

SAP Analytics – Predictive Factory

All Analytics. All Users.

Facundo Ferreyra

Senior Solution Specialist Big Data & Business Analytics



Agenda

- Donde vamos o donde estamos?
- Tech Update
- Casos de uso

Predictive Analytics & Machine Learning

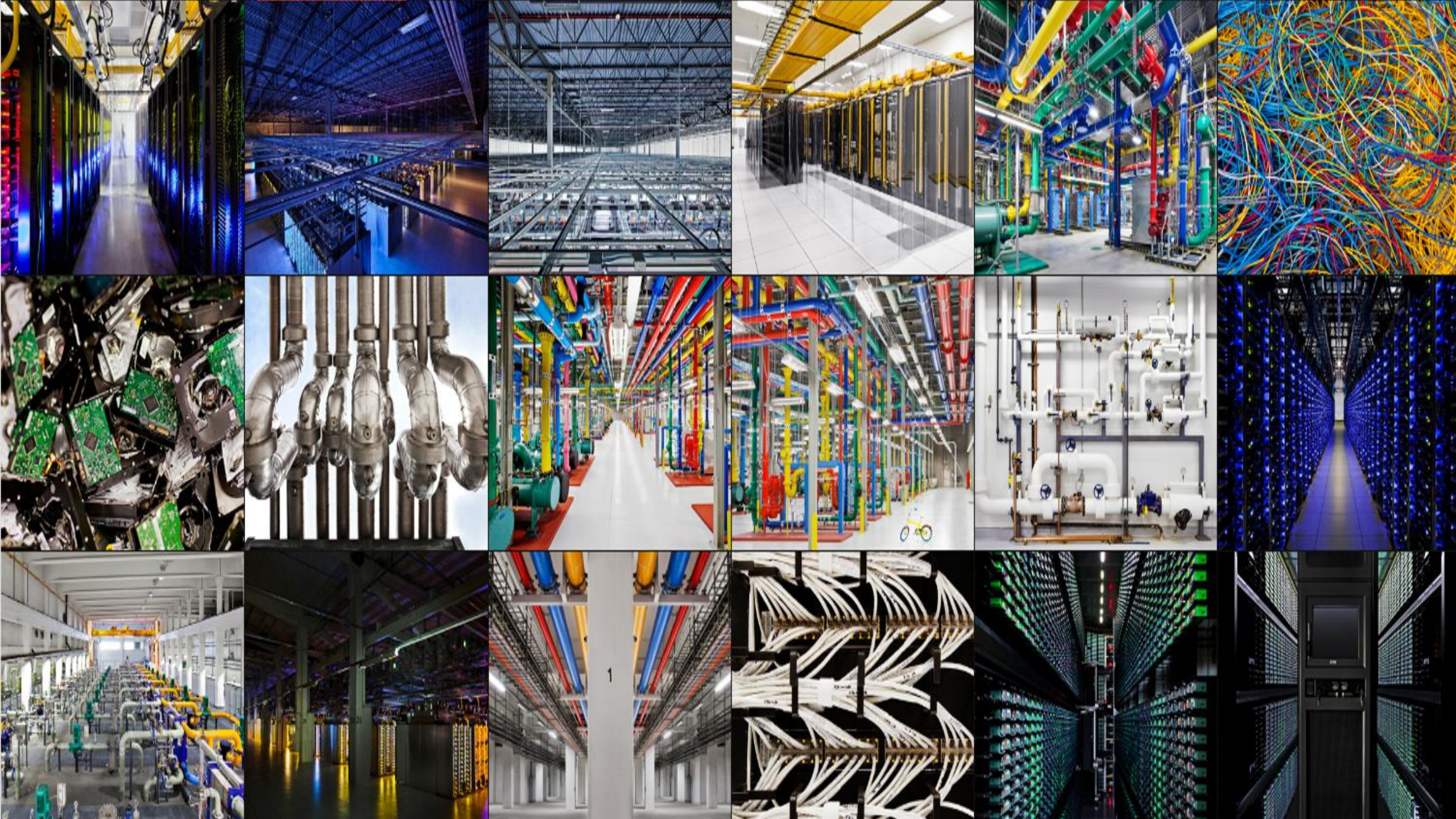


Technology Priorities for CIOs in 2016

- 1 BI/Analytics
- 2 Cloud
- 3 Mobile
- 4 Digitization/Digital Marketing
- 5 Infrastructure & Data Centre
- 6 ERP
- 7 Security
- 8 Industry Specific Applications
- 9 CRM
- 10 Networking/Voice/Data Communications

TOP
10

Gartner.



