

Machine Learning (ML) beyond the hype

Use Science to improve Business

Michail Mavroforakis, PhD
CTO, InTTrust S.A.

The Data Conference 2021
21 Sep. 2021



Overview

- Hype & Real status of ML today
- Real ML paradigms
- Conclusions

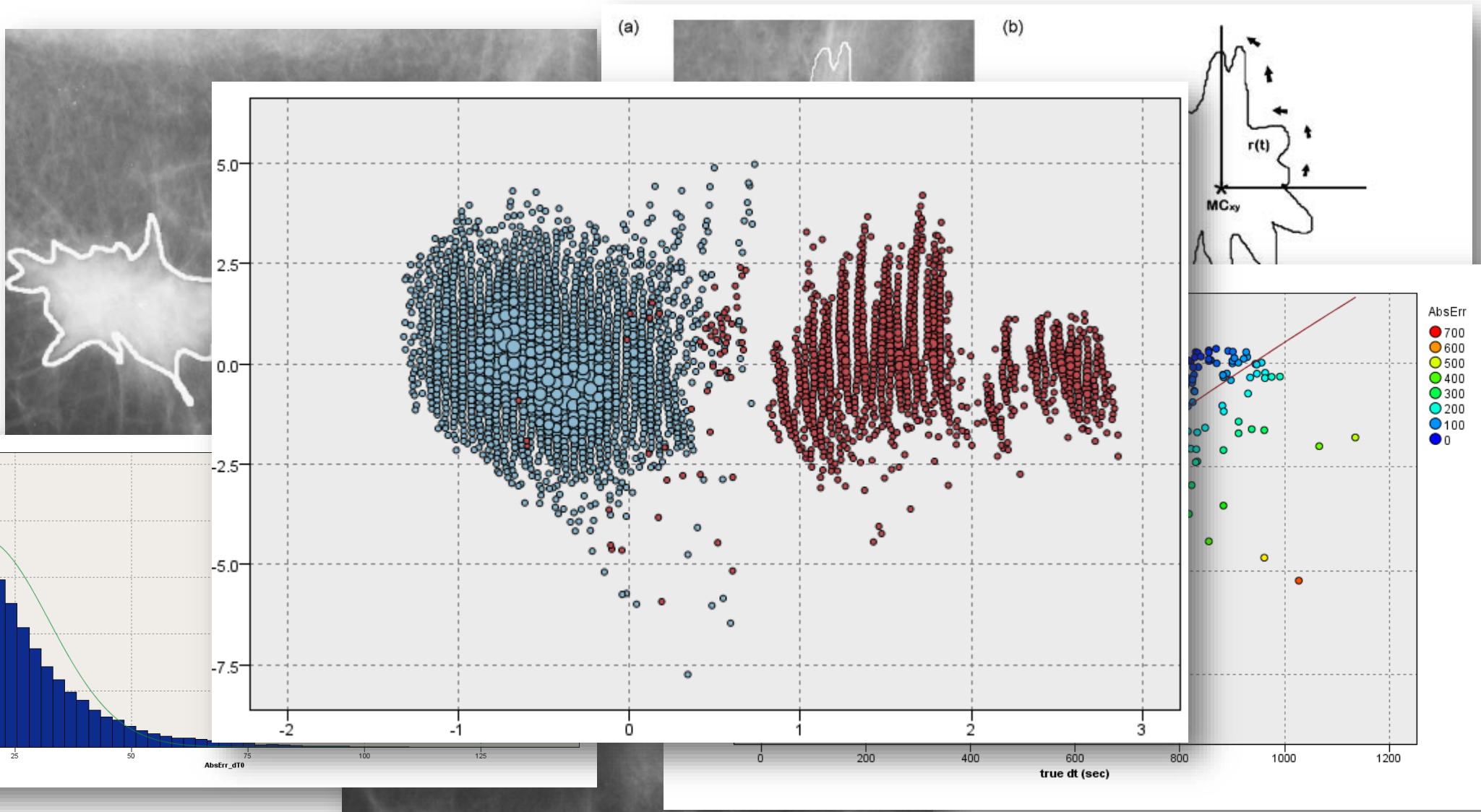
The hype of ML today...

