iecisa
A Gfi Group Company

Industrialising Artificial Intelligence.
Predictive maintenance

Andrés Iborra Martín. Analytics & Big Data Director.

IECISA part of the Gfi Group

livePdM
IECISA

MORE THAN
27 000
CONSULTANTS

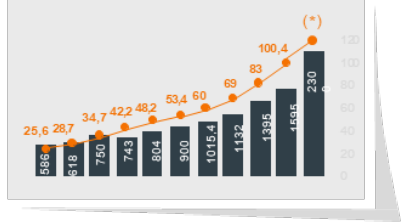
26
COUNTRIES

FRANCE	MOROCCO	PERU	RP OF PANAMA
BELGIUM	ROMANIA	USA	CHILI
SPAIN	SWITZERLAND	ANGOLA	COSTA RICA
PORTUGAL	BRAZIL	CAMEROON	DOMINICAN REPUBLIC
MEXICO	TUNISIA	SINGAPORE	*(ARGENTINA)*
LUXEMBOURG	COLOMBIA	ENGLAND	
POLAND	IVORY COAST	U.A.E.	

5
VALUES

AMBITION
INNOVATION
COMMITMENT
TEAM SPIRIT
SOCIAL RESPONSIBILITY

€ 2,300
million euros
€ REVENUE 2019 (pf)



21
SERVICE CENTERS

IN FRANCE
- LILLE
- LYON
- MEUDON
- NANTES
- TOULOUSE

INTERNATIONAL
- APAC (Macau)
- BRAZIL (São Paulo)
- COLOMBIA (Bogota)
- INDIA (Pune)
- MOROCCO (Casablanca)
- POLAND (Warsaw-Poznan-Lublin)
- PORTUGAL (Lisbon-Covilha-Bragança)
- ROMANIA (Bucarest-Constanza)
- SPAIN (Alicante-Zamudio)
- TUNISIA (Tunis)

6
ACTIVITIES
- CONSULTING
- APPLICATION & INFRASTRUCTURE SERVICES
- SYSTEM INTEGRATION *(Business Solutions, ERP, CRM, PLM…)*
- OUTSOURCING
- VALUE ADDED RESELLING
- SOFTWARE

BUSINESS SOLUTIONS
- PUBLIC SECTOR
- HEALTHCARE-SOCIAL
- INSURANCE
- RETAIL
- TELECOM

+

GROUP ALLIANCES
- SAP, Microsoft, Oracle, Salesforce
- AWS, IBM, Sage, HRAccess
- PTC, Siemens, Dassault

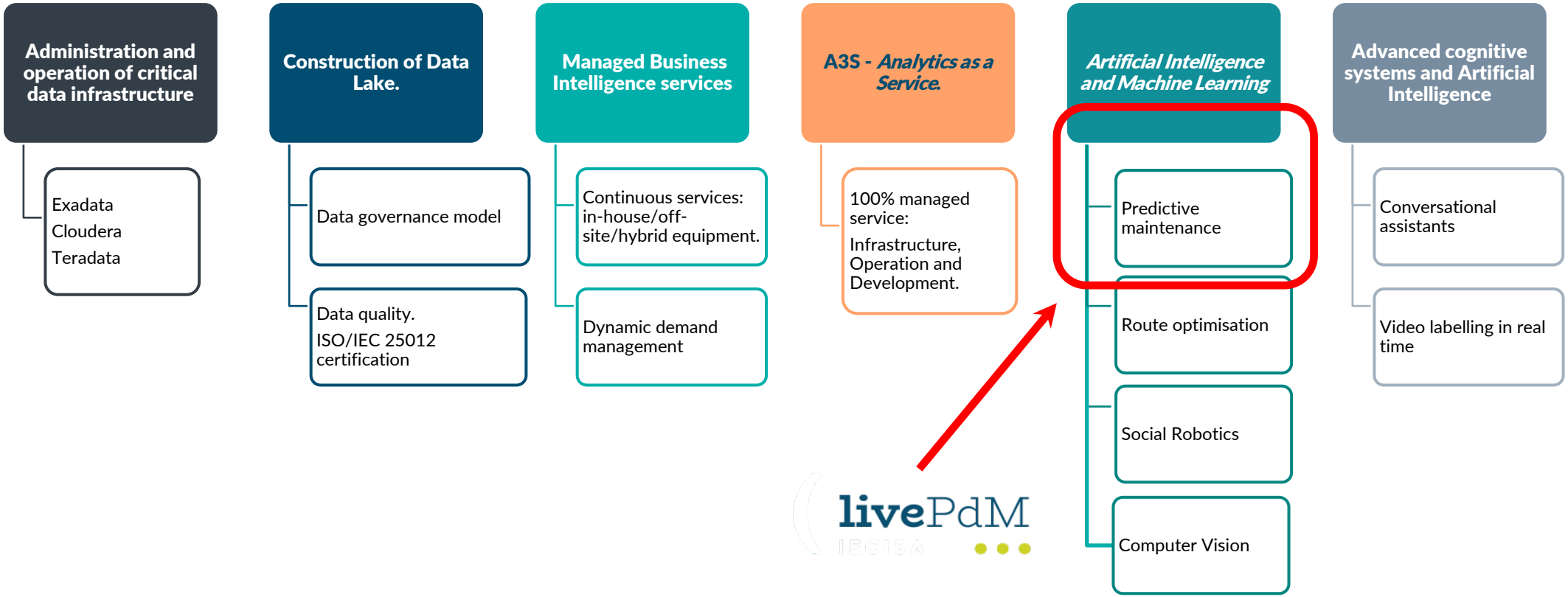
Proximity-Intimacy-Agility
Industrialisation-Automation
Innovation-Business Solutions