 **Good Morning** ✕


Driving to: Work?
Via: US Hwy 101 N

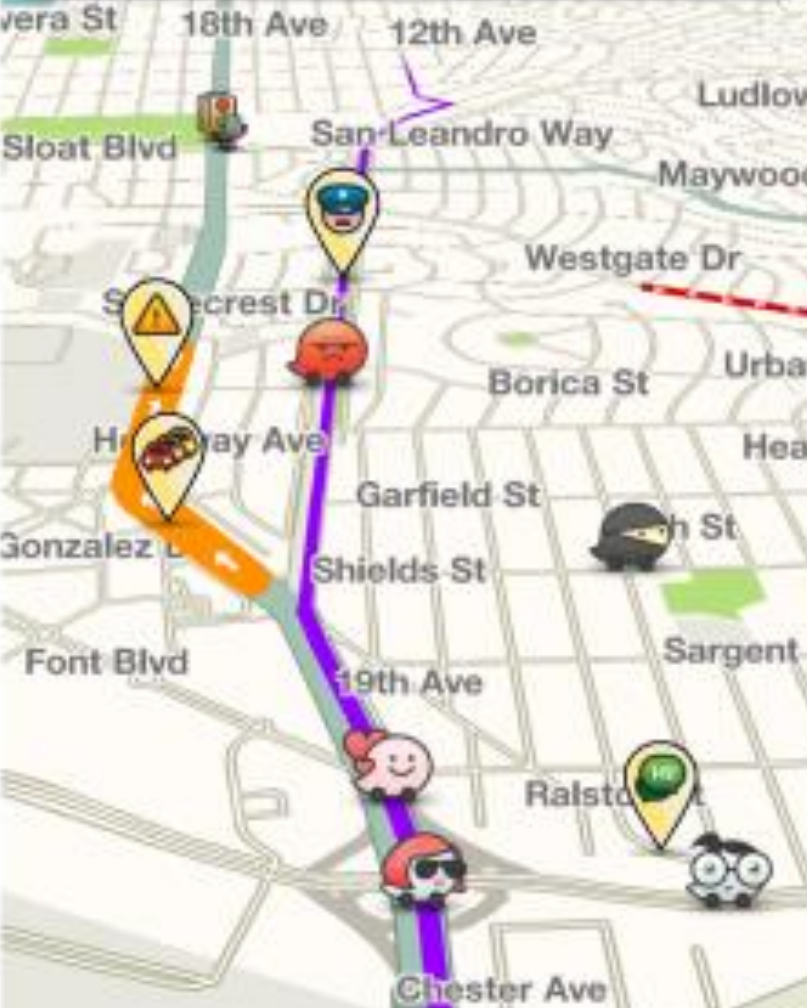
21 min. | **1.7 mil**

 11:26

Routes | **Go**

 23 Friends online
3 Driving there   ➔

 **0.4 miles**
Golden Gate Bridge



5:42 PM 1.8 mi

15 min | **4.5 miles**

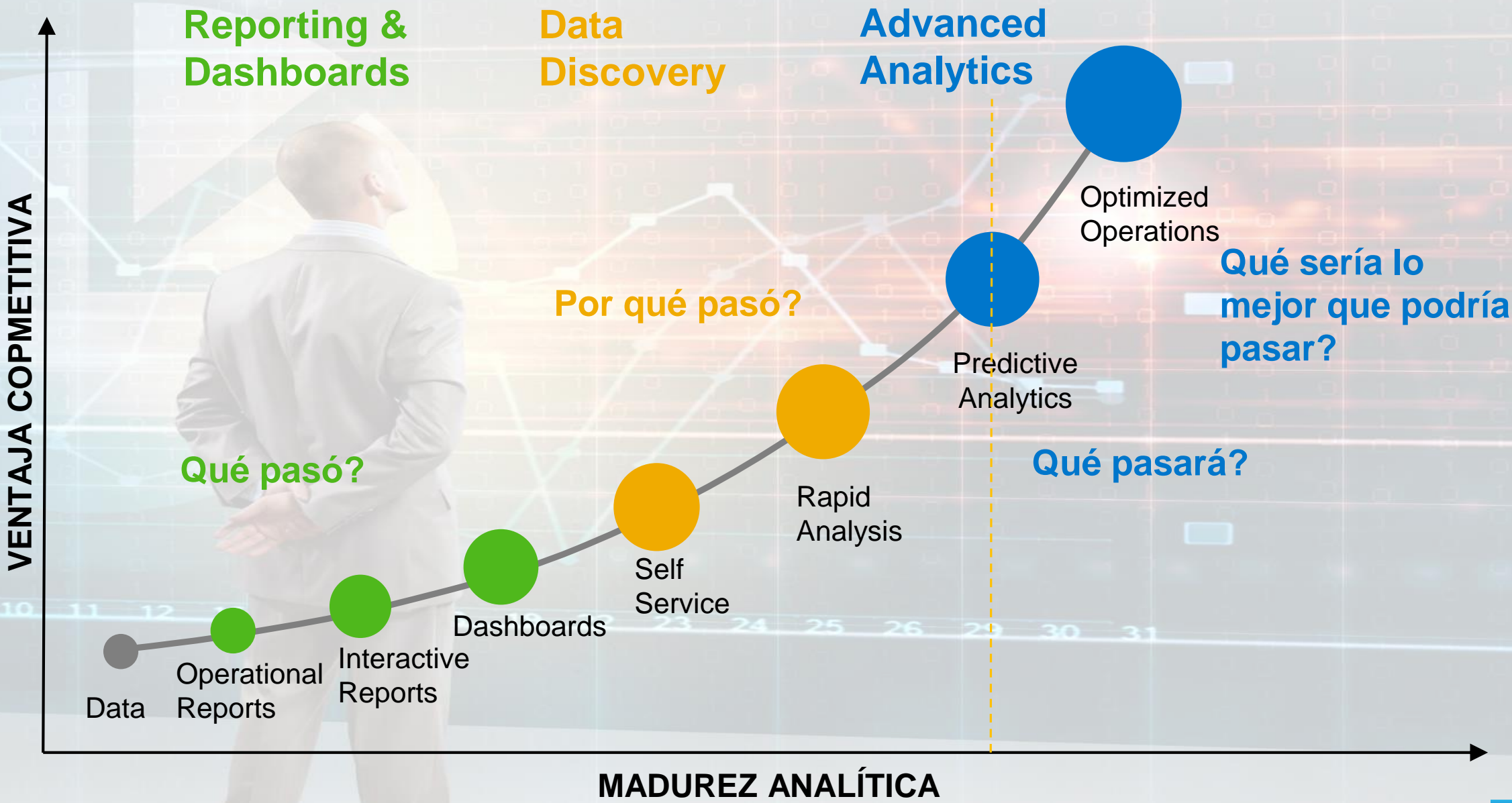
 **350 feet**
8th St

Report ✕

 Traffic Jam	 Police	 Accident
 Hazard	 Camera	 Map Chat
 Map Issue	 Gas Prices	 Check In

Location and time saved

Visión de las Soluciones Analíticas: Madurez Analítica como Ventaja Competitiva





Big Data

Smart Data

Business Processes

SOURCE: GOOGLE



atnberg





rd

Fuzziness Score