- *“Deep learning is the train-n-play black box that can solve everything”*
- *“Enough GPU parallelization can overcome any algorithmic deficiencies”*
- *“Everything can run in the cloud, even real-time Big Data Analytics (DA)”*
- *“We don’t need DA experts with deep background, just good programmers”*
- (...)

- **Over-rated “automatic” ML suites**
- **Under-rated engineering required**



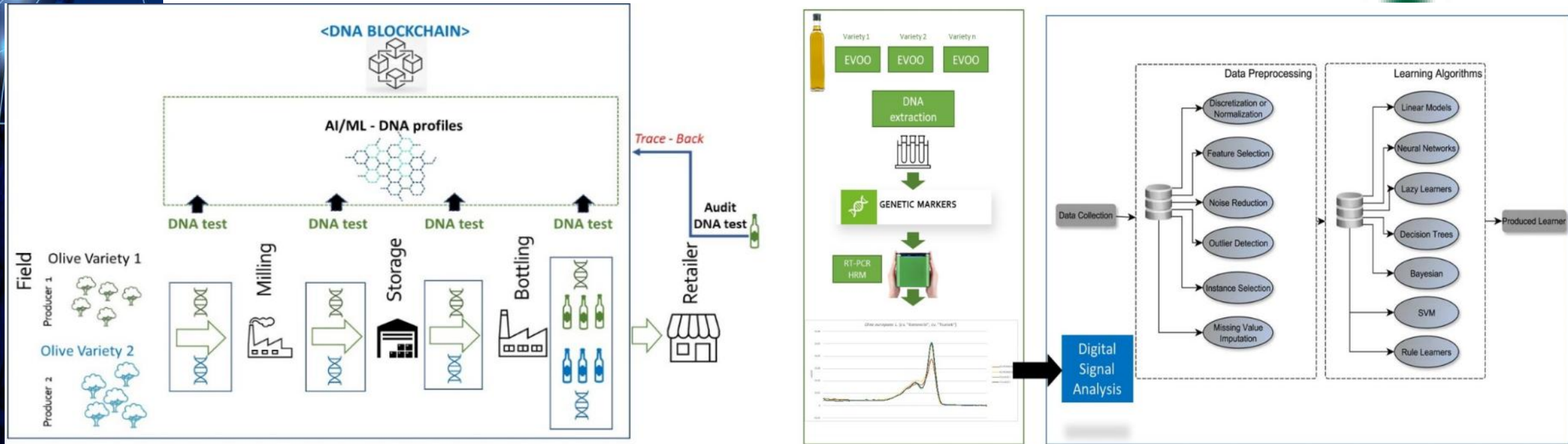
...and the real ML in practice



DNAblockchain

Protect EVOO label & prevent fraud

