ENERGY TAIWAN 2018
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O&M Optimization by AI Practice

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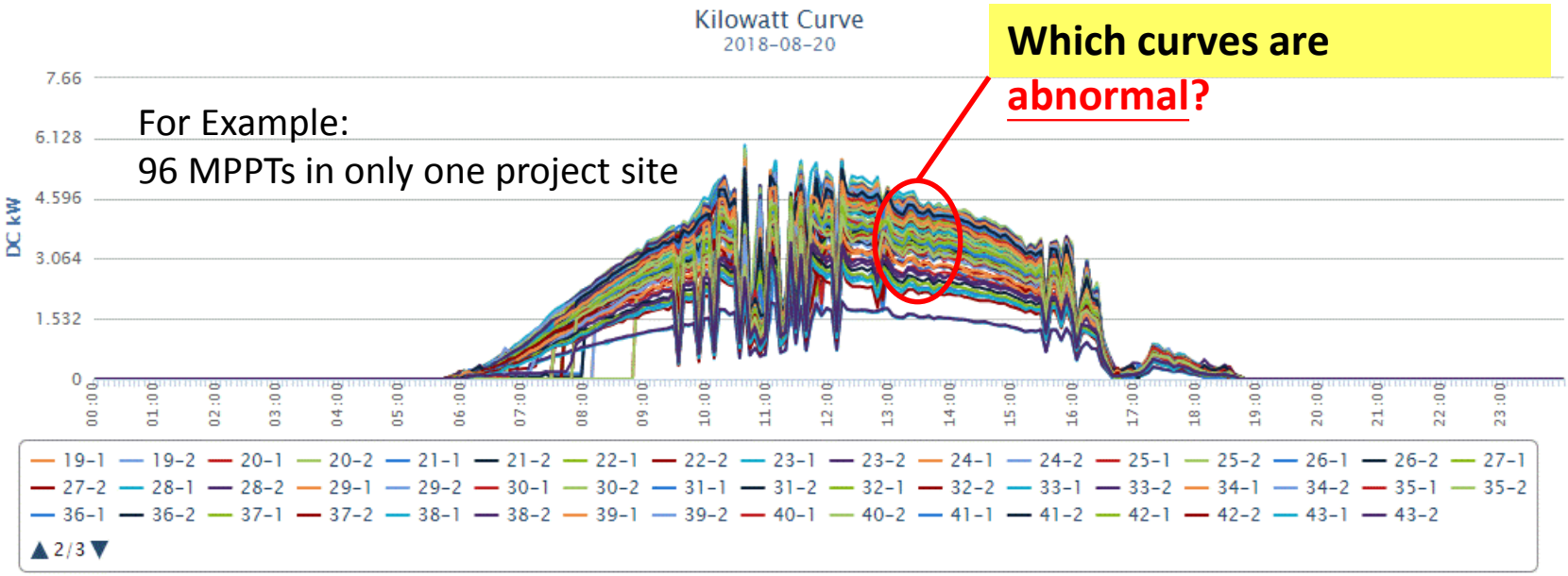
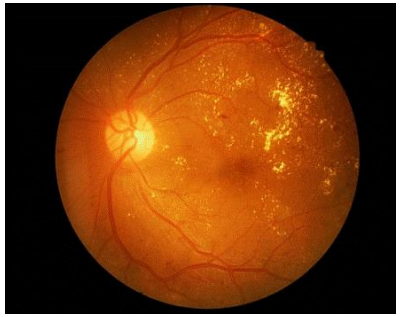
O&M Optimization by AI Practice

Background & Motivation



For Example:
96 MPPTs in only one project site

Which curves are abnormal?



