Introduction to Deep Learning

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Outline

- About Dr. Chan
- What is deep learning?
- Why do you need to take this course?
- What will you learn from this course?
- Syllabus
- Grading policy

About Dr. Chan

Website

Present Position

- Assistant Professor | Undergraduate Program in Intelligent Computing and Big Data, CYCU
- Assistant Professor | Master Program in Intelligent Computing and Big Data, CYCU
- AI Consultant | Taiwan Cybersecurity Foundry Company
- Adjunct Data Scientist | Institute of Sociology, Academia Sinica

Education

- Ph.D. | Department of Geography, National Taiwan University
- M.S. | Department of Geography, National Taiwan University
- M.S. | Department of Food Science, Nutrition, and Nutraceutical Biotechnology, Shih Chien University
- B.S.S. | Department of Social and Regional Development, National Taipei University of Education

Working Experience

- Adjunct Assistant Professor | Department of Artificial Intelligence, Tamkang University
- Postdoctoral Research Fellow | Department of Radiology, School of Medicine, Taipei Medical University
- Postdoctoral Research Fellow | Department of Radiology, Taipei Municipal Wan Fang Hospital, Taipei Medical University
- Data Scientist Engineer | Cybersecurity Technology Institute, Institute for Information Industry
- Intern Research Assistant | National Science and Technology Center for Disaster Reduction