DNAblockchain = DNA HR-PCR + Signal Analysis +
DA/ML + Blockchain

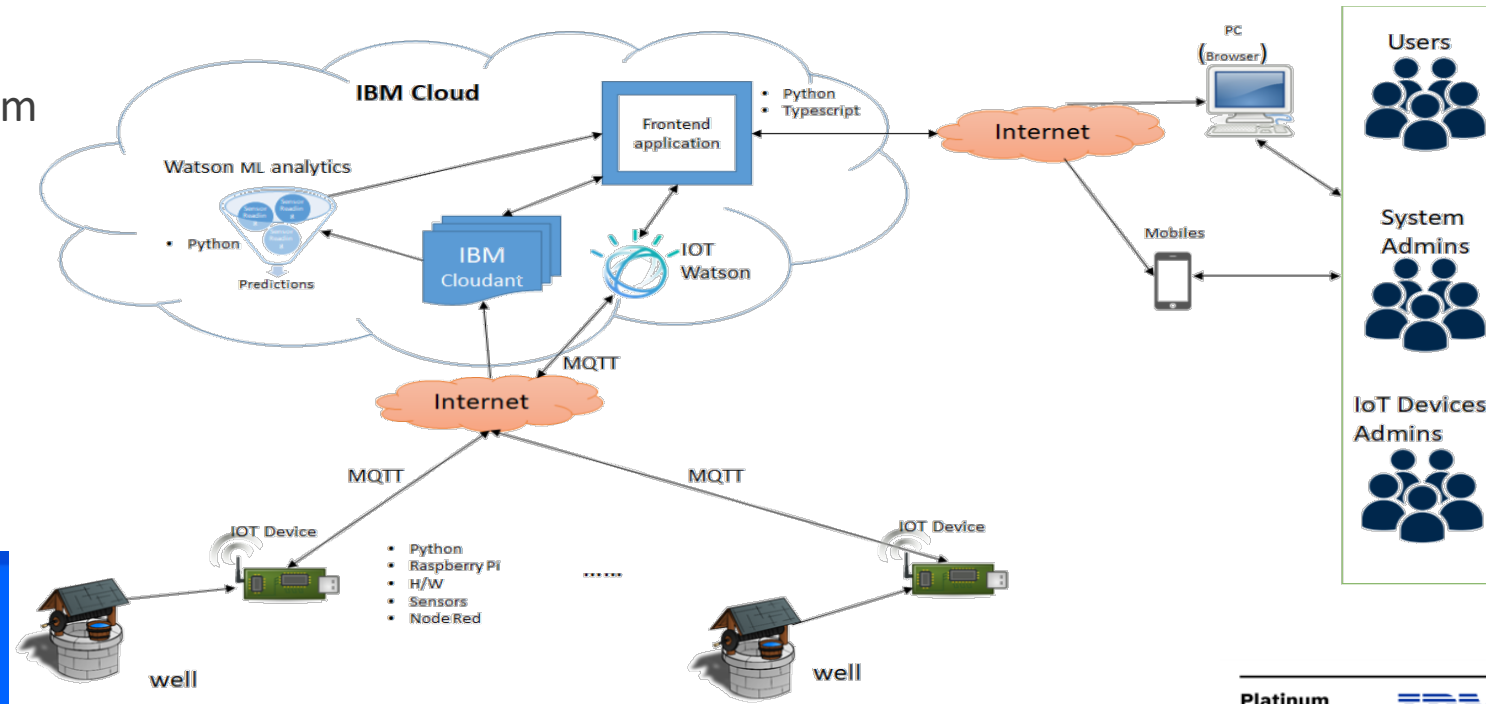


Water Underground – IoT & Architecture

Incorporate:

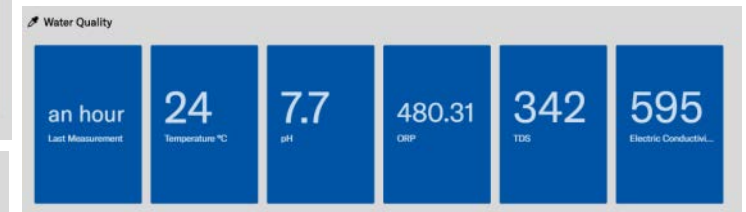
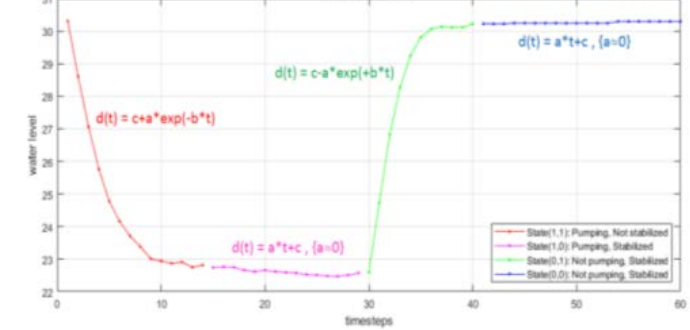
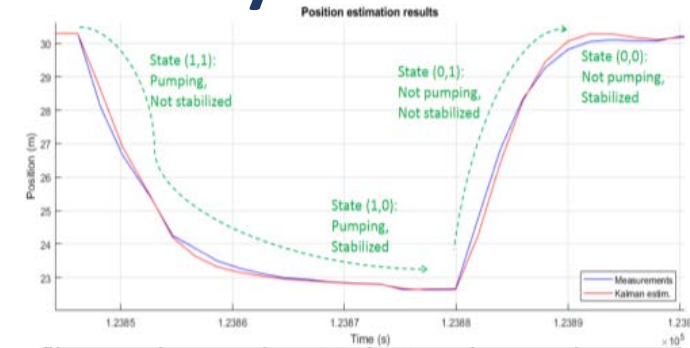
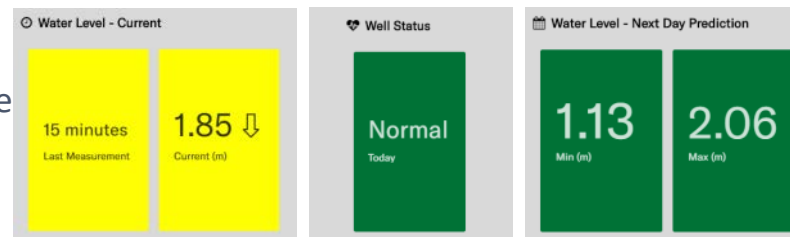
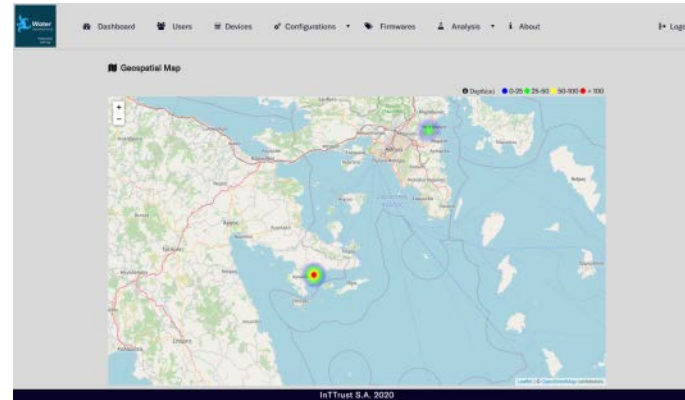
- Smart sensors – IoT – Edge computing
- Back-end processing, ML/analytics, short/long-term predictions
- Aquifers' modeling
- Cloud computing
- Front-end application, User Interface