Found 31022 matching documents of 962383 case records

... 22 50 00 4e church st r odd common assault hands 913 ...

... 00 6d 2800 liberty heights av r larceny from auto null 611 ...

... 12 00 00 4e mount holly r odd common assault hands 844 ...

... 58 00 4d 1000 aliceanna st rm 1421 agg assault hands 211 ...

... 08 00 4e 700 aliceanna st rm 733 common assault hands 211 ...

... 08 00 4e 700 aliceanna st rm 733 common assault hands 211 ...

... 08 00 4e 700 aliceanna st rm 733 common assault hands 211 ...

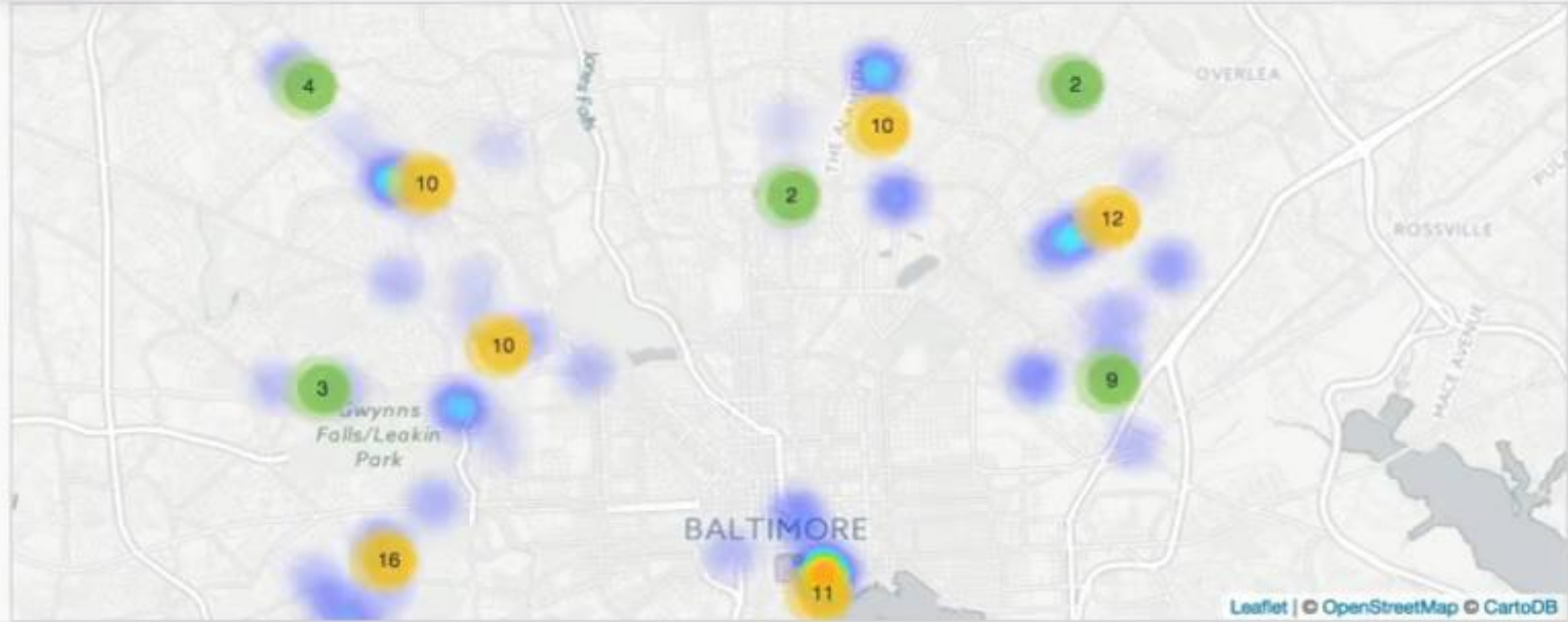
... 15 00 8fo 2000 edgewood st rm 231 arson null 812 southwestern ...