7
BUSINESS SECTORS
- FINANCIAL SERVICES
- INDUSTRIES
- PUBLIC-HEALTHCARE
- TELECOM-MEDIA-TECHNOLOGIES
- ENERGY-UTILITIES-CHEMICALS
- RETAIL-CONSUMER GOODS
- TRANSPORTATION-TRAVEL-SERVICES

6
INNOVATION CENTERS
PARIS, NANTES, LYON,
GHENT, LISBON, MADRID
Casablanca-Warsaw in 2020

8
GROUP PRACTICES

Analytics & Big Data Capabilities at IECISA

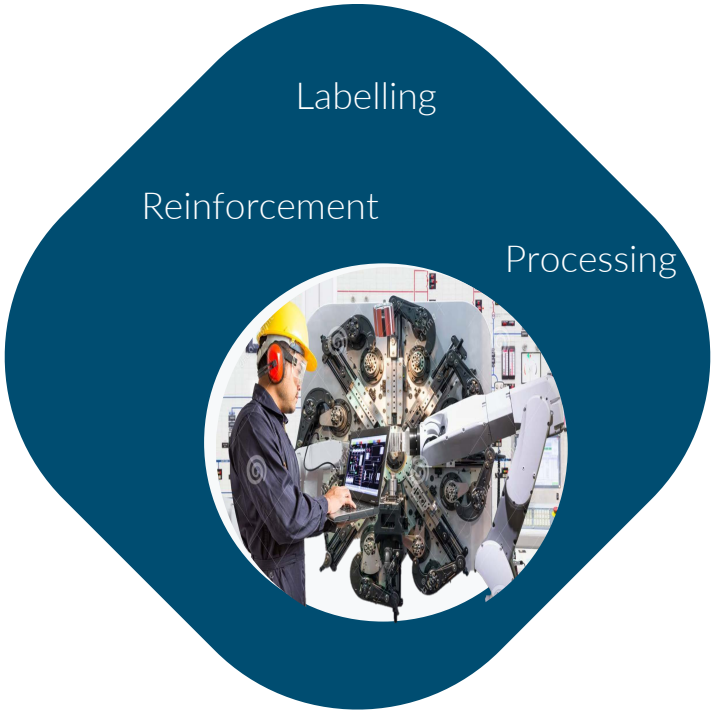


250 professionals make up the Data Management area in Spain

Why do we talk of Industrialising Artificial Intelligence?

