

Making Real (G)AI in the Modern Age

AI Cup is **NOT** AI

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Keynote Talk for AI Cup Award Ceremony

About Me

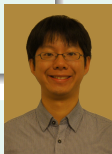
Professor
National Taiwan University



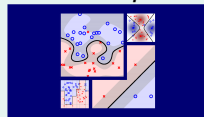
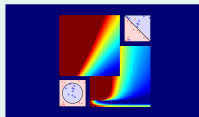
former Chief Data Scientist
Appier Inc.

The Appier logo, consisting of the word "Appier" in a stylized blue font.

Co-author
Learning from Data



Instructor
NTU-Coursera MOOCs
ML Foundations/Techniques



interest: making machine learning **realistic**

Co-Led toward Six KDDCup Champions: 2010–2013



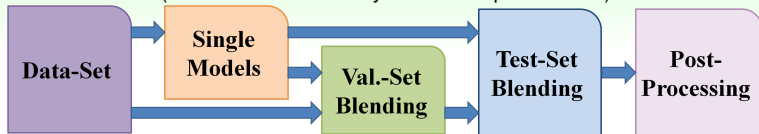
(award ceremony of KDDCup 2011)

- 2010: education (answer next math question correctly?)
- 2011: recommendation*2 (next preferred song?)
- 2012: marketing (will click ad?)
- 2013: information retrieval*2 (paper from this author?)

why NOT participate in **more KDDCups?**

Aggregating Hundreds of Models is NOT AI

(Slide modified from my ML Techniques MOOC)



(Chen et al., A linear ensemble of individual and blended models for music rating prediction, 2012)

KDDCup 2011 Track 1: World Champion Solution by NTU

- **validation set blending**: a special **any blending** model

$$E_{\text{test}} \text{ (squared): } 519.45 \Rightarrow 456.24$$

—helped **secure the lead** in **last two weeks**

- **test set blending**: **linear blending** using \tilde{E}_{test}

$$E_{\text{test}} \text{ (squared): } 456.24 \Rightarrow 442.06$$

—helped **turn the tables** in **last hour**

221 models in **test set blending**—**really?!**

(Over)-Fitting Pre-Defined Criteria is NOT AI

A Real Medical Application: Classifying Bacteria

- by human doctors:
some wrong predictions \Rightarrow **wrong antibiotics** \iff **serious costs**
- cost matrix averaged from two doctors as **evaluation criteria**:

	Ab	Ecoli	HI	KP	LM	Nm	Psa	Spn	Sa	GBS
Ab	0	1	10	7	9	9	5	8	9	1
Ecoli	3	0	10	8	10	10	5	10	10	2
HI	10	10	0	3	2	2	10	1	2	10
KP	7	7	3	0	4	4	6	3	3	8
LM	8	8	2	4	0	5	8	2	1	8
Nm	3	10	9	8	6	0	8	3	6	7
Psa	7	8	10	9	9	7	0	8	9	5
Spn	6	10	7	7	4	4	9	0	4	7
Sa	7	10	6	5	1	3	9	2	0	7
GBS	2	5	10	9	8	6	5	6	8	0

designed a **lower-cost** model (Jan et al., BIBM 2011),
but no doctor wants to use it—**why?!**

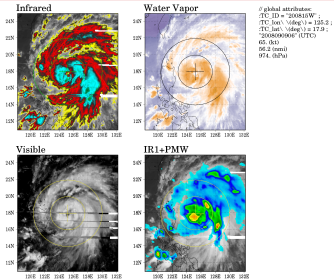
Using Well-Prepared Data is NOT AI

Tropical Cyclone Image-to-Intensity Regression (Chen et al., KDD 2018)

70501 frames of 1285 TCs:

- base: GridSat,
but we want TC data only!
- extension: CMORPH,
but needs upscaling to unify with
other data!
- label: best-track,
but they are in different databases!

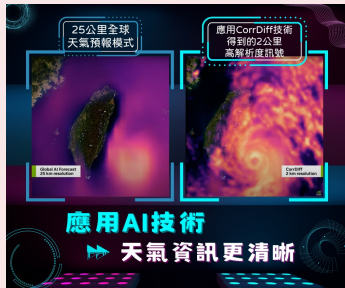
—cannot do this well without help of
domain experts



data collection/processing takes more efforts
than ML modeling in practice—surprise?!