... 15 00 4e 6400 pulaski hwy rm 155 common assault hands 241 ...

... 15 00 8fo 2000 edgewood st rm 231 arson null 812 southwestern ...

... 14 00 00 5a 200 international rm 1522 burglary null 211 southeastern ...

... 12 30 00 3bj hy mcherry ro robbery carjacking null 943 southern ...



Cases under investigation:

[View Whole Graph](#) [Clear Graph](#) [Link Prediction](#)

Agenda

- Tech Update



El diferencial está en la Plataforma

Cualquier Base de Datos

Las empresas de todos los tamaños están transformando sus negocios, de las prácticas analógicas del pasado al negocio digital del futuro.



El diferencial
está en la
Plataforma

SAP HANA



1 Tb



Una Plataforma muchas posibilidades



Database Columnar

Analítico directamente sobre
tablas de máxima
granularidad

In -Memory

Database Services

Parallelization

Multi-Core
Processors

Application Services

Processing Services

Integration Services



Modelamiento Analítico Simplificado

Integración de Datos Almacenamiento columnar y procesamiento en memoria

FUENTES DE INFORMACIÓN





ARQUITECTURA DE DATOS

SAP Cloud Platform

Integration Services | Identity Management

Capa de presentación

DIBO



ANALITICOS

ORGANIZACIÓN DE SOPORTE

SAP Fiori

ERP - PPM

GOBIERNO DE DATOS HANA PLATFORM

Data Management | Application | Analytical | Experience Services
Mobile Services | Design & Development | Security | Management

GESTION DE METADATA

SMART DATA ACCESS

BIG DATA

ESTANDARES DE DATOS



SAP HANA In-Memory Predictive Analytics

Predictive Analysis Library (PAL) - Algorithms Supported

■ Association Analysis

- Apriori
- Apriori Lite
- FP-Growth
- KORD – Top K Rule Discovery

■ Classification Analysis

- CART *
- C4.5 Decision Tree Analysis
- CHAID Decision Tree Analysis
- K Nearest Neighbour
- Logistic Regression
- Back-Propagation (Neural Network)
- Naive Bayes
- Support Vector Machine
- Confusion Matrix*
- Parameter Selection & Model Evaluation

■ Regression

- Multiple Linear Regression
- Polynomial Regression
- Exponential Regression
- Bi-Variate Geometric Regression
- Bi-Variate Logarithmic Regression

■ Cluster Analysis

- ABC Classification
- DBSCAN
- K-Means
- K-Medoid Clustering
- K-Medians
- Kohonen Self Organized Maps
- Agglomerate Hierarchical
- Affinity Propagation
- Gaussian Mixture Model*
- Latent Dirichlet Allocation (LDA)

■ Time Series Analysis

- Single Exponential Smoothing
- Double Exponential Smoothing
- Triple Exponential Smoothing
- Forecast Smoothing
- ARIMA / Seasonal ARIMA*
- Brown Exponential Smoothing
- Croston Method
- Forecast Accuracy Measure
- Linear Regression with Damped Trend and Seasonal Adjust
- Test for White Noise, Trend, Seasonality

■ Probability Distribution

- Distribution Fit
- Cumulative Distribution Function
- Quantile Function

■ Outlier Detection

- Inter-Quartile Range Test (Tukey's Test)
- Variance Test
- Anomaly Detection
- Grubbs Outlier Test

■ Link Prediction

- Common Neighbors
- Jaccard's Coefficient
- Adamic/Adar
- Katz β

■ Data Preparation

- Sampling
 - Random Distribution Sampling
- Binning
- Scaling
- Partitioning
- Principal Component Analysis (PCA)

■ Statistic Functions (Univariate)

- Mean, Median, Variance, Standard Deviation
- Kurtosis
- Skewness

■ Statistic Functions (Multivariate)

- Covariance Matrix
- Pearson Correlations Matrix
- Chi-squared Tests:
 - Test of Quality of Fit
 - Test of Independence
- F-test (variance equal test)