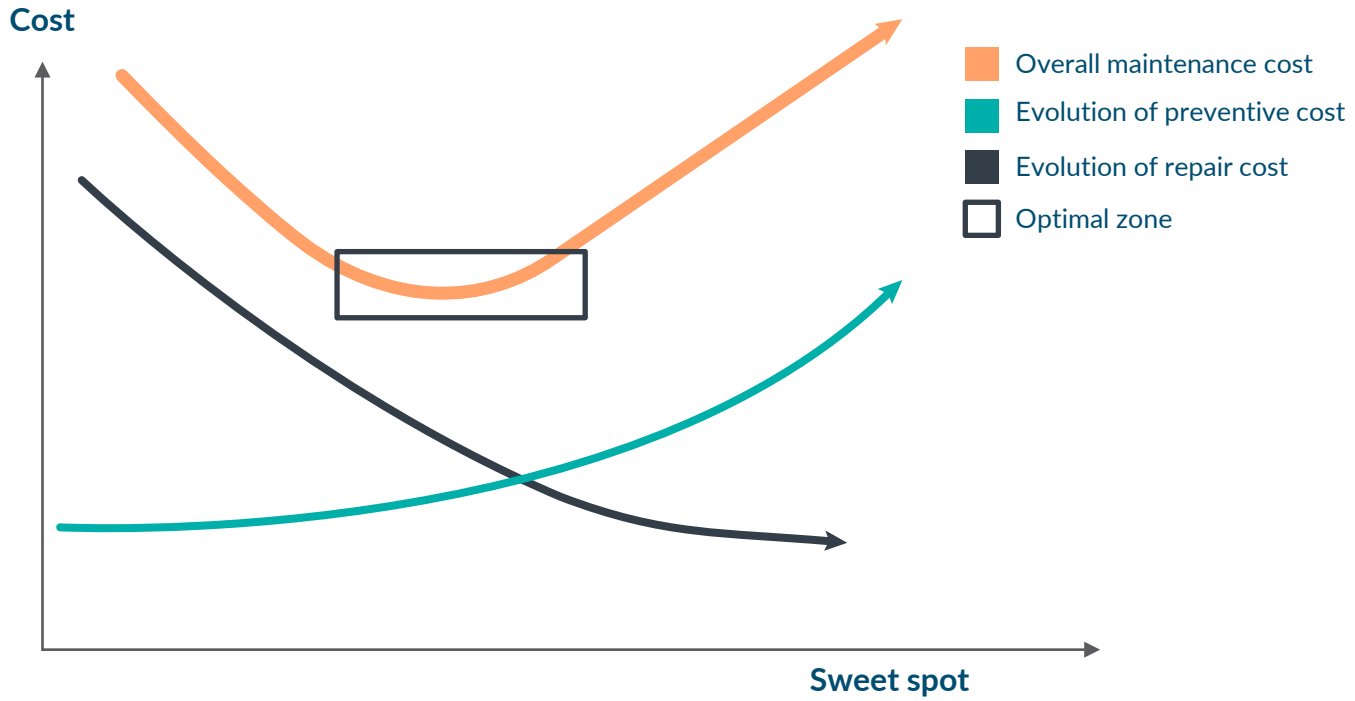
Technology

Challenges



Industrialise

Applied to Predictive Maintenance



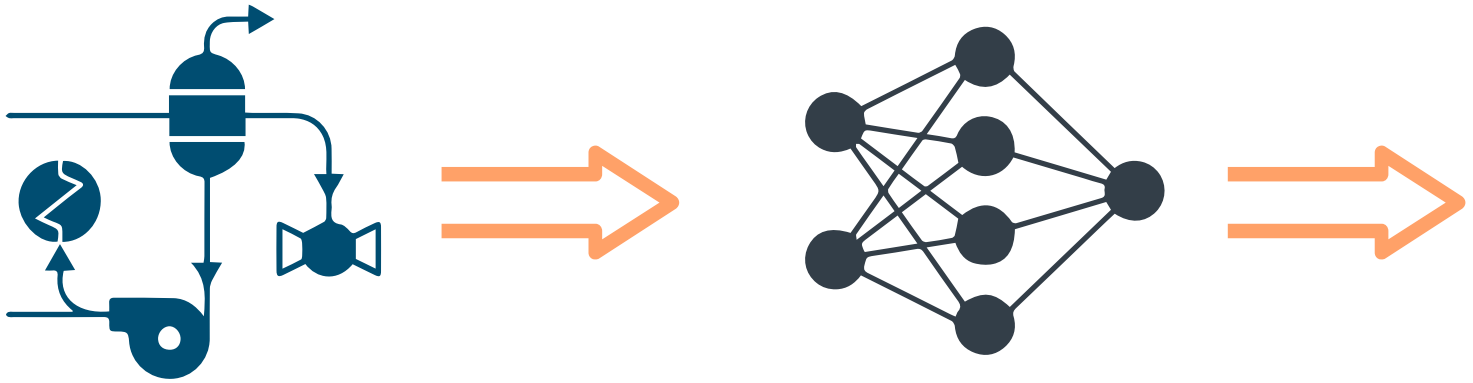
Is my maintenance cost optimal?