Interconnected IoT devices for real-time monitoring of the underground waters' level and quality.



Water Underground - functionality

- Map representation
- Dashboard - Metrics
 - Depth
 - Prediction
 - Trends
 - Statistics
 - Quality
- Time Analysis
 - Water height/level graph
 - Water quality graph (pH, TDS, ORP, EC, Temp)
- User roles
- Configuration
 - Application, System, Device
- Remote IoT Device Updates

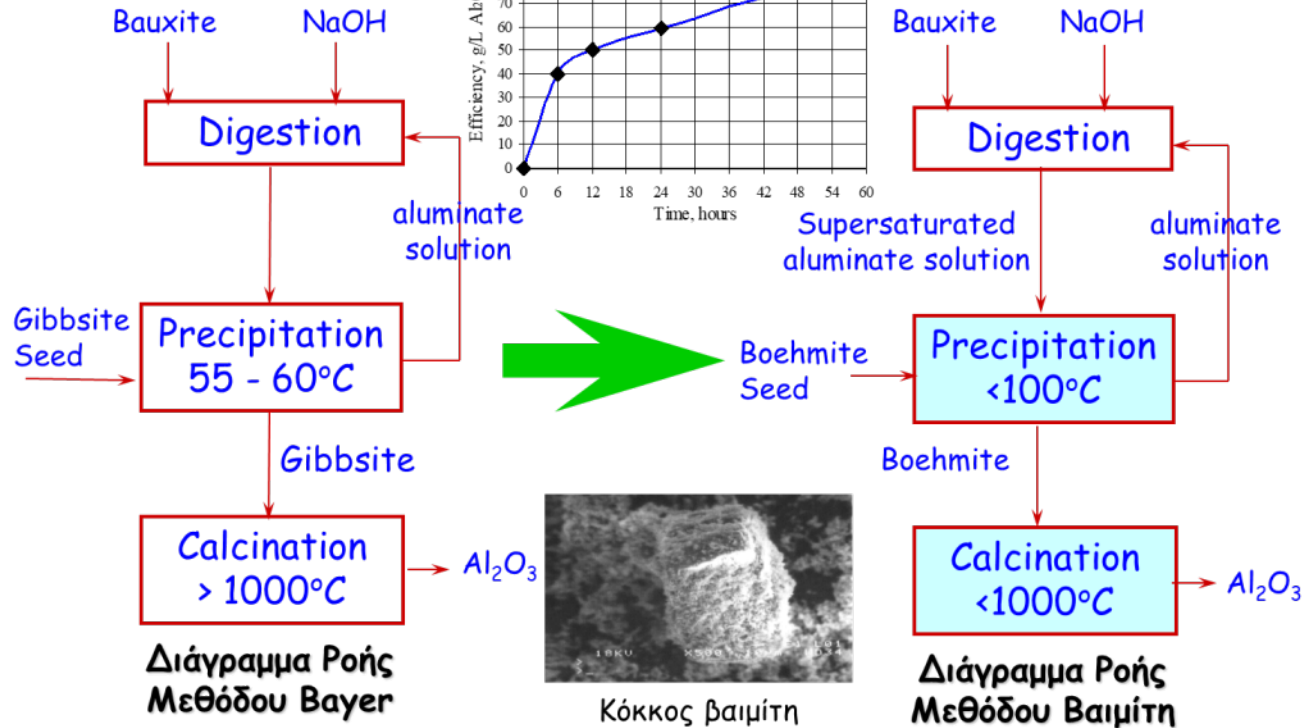
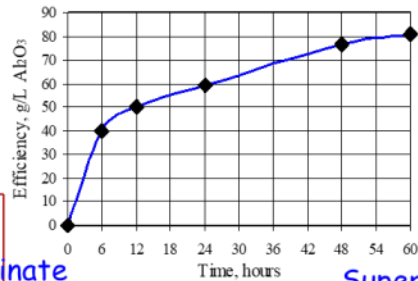