■ Other

- Weighted Scores Table
- Substitute Missing Values

SAP HANA Predictive Analysis Library

▫ New in HANA 2 SPS0

▫ New in HANA 2 SPS1

Roadmap - New and enhanced Algorithms in SAP HANA 2 SPS1

Classification Analysis

- CART
- C4.5 Decision Tree Analysis
- CHAID Decision Tree Analysis
- K Nearest Neighbour
- Logistic Regression Elastic Net
- Back-Propagation (Neural Network)
- Naïve Bayes
- Support Vector Machine
- Random Forests
- **Gradient Boosting Decision Tree (GBDT)***
- **Linear Discriminant Analysis (LDA)***
- Confusion Matrix
- Area Under Curve (AUC)
- Parameter Selection / Model Evaluation

Regression

- Multiple Linear Regression Elastic Net
- Polynomial, Exponential, Bi-Variate Geometric, Bi-Variate Logarithmic Regression
- **Generalized Linear Model (GLM)***
- **Cox Proportional Hazards Model***

Cluster Analysis

- ABC Classification
- DBSCAN
- K-Means/ **Accelerated K-Means****
- K-Medoid Clustering
- K-Medians
- Kohonen Self Organized Maps
- Agglomerate Hierarchical
- Affinity Propagation
- Latent Dirichlet Allocation (LDA)
- Gaussian Mixture Model (GMM)
- Cluster Assignment

Time Series Analysis

- Single/Double/ Brown /Triple Exp.Smoothing
- Forecast Smoothing
- Auto - ARIMA/ Seasonal ARIMA
- Croston Method
- Forecast Accuracy Measure
- Linear Regression with Damped Trend and Seasonal Adjust
- Test for White Noise, Trend, Seasonality
- **Fast Fourier Transform (FFT)***
- **Correlation Function***

Association Analysis

- Apriori, Apriori Lite
- FP-Growth
- KORD – Top K Rule Discovery
- **Sequential Pattern Mining***

Probability Distribution

- Distribution Fit/ Weibull analysis
- Cumulative Distribution Function
- Quantile Function
- Kaplan-Meier Survival Analysis

Outlier Detection

- Inter-Quartile Range Test (Tukey's Test)
- Variance Test
- Anomaly Detection
- Grubbs Outlier Test

Recommender

- **Factorized Polynomial Regression Models****

Link Prediction

- Common Neighbors, Jaccard's Coefficient, Adamic/Adar, Katz β

Statistic Functions

- Mean, Median, Variance, Standard Deviation, Kurtosis, Skewness
- Covariance Matrix
- Pearson Correlations Matrix
- Chi-squared Tests:
 - Test of Quality of Fit
 - Test of Independence
- F-test (variance equal test)
- **Data Summary***
- **ANOVA****
- **One-sample Median Test****
- **T Test****
- **Wilcoxon Signed Rank Test****

Data Preparation

- Sampling, Binning, Scaling, Partitioning
- Principal Component Analysis (PCA) / PCA Projection