Is the cost of unavailability through breakage properly valued?

Tools and methodologies to help **minimise the cost of maintenance**, by calculating optimal performance.

livePdm. What does it do?

livePdM
IECISA

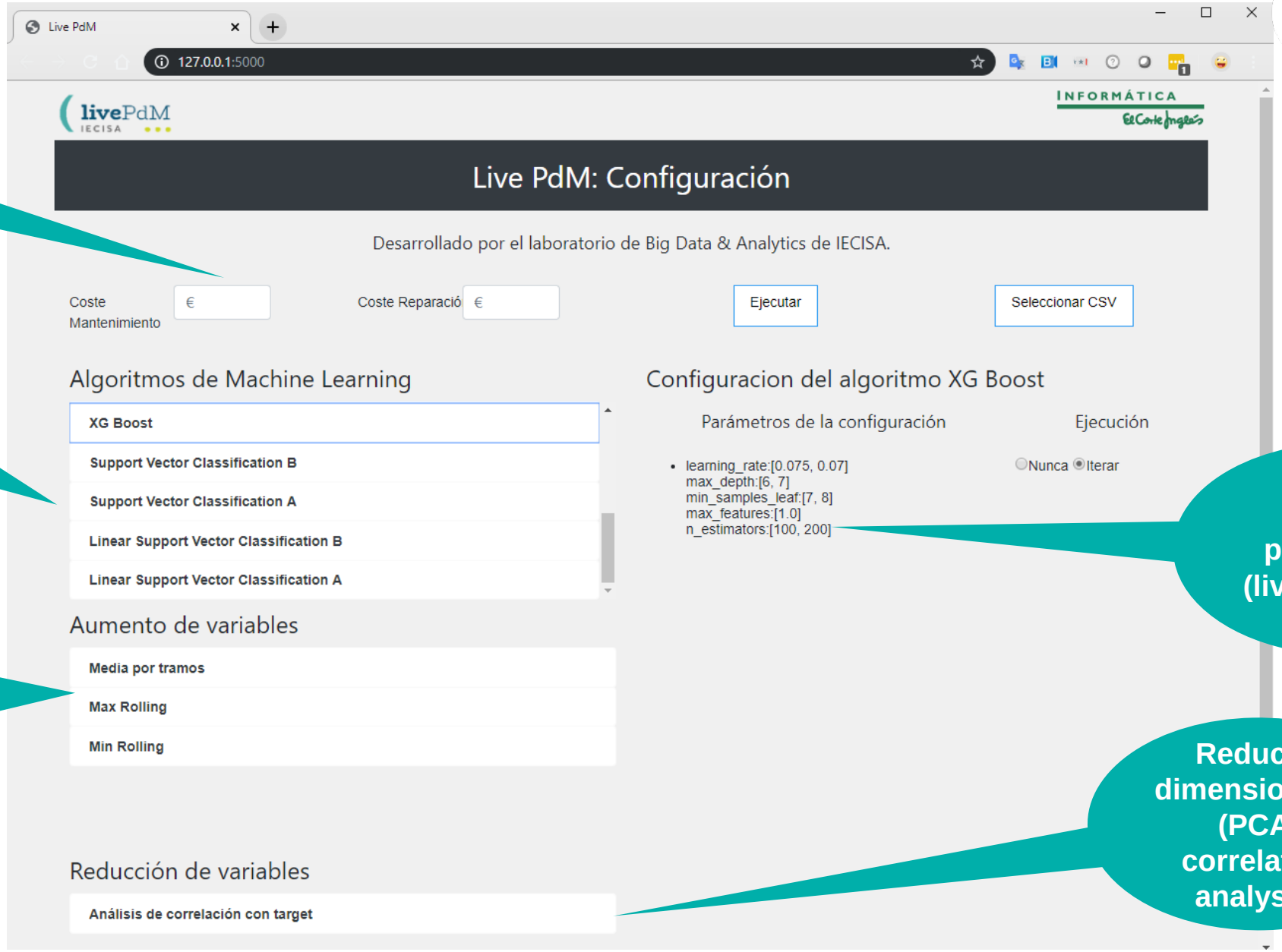


Distinctive:

- Hyper-parametrisation
- Algorithm competency
- More than 450 Algorithms with their parametrisations
- Extremely high instance capacity
  - NVIDIA Tesla/K80 GPUs
  - Serverless architectures

id	cycle	setting1	setting2	setting3	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21
1	1	-0.0007	-0.0004	100	518.67	641.82	1589.7	1400.6	14.62	21.61	554.36	2388.06	9046.19	1.3	47.47	521.66	2388.02	8138.62	8.4195	0.03	392	2388	100	39.06	23.419
1	2	0.0019	-0.0003	100	518.67	642.15	1591.82	1403.14	14.62	21.61	553.75	2388.04	9044.07	1.3	47.49	522.28	2388.07	8131.49	8.4318	0.03	392	2388	100	39	23.4236
1	3	-0.0043	0.0003	100	518.67	642.35	1587.99	1404.2	14.62	21.61	554.26	2388.08	9052.94	1.3	47.27	522.42	2388.03	8133.23	8.4178	0.03	390	2388	100	38.95	23.3442
100	198	0.0004	0	100	518.67	643.42	1602.46	1428.18	14.62	21.61	550.94	2388.24	9065.9	1.3	48.09	520.01	2388.24	8141.05	8.5646	0.03	398	2388	100	38.44	22.9333
100	199	-0.0011	0.0003	100	518.67	643.23	1605.26	1426.53	14.62	21.61	550.68	2388.25	9073.72	1.3	48.39	519.67	2388.23	8139.29	8.5389	0.03	395	2388	100	38.29	23.064
100	200	-0.0032	-0.0005	100	518.67	643.85	1600.38	1432.14	14.62	21.61	550.79	2388.26	9061.48	1.3	48.2	519.3	2388.26	8137.33	8.5036	0.03	396	2388	100	38.37	23.0522

IECISA ML/AI laboratory Cloud Platform to calculate **maintenance optimisation**



Economic estimators

Scikit-learn, Tensorflow, Keras algorithms

Dataset enrichment

Hyper-parameters (livepdm.json)

Reduced dimensionality (PCA, correlation analysis)

livePdM IECISA

Economic Estimator.