About Dr. Chan

Website

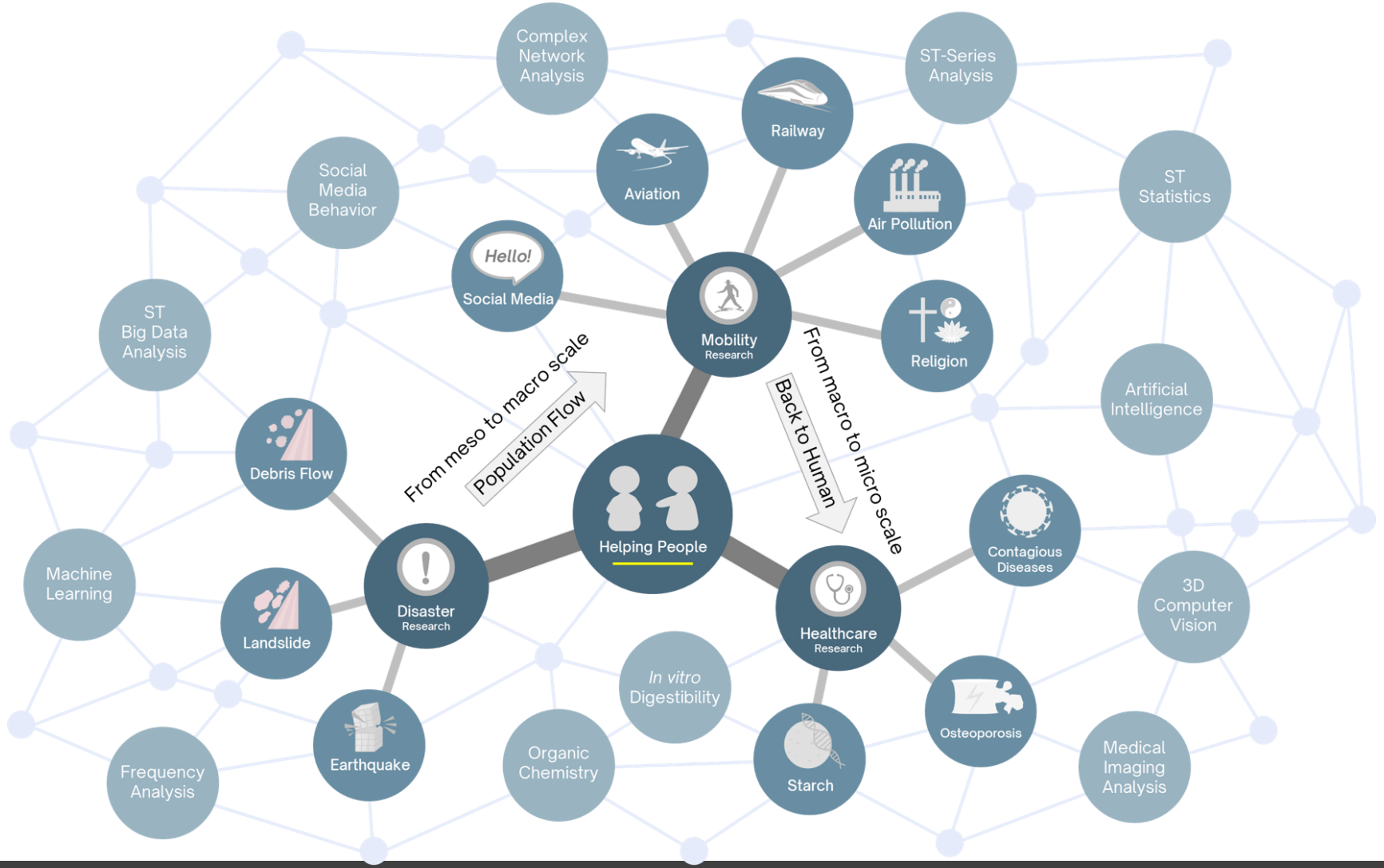
Technical Skills

- **Computer Science: Python, Matlab, R**, C#, JavaScript, jQuery, jQueryUI, Android Development, HTML, MySQL, Nodejs, AngularJS, MongoDB, Elasticsearch, Spark, Facebook APIs and Twitter APIs
- **Geography:** GIS (ArcGIS, QGIS, Super GIS), Spatial Statistics, Spatial Database, Complex Network Analysis, Gephi
- **Physics:** Signal Processing (in time sequence and frequency) and Electromagnetic Analysis
- **Food Chemistry:** Starch Science, Resistant Starch, Slowly Digestible Starch, *in vitro* Digestibility, SEM, XRD and HPSEC
- **Chemistry:** Organometallic synthesis, NMR, IR, HPLC, ESI-MASS and pH meter
- **Design:** Illustrator, Photoshop, Dreamwaver and Google SketchUp
- **Marketing:** Google Analysis, Facebook Marketing and Google Trend

Interests

Emergency Medicine, Chinese Medicine, Volleyball, Sport Science, Photography, Tourism, Web and Graphic Design

About Dr. Chan



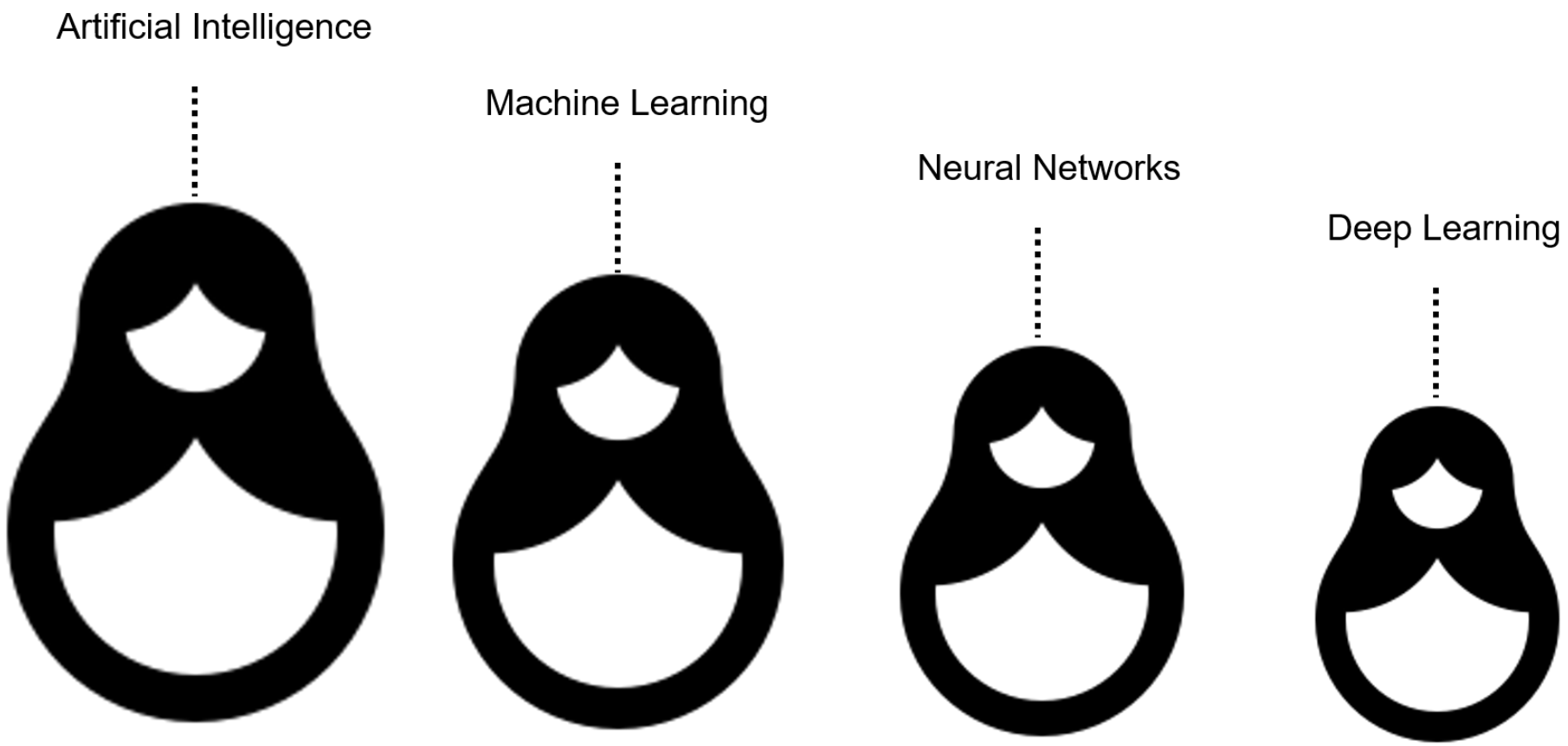
What is deep learning?