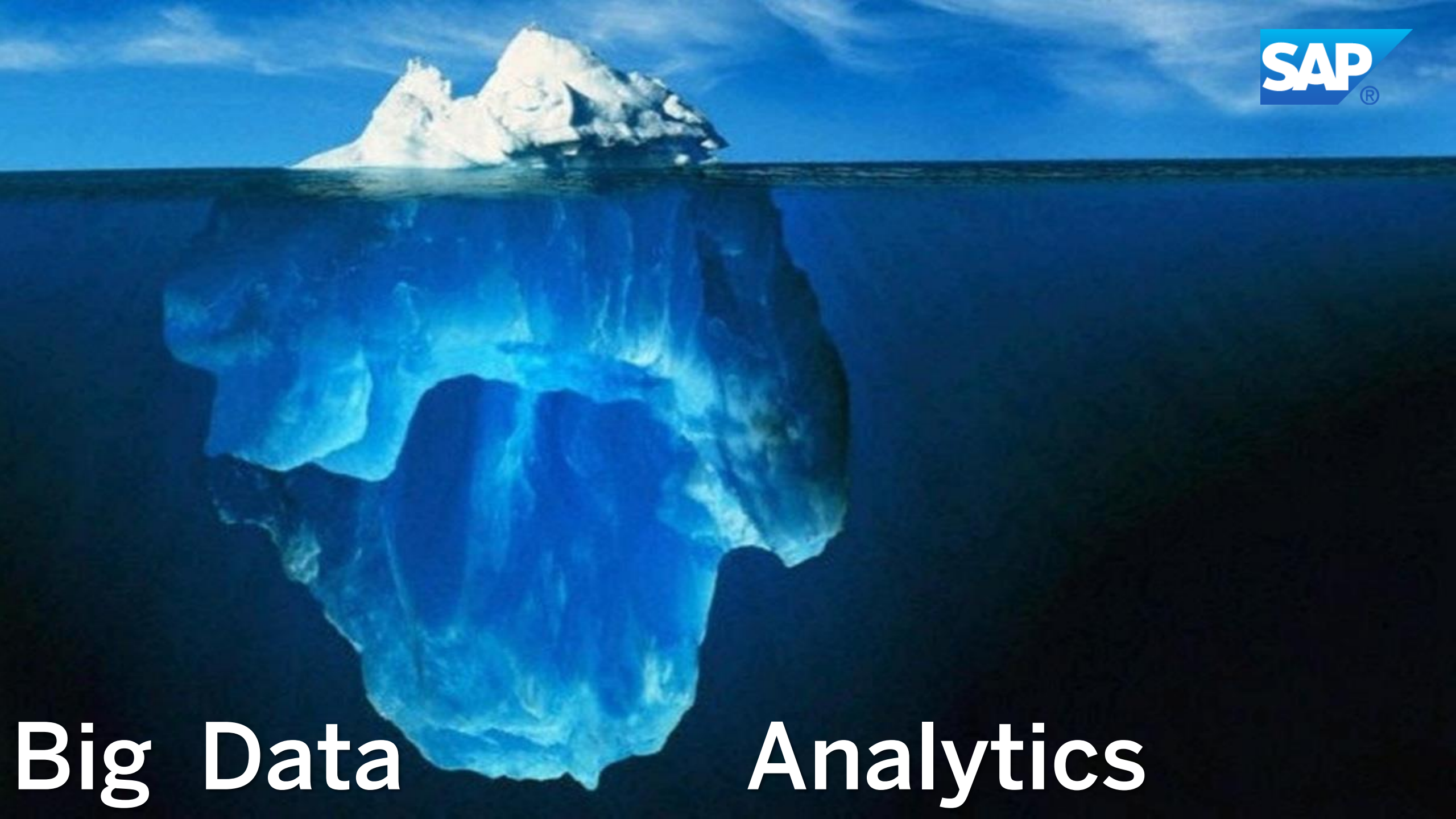
Other

- Weighted Scores Table
- Substitute Missing Values



Big Data

Analytics



A few data mining functions for answering various business questions



Classification / Scoring

Who will churn, fraud or buy next week, next month ?



Regression

How many products will a customer buy next month, next quarter ?



Segmentation / Clustering

What are the groups of customers with similar behavior or profile ?



Forecasting

How much will be the monthly revenue or number of churners next year ?



Recommendations

What is the best offer or action for a customer or internet user ?