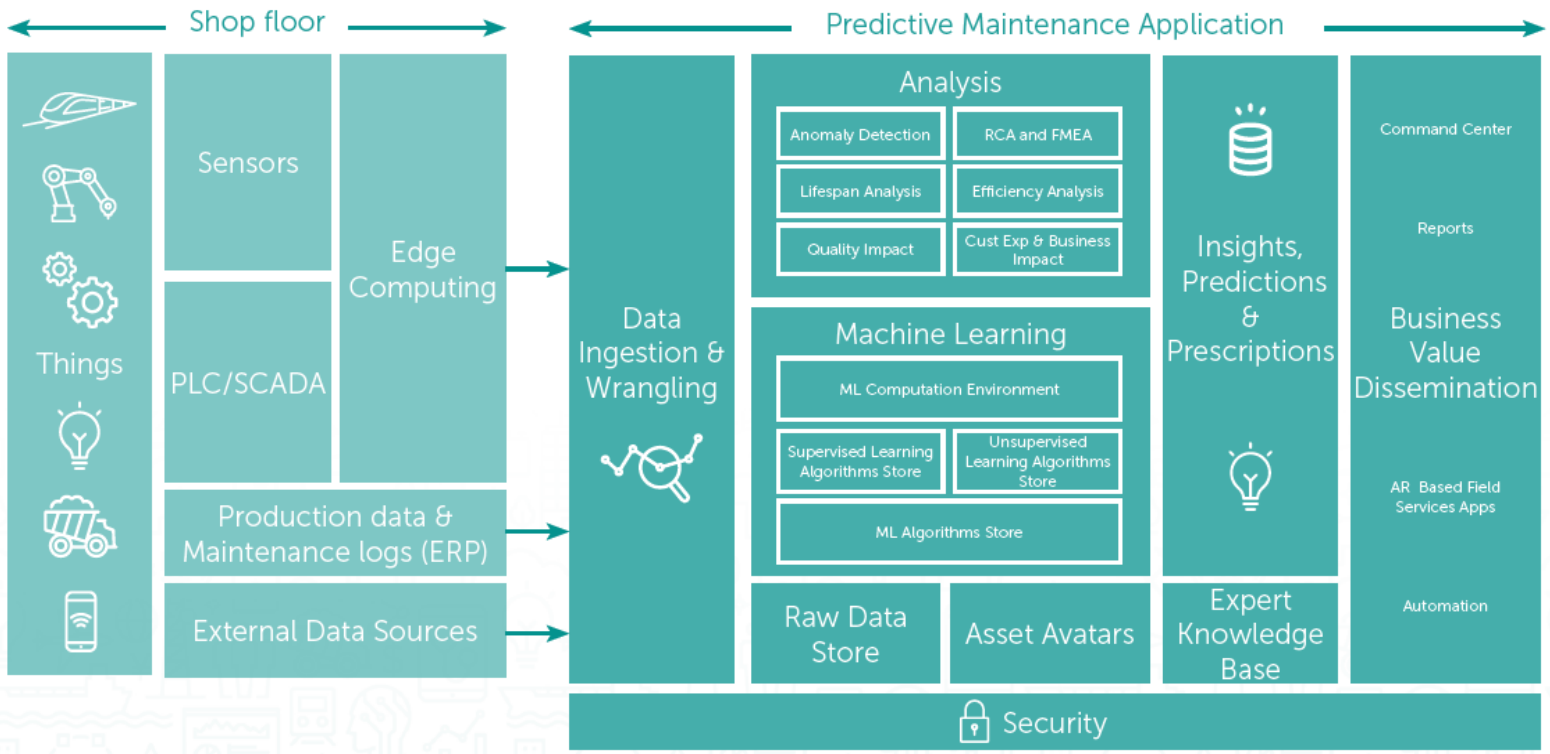
livePdM
IECISA

Analytical calculation

	Profit	Model	Accuracy	Thresbold	TP	FP	TN	FN	TPR	FPR	TNR	FNR	Precision	Recall	F1 Score	ROC AUC	model_trained	Config
0	-1.190141	Decision Tree	0.6624	0.118168	24	73	3	0	1.000000	0.963615	0.036972	0.000000	0.441463	0.227387	0.300166	0.604696	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
1	2.150353	Extra Tree	0.7160	0.061034	24	74	13	1	1.000000	0.977700	0.170188	0.056533	0.584646	0.373116	0.455521	0.663290	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
2	3.460731	Gaussian Naive Bayes	0.4820	0.048098	24	71	14	1	0.998744	0.937793	0.185446	0.055276	0.350330	0.733668	0.474218	0.611241	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
3	17.000531	Logistic Regression A	0.7324	0.228584	23	64	37	3	0.972362	0.835681	0.480634	0.129397	0.684058	0.296482	0.413672	0.745794	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
4	18.818470	Logistic Regression Base	0.6980	0.223056	24	65	38	3	0.989950	0.859742	0.500587	0.126884	0.545055	0.311558	0.396483	0.748339	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
5	-0.075117	Random Forest B	0.6820	0.125524	24	72	15	2	1.000000	0.948357	0.193075	0.094221	0.501754	0.262563	0.344316	0.584007	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....
6	7.881379	XG Boost	0.7012	0.060785	24	74	44	7	1.000000	0.970070	0.572770	0.285176	0.560794	0.384422	0.434043	0.653497	[GridSearchCV(cv=5, error_score='raise-depreca...	RV:0 {'indiceCorrMin': 0.25, 'ejec': 1} EDA:1....

Economic Estimator.
Estimated saving according to expenditure incurred.