Showing Best-Case Demo is NOT AI

NVIDIA CorrDiff: a Proof-of-Concept Demo



(NVIDIA YouTube)

- 4 instead of 44 channels on 2018–2022 Taiwan data with GAI
- 10x scaling is non-trivial
- operation needs average or even worst case verification

worst cases are often not
ML-solvable—seriously?!

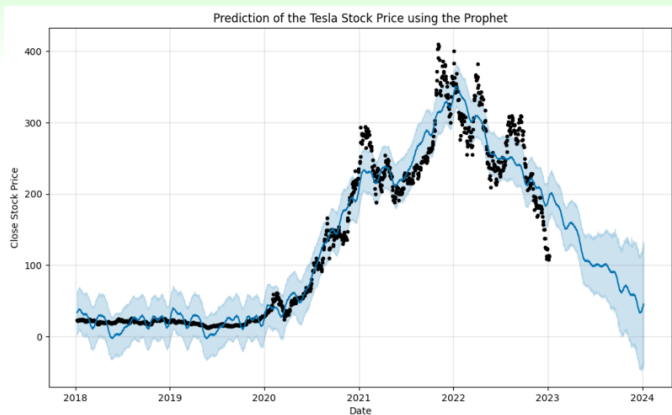
From AI to GAI: Is This GAI? (1/4)



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generative,
but **arguably no intelligence**

From AI to GAI: Is This GAI? (2/4)



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predictive intelligence,
but **arguably not generative**

From AI to GAI: Is This GAI? (3/4)



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Van Gogh,
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generative intelligence,
or **just (predictive) image processing?**

Properties of Generative AI

Recognitive AI

Listen/Read/Watch

Generative AI

Speak/Write/Draw

Two Properties of Generative AI

variation (creativity)



(Pictures Extracted from Ho et al. for
educational purposes)

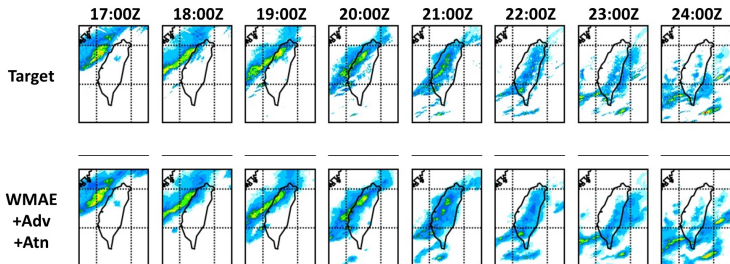
complexity (structure)



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Generative AI :
complex outputs with **variations**

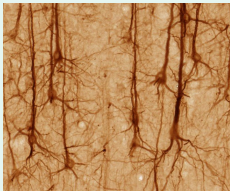
From AI to GAI: Is This GAI? (4/4)



predictive: time-series prediction;
generative: complex output;
or does it matter? 😊

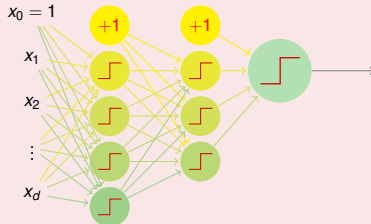
Neural Network: from Bird to Airplanes

(Slide modified from my ML Techniques MOOC)



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neural network: a **bio-inspired model**

From Wright Flyer (1903) to Commercial Airplanes (1919–)



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we are at **wright-flyer-age** of (G)AI

What's Needed before Wider Acceptance airplanes

- war? 😊
- technology advancements: like lighter materials, more efficient engines, **better control**
- regulations: like laws, licenses, etc.
- trials: understanding success **and failure** cases

(G)AI needs research on **process**

manipulation challenge

generating something is easy;
generating as desired is hard

—need research on **control**

certification challenge

trying is easy;
systematic testing is hard

—need research on **verification**

process → **trust** is the key to real (G)AI

Summary



(award ceremony of KDDCup 2010)

- winning AI Cup is great, but **NOT AI** yet
 - model, data, criteria, case studies
 - ... and more, actually
- (G)AI is booming, but needs more
 - social systems and other tools
 - professional efforts on **process** (control+verification) to build trust

Thank you! Questions?