- **Deep learning is a subset of machine learning**, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behavior of the human brain—albeit far from matching its ability—allowing it to “learn” from large amounts of data. While a neural network with a single layer can still make approximate predictions, additional hidden layers can help to optimize and refine for accuracy.
- Deep learning drives many artificial intelligence (AI) applications and services that improve automation, performing analytical and physical tasks without human intervention. Deep learning technology lies behind everyday products and services (such as digital assistants, voice-enabled TV remotes, and credit card fraud detection) as well as emerging technologies (such as self-driving cars).

https://www.ibm.com/tw-en/topics/deep-learning#:~:text=Machine%20Learning%20Accelerator-,What%20is%20deep%20learning%3F,from%20large%20amounts%20of%20data.

https://www.intellspot.com/types-statistical-analysis/

What is deep learning?



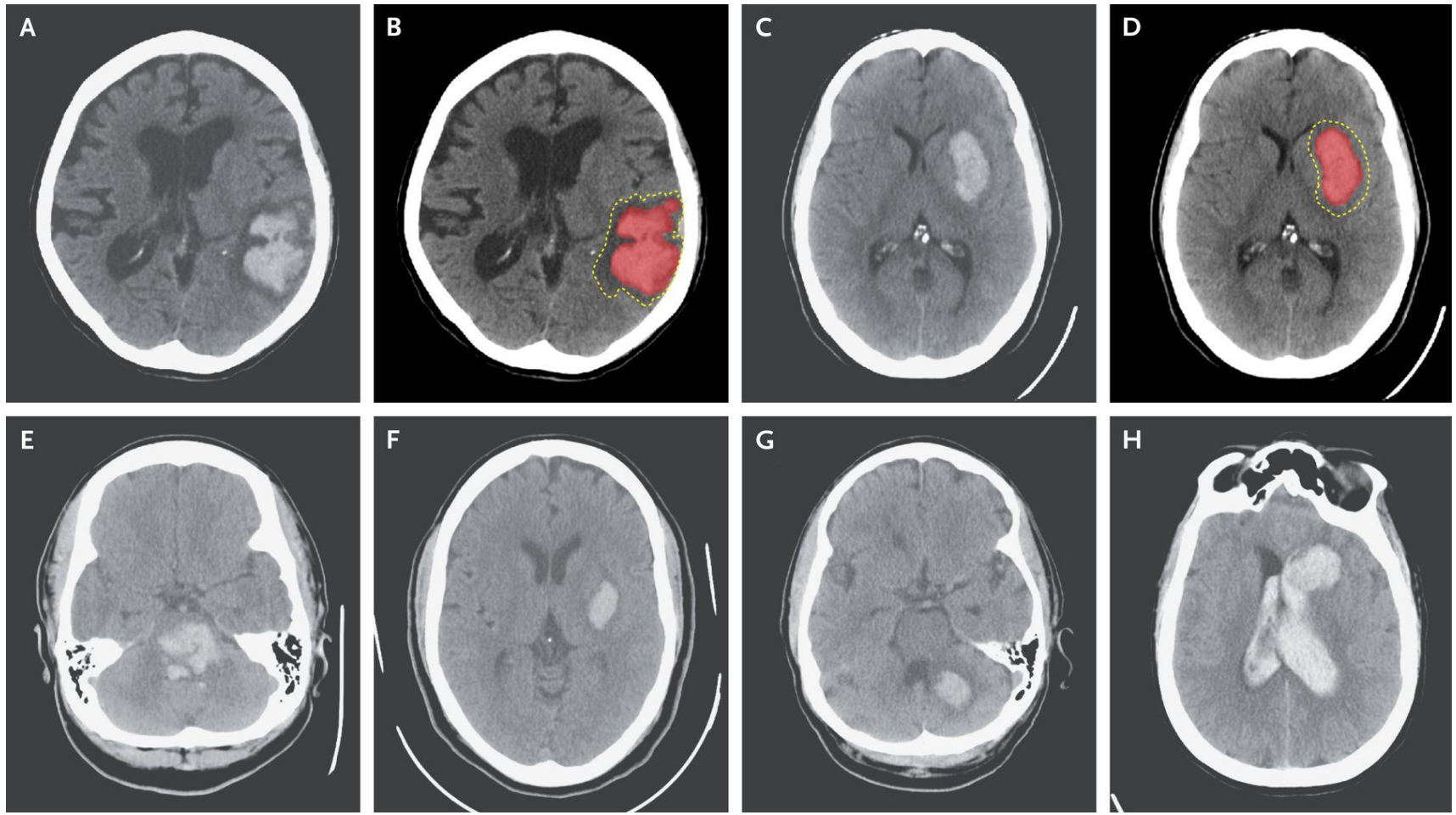
https://www.ibm.com/cloud/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks

Why do you need to take this course?

- **The Role of a Clinical Trial Statistical Analysis**
  1. Demonstrating compound efficacy
  2. Demonstrating compound safety
- **Variance & Bias in Clinical Trial Data**
- **The Clinical Trial Statistical Analysis Process**
  - #1. Decide on Hypothesis
  - #2. Calculate Study Power & Required Sample Size
  - #3. Develop a Statistical Analysis Plan (SAP)
  - #4. Collect Data & Run Study
  - #5. Conduct Statistical Analysis & Report Outcomes
- **How to Minimize Variance in Statistical Analysis**

https://blog.nd.edu/clinical-trial-statistical-analysis-how-to-minimize-noise/#:~:text=Statistical%20analyses%20in%20clinical%20trials,factor%20impacts%20a%20response%20variable.

Why do you need to take this course?



Shown are intracerebral hemorrhages as seen on noncontrast computed tomography (Panels A through H). Lobar intracerebral hemorrhage (Panels A and B) and putaminal intracerebral hemorrhage (Panels C and D) are shown with a rim of perihematomal edema surrounding the intracerebral hemorrhage (outlined by dotted lines in Panels B and D). Other panels depict a pontine intracerebral hemorrhage in the middle portion of the brain stem (Panel E); basal ganglia intracerebral hemorrhage (Panel F); intracerebral hemorrhage in the left cerebellum (Panel G); frontal intracerebral hemorrhage with extension into the ventricles (compartments that contain cerebrospinal fluid), often referred to as an intraventricular hemorrhage (Panel H, with cerebral microbleeds in the juxtacortical or lobar locations that are often seen on susceptibility or gradient-echo sequences and that are typical of cerebrovascular amyloid.