livePdm. What is it? What technolog

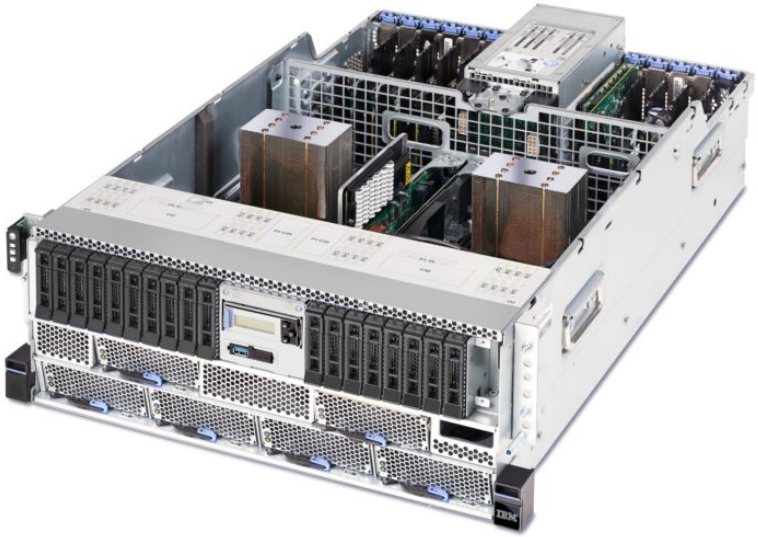


Report on Machines to be Maintained **Prioritising**

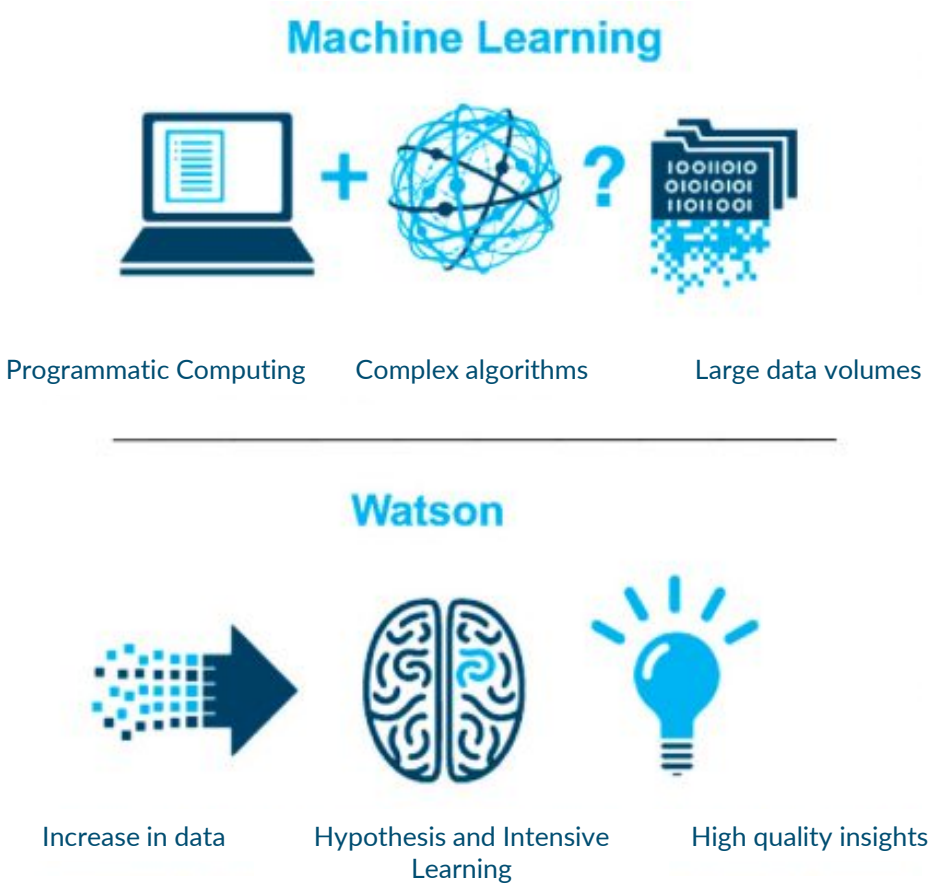
- Binary (24 hours)
- Range (4 – 8 – 16 hours)
- Regression (When?)

Efficiency report (OEE and Costs)

livePdm. IBM technology employed



-- High in-house computing needs.
-- Reduction in costs
-- Use of market standards
-- Development and construction platform can be standardised



livePdm. Case Study

1 Initial Maintenance Cost Study

Sales offices	635
Digital Signage (Machines)	978
Variables / equipment	2,500

Contracted SLA	NBD
Maintenance Per Call	€ 590
Incidents/Year	2052
Cost/year	€ 1,210,680
Availability (hours without service)	36,936

2 *livePdM* -> Industrialisation

		PREDICTION	
		TRUE	FALSE
REAL	TRUE	85.02%	0.32%
	FALSE	3.79%	10.87%

Wrong Result from Predictive (0.32%)

Maintenance Per Call	€ 590
Incidents/Year	6.57
Cost/Year	€ 3.874

Indicates that attention is needed (total increase with 3.79%)

Prior administration with 24 hours	€ 290
Incidents/Year	2130
Cost/Year	€ 617,634

Previous year's cost	€ 1,210,680
livePdM cost	€ 621,508
Saving	€ 589,172
% Saving	48.66%
Availability (hours without service)	118

Cost Function to be Minimised

3 Production => livePdM Server

livePdM. How is a project tackled?