Como analista, usted proporciona a la empresa importantes datos estratégicos,



SAP Predictive Analytics

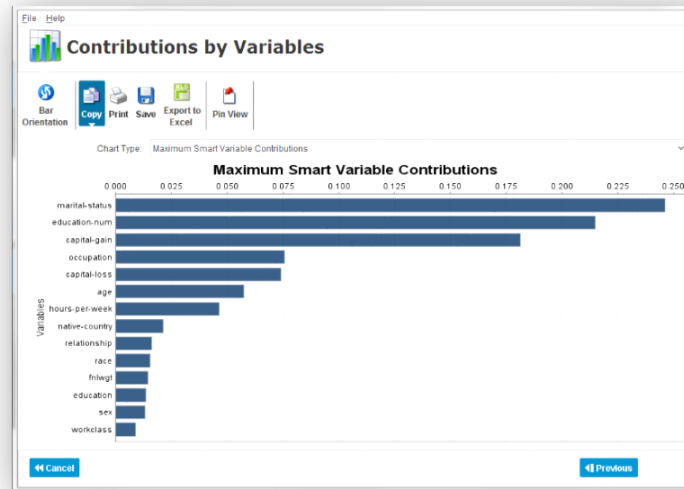
Core workflows

Prepare Data with Data Manager

Name	Type	Format	Day	Order	Missing	Group	Description	Structure
1 first	string	normal	0	0				
20 first_timestamp	datetime	normal	1	0				
3 last	string	normal	0	0				
4 address_line	string	normal	0	0				
5 address_line	string	normal	0	0				
6 number_of_adults	integer	continuous	0	0				
7 number_of_children	integer	continuous	0	0				
8 number_of_adults_2	integer	continuous	0	0				
9 number_of_adults_3	integer	continuous	0	0				
10 number_of_adults_4	integer	integer	0	0				
11 number_of_adults	integer	integer	0	0				
12 urban_or_not	boolean	continuous	0	0				
13 marital_status	integer	continuous	0	0				
14 urban_or_not_2	boolean	continuous	0	0				
15 urban_or_not_3	boolean	continuous	0	0				
16 urban_or_not_4	integer	continuous	0	0				
17 number_of_adults_5	integer	continuous	0	0				
18 number_of_adults_6	integer	continuous	0	0				
19 number_of_adults_7	integer	continuous	0	0				
20 first_timestamp	datetime	normal	0	0				
21 first_timestamp	datetime	normal	0	0				
22 number_of_adults	integer	normal	0	0				
23 age_loan_to_income_ratio_2	number	continuous	0	0				Assignment
24 age_loan_to_income_ratio_3	number	continuous	0	0				Assignment
25 age_loan_to_income_ratio_4	number	continuous	0	0				Assignment
26 age_loan_to_income_ratio_5	number	continuous	0	0				Assignment
27 age_loan_to_income_ratio_6	number	continuous	0	0				Assignment
28 age_loan_to_income_ratio_7	number	continuous	0	0				Assignment
29 age_loan_to_income_ratio_8	number	continuous	0	0				Assignment
30 age_loan_to_income_ratio_9	number	continuous	0	0				Assignment
31 age_loan_to_income_ratio_10	number	continuous	0	0				Assignment
32 age_loan_to_income_ratio_11	number	continuous	0	0				Assignment
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34 age_loan_to_income_ratio_13	number	continuous	0	0				Assignment
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83 age_loan_to_income_ratio_62	number	continuous	0	0				Assignment
84 age_loan_to_income_ratio_63	number	continuous	0	0				Assignment
85 age_loan_to_income_ratio_64	number	continuous	0	0				Assignment
86 age_loan_to_income_ratio_65	number	continuous	0	0				Assignment
87 age_loan_to_income_ratio_66	number	continuous	0	0				Assignment
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96 age_loan_to_income_ratio_75	number	continuous	0	0				Assignment
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103 age_loan_to_income_ratio_82	number	continuous	0	0				Assignment
104 age_loan_to_income_ratio_83	number	continuous	0	0				Assignment
105 age_loan_to_income_ratio_84	number	continuous	0	0				Assignment
106 age_loan_to_income_ratio_85	number	continuous	0	0				Assignment
107 age_loan_to_income_ratio_86	number	continuous	0	0				Assignment
108 age_loan_to_income_ratio_87	number	continuous	0	0				Assignment
109 age_loan_to_income_ratio_88	number	continuous	0	0				Assignment
110 age_loan_to_income_ratio_89	number	continuous	0	0				Assignment
111 age_loan_to_income_ratio_90	number	continuous	0	0				Assignment
112 age_loan_to_income_ratio_91	number	continuous	0	0				Assignment
113 age_loan_to_income_ratio_92	number	continuous	0	0				Assignment
114 age_loan_to_income_ratio_93	number	continuous	0	0				Assignment
115 age_loan_to_income_ratio_94	number	continuous	0	0				Assignment
116 age_loan_to_income_ratio_95	number	continuous	0	0				Assignment
117 age_loan_to_income_ratio_96	number	continuous	0	0				Assignment
118 age_loan_to_income_ratio_97	number	continuous	0	0				Assignment
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121 age_loan_to_income_ratio_100	number	continuous	0	0				Assignment

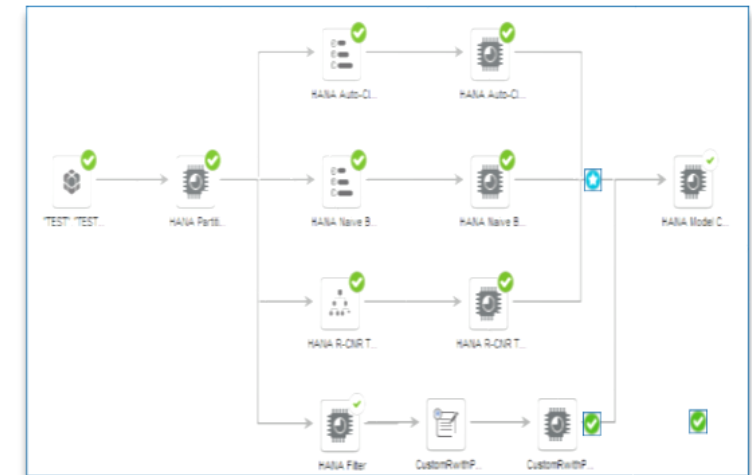
- Build analytical datasets with clicks, not code
- Create thousands of derived attributes to increase predictive accuracy
- Automate dataset production & create reusable transformations
- Timestamp populations identify which variables are changing over time