- **By manual review (Visual Inspection)?**
- **How about monitoring 500 projects?**
- **Automatic judgement? Threshold?**
- **What should be prepared before dispatching manpower to the field?**

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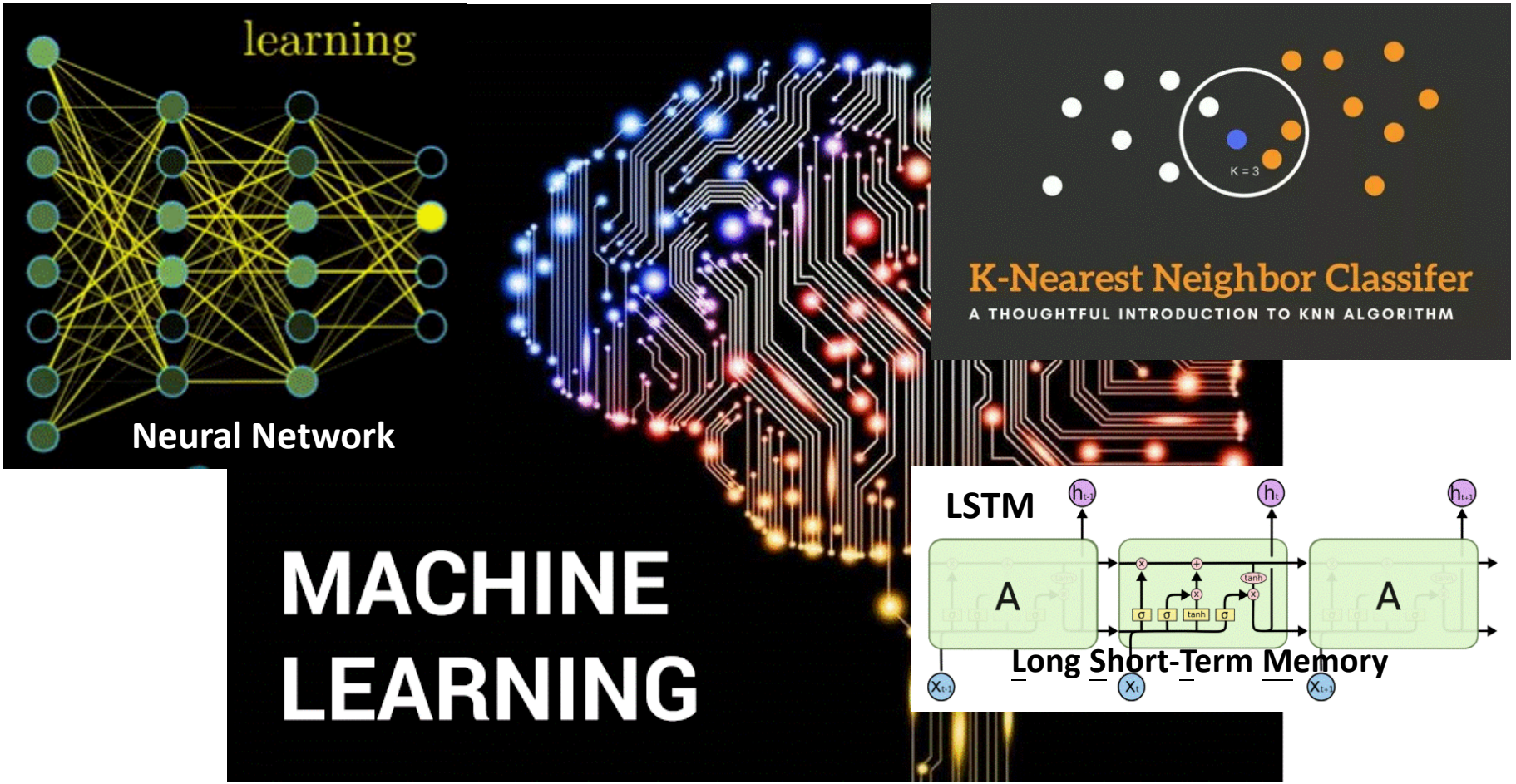

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Algorithm (for Power Prediction Engine)