Applied consultancy

— Generation of initial cost study

— Execution of livePdM Algorithms (Binary model)

— Efficiency Study (Costs and Availability)

— Performed in **3 weeks**

Implementation => Lean Model (Maximum Value)

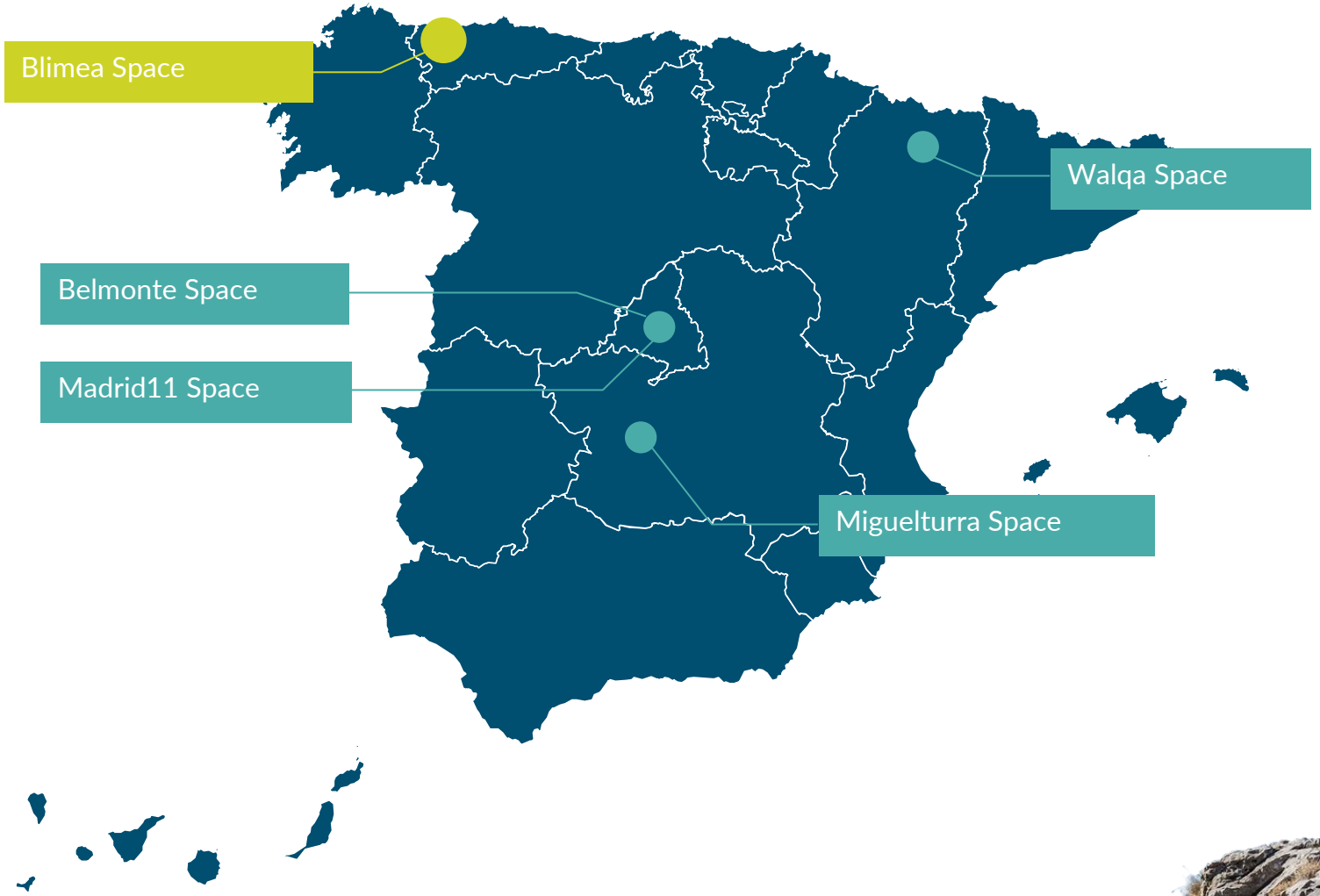
— Phase I. Implement Binary production => First success with ROI

— Phase II. Definition of Error Types and Impact on Business

— Phase III. Execution in livePdM and Implementation

— Iterate Phase II and Phase III => Until a case with no appealing ROI is reached

livePdm. Where do we do it?



Technology spaces

THANK YOU

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