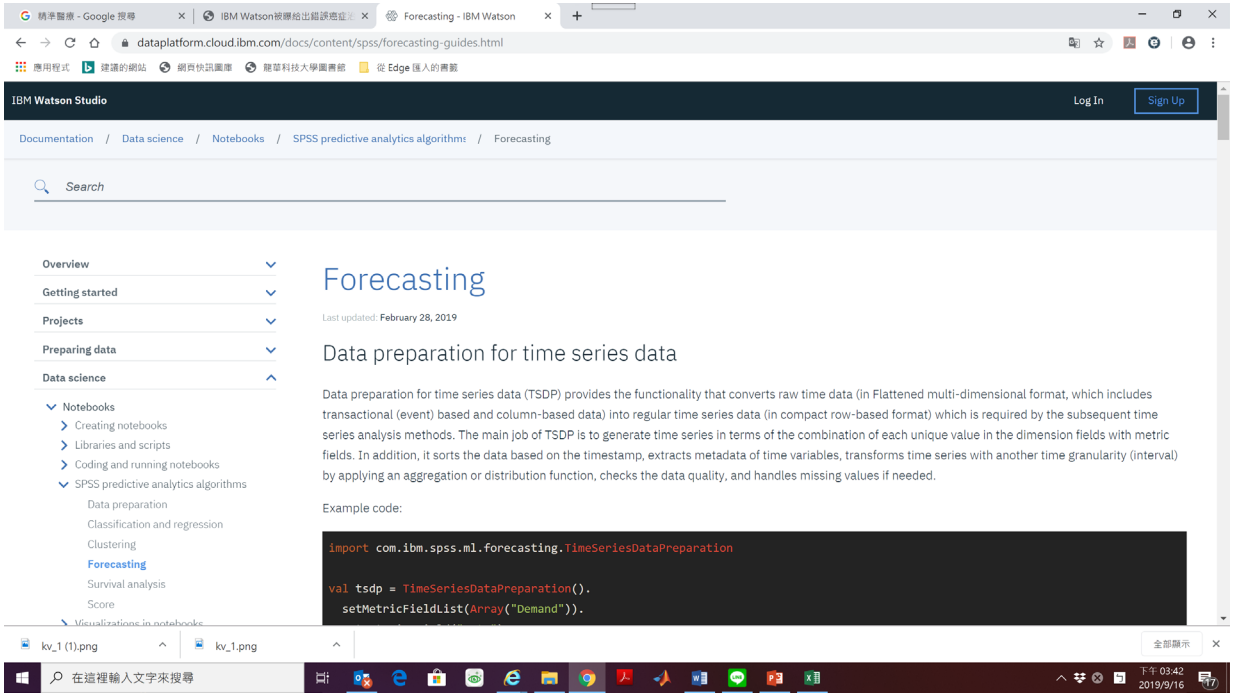
Improve gene editing

- This technique relies on short guide RNAs (sgRNA) to target and edit a specific location on the DNA. But the guide RNA can fit multiple DNA locations – and that can lead to **unintended side effects** (off-target effects).

IBM Watson Case

Autoregressive Integrated Moving Average

The Autoregressive Integrated Moving Average (ARIMA) model is a traditional time series model which was first popularized by Box and Jenkins (1976).




Thank you for your Listening
Welcome to IEEI, Tunghai University
Q&A
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