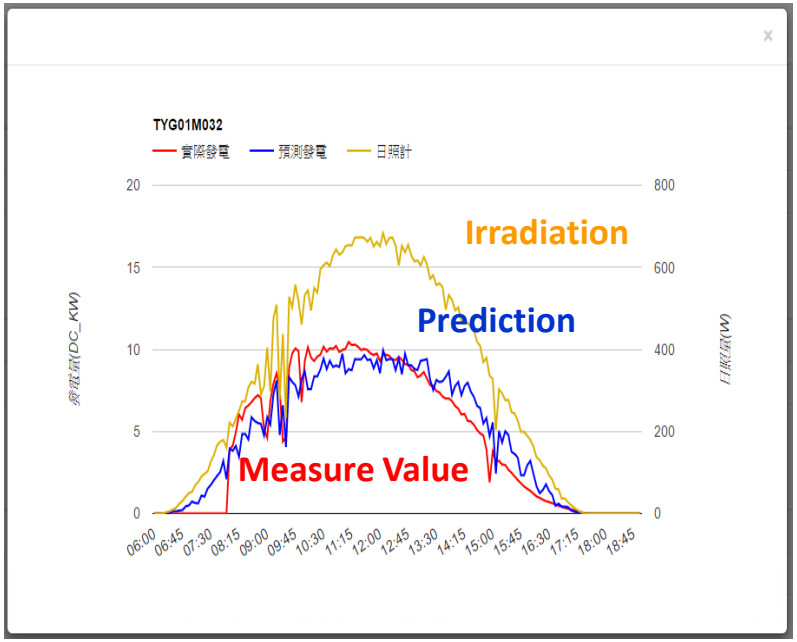
Only 7-day Learning
for each Project Sits

In-situ analysis
in every 5-min

No Specific Parameters
to input

- Location / Sea-Level
- Inclination / Azimuth Angle
- PV Module (type/vendor/PAN file)
- Inverter (type/supplier)

Finger-Print is built
by each power plant



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Algorithm (for Abnormal Equipment Detection)

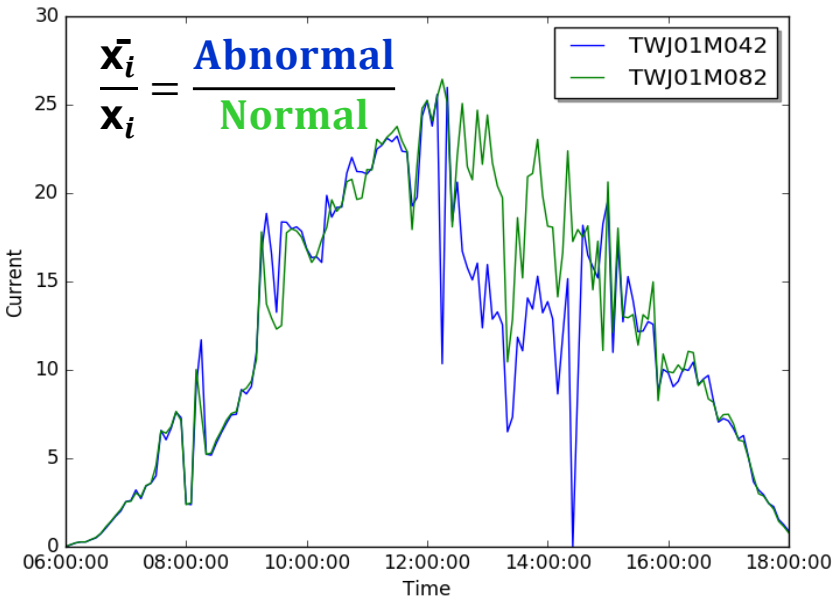
Each project site with
840 data for machine learning
(12 data/hr x 10 hrs/day x 7 days)

For Example:

500 project sites
> 20,000 MPPT
> 16,800,000 data for learning

For Equipment (MPPT)

$$\text{Abnormal Ratio} = \sum_{i=1}^{T} \frac{\bar{x}_i}{x_i} / T$$



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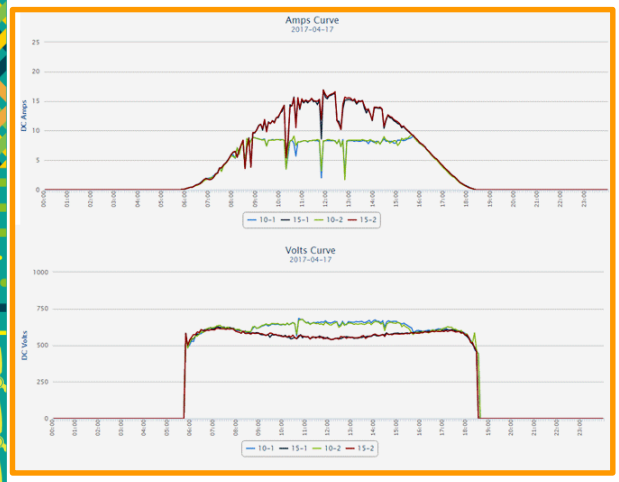
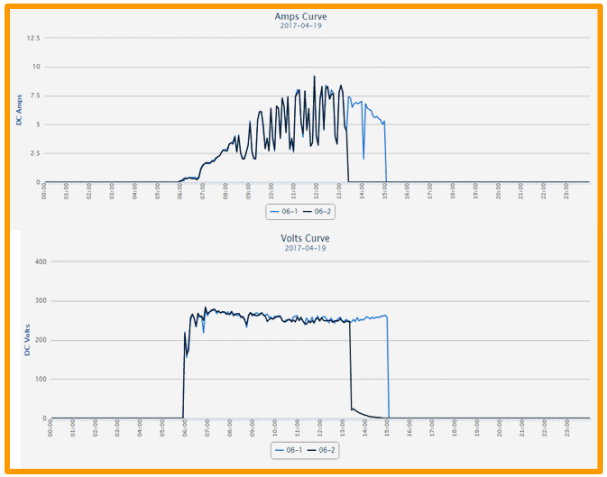
Knowledge Database (Failure Type)

- Supervised Learning

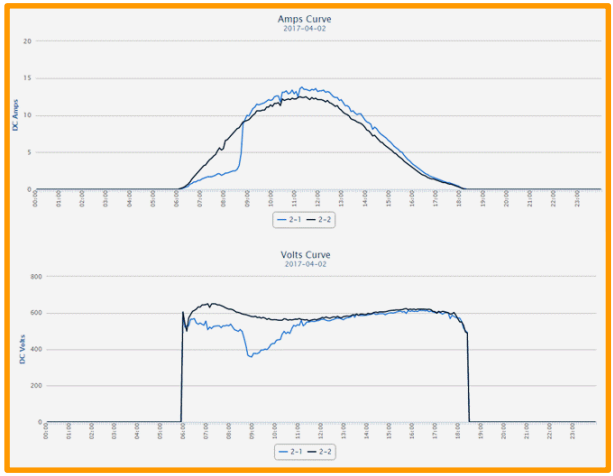
Thermal Degradation



Fuse Burnt



Shadowing



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Mobile Message & e-mail Alert for user

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Abnormal Detection System

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Precision

- Learning Period: 163 days (2018/3/10~8/31)
- Project site Number: 500 (> 20,000 MPPT)
- Abnormal Alert Data: 858 (Total diagnosis data: > 391.2 million)

Equipment Fault	Total Alert	True	False	Precision
	858	849	9	99.0%

Failure Type	Total Alert	Confirmation		Precision
		True (a)	False (b)	a / (a+b)
Fuse Burnt	178	169	9	94.9%
Thermal Degradation	30	26	4	86.7%
Inverter Faulty/ Late Operation	522	408	114	78.2%
Shadowing	128	20	108	15.6% (*raining)

Continuous Improvement by further Machine Learning.