From data to decisions:
The expanding role of AI/ML toolkits
for utilities

Stantec

Imagine we could (accurately) predict
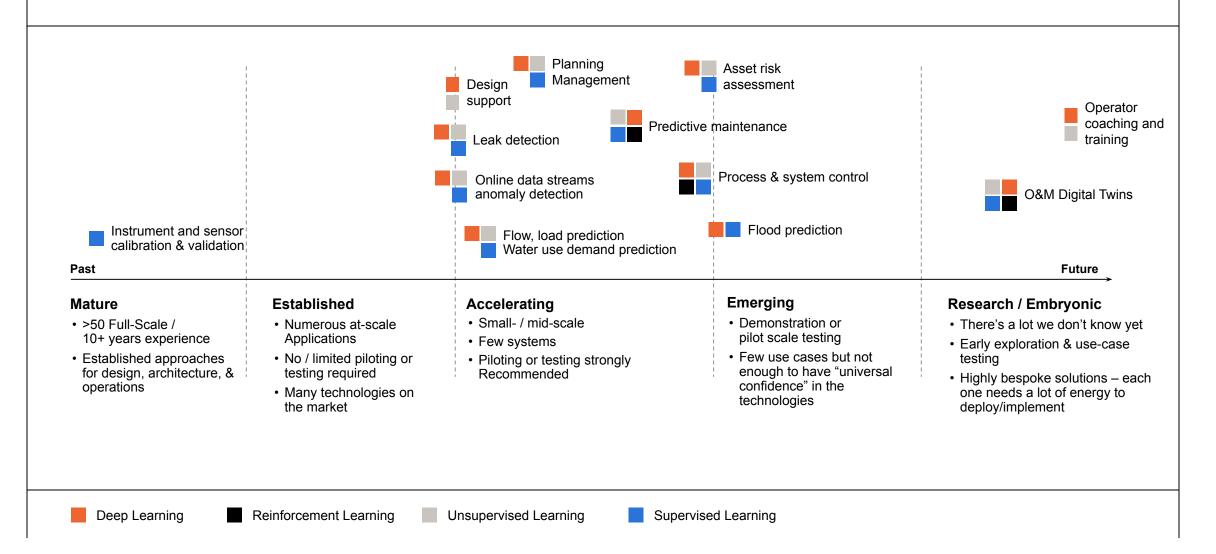
…when equipment would fail

…what the flow, demand, load and characteristics will be next week

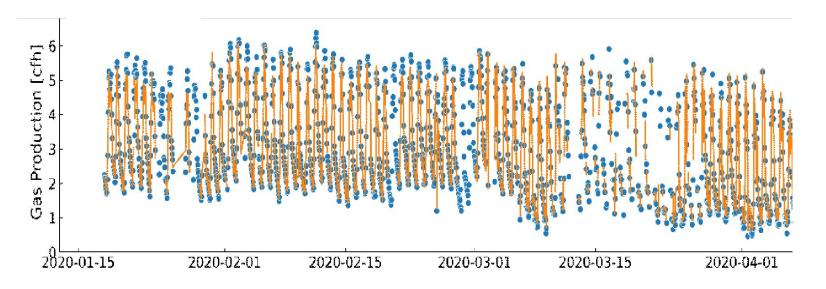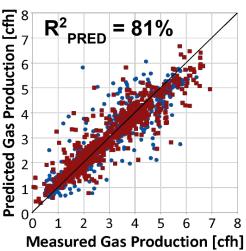…planned maintenance shutdowns to minimize risks to system performance or capacity

ML applications in Water Management

Planning Management (Deep Learning, Unsupervised Learning, Supervised Learning)

Design support (Deep Learning, Unsupervised Learning)

Asset risk assessment (Deep Learning, Unsupervised Learning, Supervised Learning)

Predictive maintenance (Unsupervised Learning, Deep Learning, Supervised Learning, Reinforcement Learning)

Operator coaching and training (Deep Learning, Unsupervised Learning)

Leak detection (Deep Learning, Unsupervised Learning, Supervised Learning)

Online data streams anomaly detection (Deep Learning, Unsupervised Learning, Supervised Learning)

Process & system control (Deep Learning, Unsupervised Learning, Reinforcement Learning, Supervised Learning)

O&M Digital Twins (Unsupervised Learning, Deep Learning, Supervised Learning, Reinforcement Learning)

Instrument and sensor calibration & validation (Supervised Learning)

Flow, load prediction / Water use demand prediction (Deep Learning, Unsupervised Learning, Supervised Learning)

Flood prediction (Deep Learning, Supervised Learning)

Past → Future

Mature
- >50 Full-Scale / 10+ years experience
- Established approaches for design, architecture, & operations

Established
- Numerous at-scale Applications
- No / limited piloting or testing required
- Many technologies on the market

Accelerating
- Small- / mid-scale
- Few systems
- Piloting or testing strongly Recommended

Emerging
- Demonstration or pilot scale testing
- Few use cases but not enough to have "universal confidence" in the technologies

Research / Embryonic
- There's a lot we don't know yet
- Early exploration & use-case testing
- Highly bespoke solutions – each one needs a lot of energy to deploy/implement

MACHINE LEARNING IN WATER MANAGEMENT

■ Deep Learning   ■ Reinforcement Learning   ■ Unsupervised Learning   ■ Supervised Learning

Forecasting biogas production

ML + a novel sensor

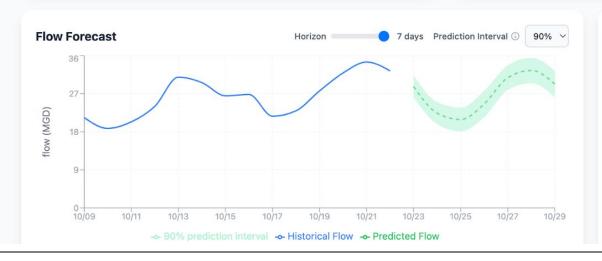

from Sathyamoorthy et. al, 2022

Forecasting influent flow to a WRRF (7 days ahead)

**ML
+
2-yrs historical flow data
+
recent flow data
+
weather**

ML Applications in Water Management

Identify high value business use cases

What problems do your teams want to solve.

Focus on augmentation not automation problems

Adopt a data-first mindset

**What data do we have?
What is the data quality?
Is it well organized?**

Empower Intentional Exploration

Support your staff in upskilling and exploration

Build ecosystems

Sandeep Sathyamoorthy
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Water Business

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