https://www.nejm.org/doi/full/10.1056/NEJMra2201449

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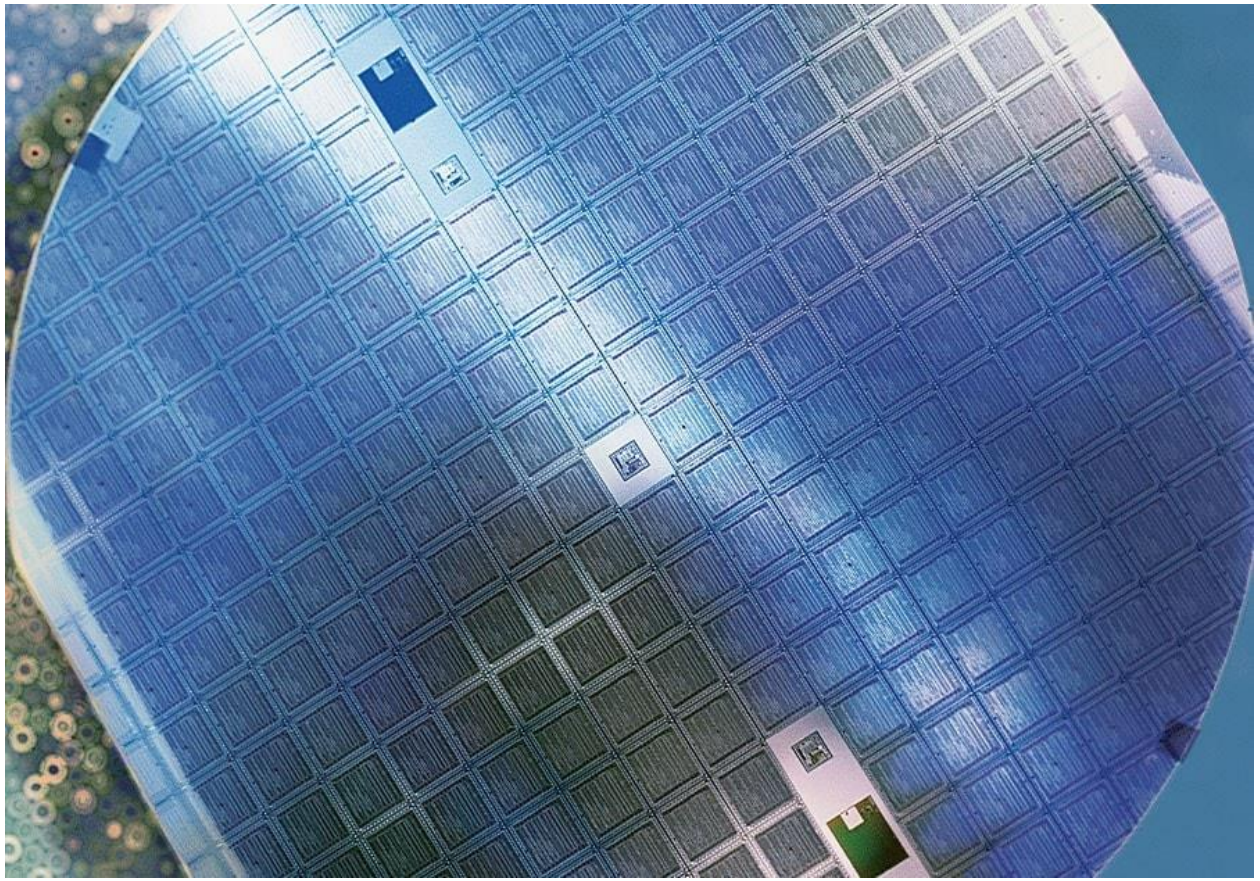

Data orchestration with deep learning process optimization in fabs presents a largely untapped opportunity for next-level production.

In the semiconductor industry, technological complexity and ballooning expenditures — on capital equipment, operations, and materials — are driving the adoption of AI and machine learning to unlock efficiencies across the entire value chain.

https://www.jmp.com/en_au/industries/data-analysis-software-for-the-semiconductor-industry.html

Why do you need to take this course?