Build robust Predictive Models quickly with Predictive Modeler



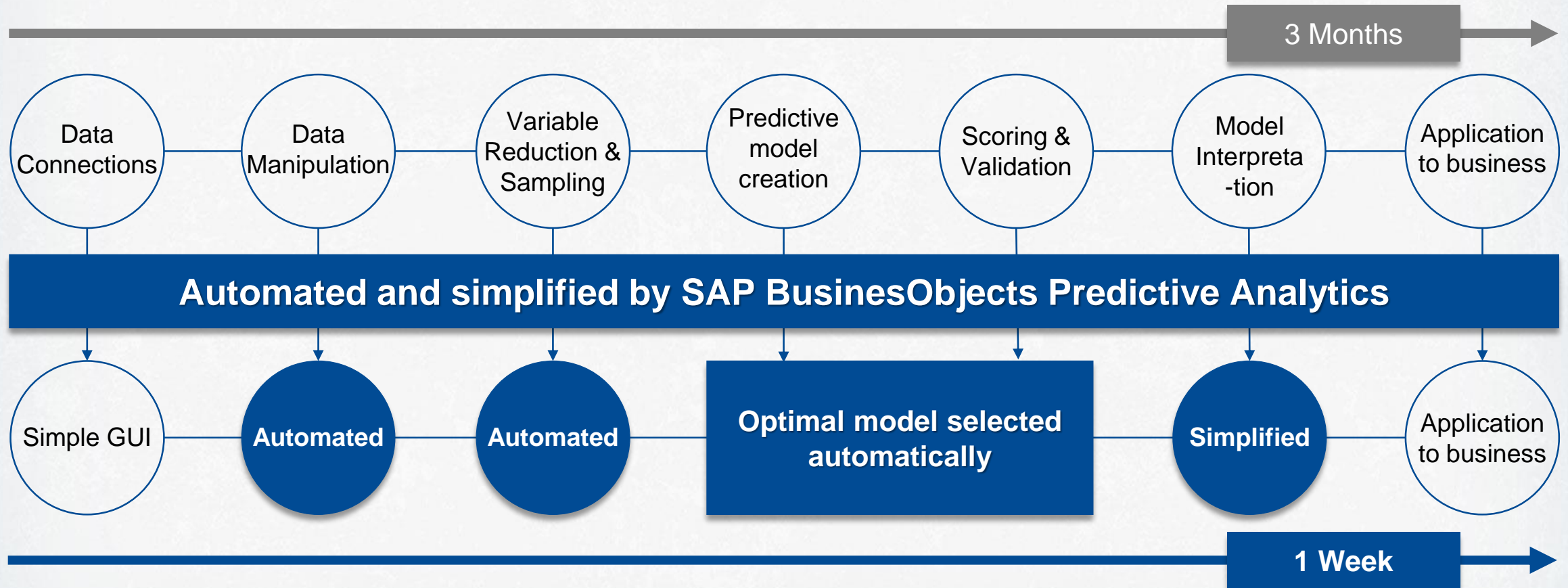
- Automated Predictive Modelling with Classification, Regression, Clustering, Time Analysis, Association Rules
- Automatic identification of key contributing variables on very wide datasets (64k+)
- Executive and operational reports
- In Database Execution – APL on SAP HANA & Native Spark Modelling on Hadoop

Use Expert Analytics to build complex Predictive Flows



- Easy to Use - Drag-and-drop data selection, preparation and predictive modelling
- Use the predictive models in SAP HANA such as UDF, PAL & APL
- Leverage 8000+ existing R functions and libraries
- Embed the models in external applications

Greatly Improve your Time to Value



MEJORE LA TOMA DE DECISIONES EN TODA LA ORGANIZACIÓN



- Reducción de Churn
- Adquisición de Cliente
- Generación de Scoring
- Recomendar Productos
- Optimizar Campañas
- Segmentación Clientes
- Next Best Offer/Acción



- Mantenimiento Predictivo
- Pronóstico de Ventas
- Optimización Inventario/Demanda
- Optimización Precios
- Optimización proceso manufactura
- Gestión Calidad
- Gestión Rendimiento



- Detección de Fraud
- Credit Scoring
- Análisis Reclamo
- Cobranza y Morosidad
- Modelaje Riesgo Operacional
- Amenaza Crime
- Análisis Ingreso y Perdidas



- Anticipación de juicios
- Simulación Budget
- Pronóstico Flujo de Caja
- Simulación Budget
- Análisis de Ganancia y Margen
- Modelaje Riesgo Financiero
- Retención Empleado
- Planificación Sucesión

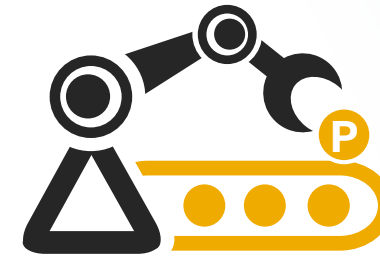


- Life Sciences
- Health Care
- Media
- High Education
- Public Sector / Social Sciences
- Construcción Y Minería
- Viaje y Hospitality
- Big Data e IoT



PREDICTIVE PARA **LAS MASAS!**

Democratice el análisis predictivo para todo tipo de usuario y para todas las líneas de negocios



FACTORY OF PREDICTIVE

Genere, entregue y gerencie miles de datasets y modelos predictivos en todos los procesos de negocios

Agenda



- **Predictive Analytics & Machine Learning**

Functional Services:



SAP TV





COOTRASANA

thank you for choosing
public transport

+4 CITY POINTS

éxito

GET OFF NOW

éxito

GET OFF NOW

éxito

GET OFF NOW

éxito

GET OFF NOW

COOTRASANA

COOTRASANA

COOTRASANA

COOTRASANA

351

22

Aisle 17 / Shelf 3

POS	Material	Pcs
1	Headphones	2
2	Netbook	1
3	TV	1
4	Screen	2



Gracias!

SAP