- **pH** : Alkalinity
- **ORP** : Oxidation Reduction Potential (disinfection potential)
- **TDS** : Total Dissolved Solids
- **Electrical Conductivity** : Salinity



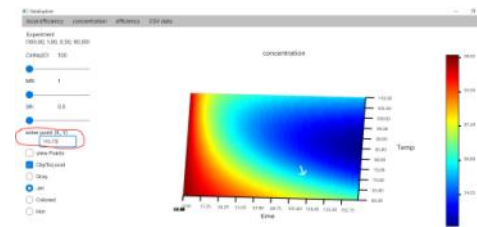
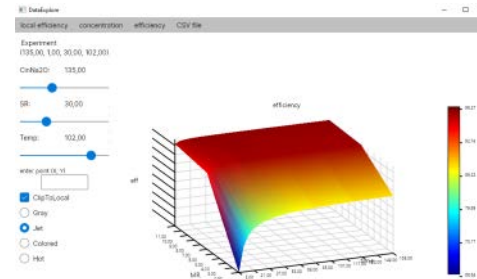
Boehmite Alumina Precipitation

Boehmite precipitation = Energy consumption optimization of Bayer Process

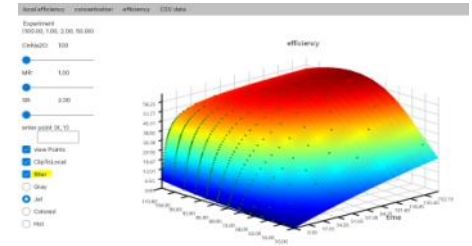


Analytic Digital Twin

$$\frac{dC_{pr}}{dt} = 2.29 \times 10^{13} (C_{Na_2O})^{-1.8} \times (SR)^{0.54} e^{-\frac{10,750}{T}} (C - C_e^{app})^2$$



ML Digital Twin



Advantages

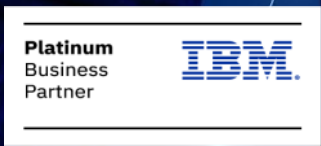
- Analytical model not required (e.g., complex/unknown processes)
- Relies only on observed data
- Fast and responsive (analytical model often time consuming)
- Low resources' consumption
- Graceful to errors/deviations from abstract/ideal processes

Result: **Energy consumption reduction by 1.8 GJ/ton Al₂O₃** –
ML process optimization simulation

About InTTrust S.A.

Some of InTTrust's customers

- Founded in 2006
- Certified and Highly Qualified Engineers
- Active research and experience in the field of AI/ML
- Awarded International Expertise
- Innovation, in cooperation with the Customer
- Presence in North America (Canada)



Patents, Awards & certifications



100+ Engineers



300+ Certifications

The Data Conference

Conclusions

- ML is real and is here – it cannot do everything we can imagine, but it is a strong tool & we must use it today, as our competitors do
- ML real apps need more than programmers & tools: Data Scientists & Skilled domain experts
- Each case has to be examined separately – there is no one-size-fits-all solution
- Find a trusted, knowledgeable partner to focus on your specific needs



Thank you for your attention