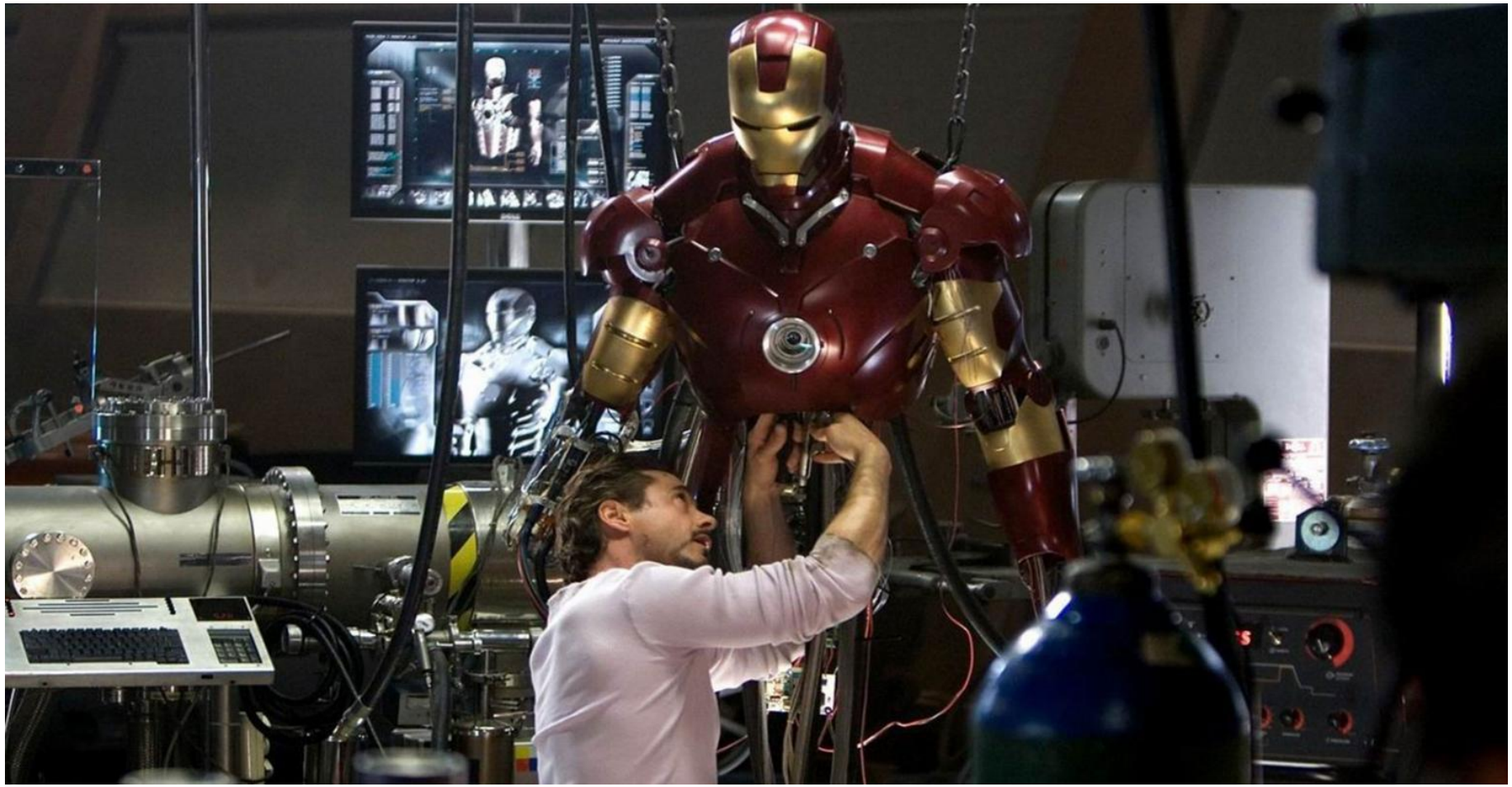

Photo credit: Marvel Studios

What will you learn from this course?

- In this course, we will teach the fundamental concept of deep learning and its applications for numerical and text data.
  - Neural network basis
  - Backpropation
  - FNN
  - RNN
  - LSTM
  - CNN
  - Word Embedding
  - Attention model
  - Reinforcement learning

Syllabus

Week	Date	Content
1	Feb. 14-15	Introduction to Deep Learning
2	Feb. 21-22	Neural Network Basis
3	Feb. 28/ Mar. 1	228 (Holiday)/ Neural Network Basis
4	Mar. 7-8	Backpropagation
5	Mar. 14-15	Neural Network with Numerical Data
6	Mar. 21-22	Hardware/Software Platforms for Deep Learning Applications
7	Mar. 28-29	
8	Apr. 4-5	Spring Break
9	Apr. 11-12	- Mid-term Exam Week -
10	Apr. 18-19	Midterm Pitch
11	Apr. 25-26	Word Representation

Week	Date	Content
12	May 2-3	Recurrent Neural Network with Text Data
13	May 9-10	Long-Short Term Memory with Text Data
14	May 16-17	Attention Model
15	May 23-24	Convolutional Neural Network
16	May 30-31	Reinforcement Learning
17	Jun. 6-7	Final Report Presentation
18	Jun. 13-14	(Final Exams)

Grey: Chun-Hsiang Chan (詹竣翔)
Blue: Slo-Li Chu (朱守禮)
Gold: Hsiu-Min Chuang (莊秀敏)

Grading policy

- All you have to do is study hard and feel free to ask question when you do not understand.
- I believe that if you fulfill all required items, and then you will pass this course.
- Do not worry about the grade! The most important thing is what you learn from this course.

Assignments	30 %	**Midterm Report**	30 %
Others	10 %	**Final Report**	30 %


Thank you for your attention!