

# **0.** Company Profile

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# Martin Weber Digital Futurist, Data Scientist

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#### For your growth

As Catalysts we do everything to give you a competitive edge in order to grow your business.

# Catalysts



	Services	Business Models	Customers	Numbers 2017
Hidden Champions & World Market Leaders in Europe	Individual Software Development for Predictive Analytics Big Data, Artificial Intelligence Condition Monitoring Predictive Maintenance Machine Learning	- Pay per Use - Agile Fixed Price - Time & Material	CORSCHE INFORMATIK CFraport DB C Lufthansa + >80 additional Hidden Champions	250 employees Every 7 hours on average anoth qualified project request 3.000+ applicants per year
Start-Ups	High Performance Computing Clusters & Supercomputing Industry 4.0, Storage & Compute Clouds, Large Agile and Lean SW Projects	- Cash Investment - Work4Equity - Sweat Money	HYPERLOOP TRANSPORTATION TECHNOLOGIES + 7 additional Start-Ups	>6M USD Cash Investment >20.000 h / year

Sectors: Mobility | Energy | Government | Space

Catalysts

#### Our Clients are...

... mainly market leaders and hidden champions

VW, Porsche, ESA, Fraport, DB-Schenker, Doka, Bosch, Fill, Palfinger ... but also Silicon Valley, CA startups like Hyperloop

The **C**ats are active in the field of Big Data, IoT, I4.0, Cloud, HPC, Artificial Intelligence, Algorithms, Custom Software

	Small Size Projects	Medium Size Projects	Large Size Projects
Persons	1-2 Persons	1 <b>Team</b> (3-8 P.)	Multiple Teams
Development Time	Weeks	Months	Years
Budget	< 50 k€	< 500 k€	> 1.000 k€ per year
Nr. of Projects 2017	< 20	> 20	< 5



# Employee Age and New Technologies

Start your digital business with people who have 01110110101 in their DNA!

Our typical employee finished 10,000 h software development under an age of 25 years.

#### HOW OLD ARE THE EMPLOYEES AT TOP TECH COMPANIES



#### **In ventures**

besides money we invest sweat money

to play a role in disruptive innovations

to push us to solve extreme challenges

to get to new business opportunities we build the backend of EODC, Hyperloop, ...



Satellite based Earth Observation Cloud 30 Petabyte 32.000+ Xeon Cores Global service provider **eodc.eu** 



GRASP

Pure scientific service company for space grasp-sas.com



#### Hyperloop

Transportation reinvented green, fast and safe **hyperloop.global** 



#### TeamEcho

Emotional seismograph for enterprises teamecho.at



CORE

Employer branding core-smartwork.com



**Record Bird** 

Online-service notifying music fans worldwide about new releases by their favourite artists **recordbird.com** 



## 1. Artificial Intelligence (AI) working for Catalysts

#### AI - SID Classifier

Automatic classification has become essential in accelerating data mining processes.

With the right learning environment its ability can go in any direction.

SID enables precise results especially in the field of conditional monitoring.





this is a cat.

#### Cats vs. Dogs

2-class classification task

Convolutional Neural Network







I am quite certain this is a cat.



I am quite certain this is a dog.



Image sources: http://i2.kym-cdn.com/photos/images/newsfeed/000/406/325/b31.jpg http://media.galaxant.com/000/340/679/desktop-1441307840.jpg

#### AI - SID Classifier

Basic principle



#### AI - SID Classifier

Example of convolutional neural network



[Visualizing and Understanding Convolutional Networks, Zeiler & Fergus, ECCV 2014]













#### AI - SID Example: Face Recognition

SID was trained with more than 3 million faces.

Use it for identification service over the internet.

Mesh the identified people with structured information.

Planned to be in use 2018 at Skidata, Porsche, VW, University of Vienna ...

#### **Christopher Avery**

book author, www.christopheravery.com



#### Harald Vogl

works at Catalysts, coder with great management skills

#### Marian Doms

works at Catalysts, coder and a damn good project manager



#### AI - SID Example: Face Recognition

Know your customers better!

Recognize your visitors as soon as they enter your showroom

Gain information about them

Have an interaction between the AI and your customer



Hello Laura, welcome to our show room! What can I do for you?



#### A new customer has entered the show room!



Personal Data Name: Laura Landauer Age: 28 Gender: female Emotions: 61% neutral, 22% happy, 17% curious

Duration of stay: 00:08 Accompanied by: Lorenz Landauer

Job: Teacher Family status: married to Lorenz Landauer Lauras current car

Typ: Ford Focus Ambiente 1,8 TDdi Manufactured: 2003 Kilometers: 59.341

Purchase probability: 86,23%

→ 20 properties more



#### Object detection at Catalysts

# iSicca: Eye detection for dry eyes



#### AI - SID: Computational Intelligence for Clouds

In order to avoid misclassification of satellite data, which assumes a clear sky, we are detecting clouds within Satellite Data Processing.

For example, on similar principle our machine learning algorithms could be able to detect best location for solar rooftops.









# Al: The Natural Language Processor BERNI

#### AI - BERNI Natural Language Processor

Berni is able to comprehend given answers, collect important information and to apply it on numerous facets of the business.

Use case: Customers can interact with your company 24x7 on special topics in their natural language





#### AI - NLP: Amy

Mail-Bot conversation: Amy is a bot that arranges appointments for Christian.

Dear Amy, the following time slot work for me:	If not, could you please give me a few slots that work for you? Please let me know and I will send an invite shortly. Thanks! Amy
Tue December 22 01:30 pm PST (22:30 MEZ) - 3:00 pm	Hi Christian,
Best, Christian	unfortunately that slot has been taken. Does any of the following options (PST) work instead? Please let me know.
	Mon December 28 10:30 am - 12:00 pm Mon December 28 02:30 pm - 03:30 pm Tue December 29 01:30 pm - 03:30 pm Wed December 30 10:00 am - 12:00 pm
Hi Amy, no. I am on vacation till Jan 6th 2016. Do you have a slot on Jan 7th or 8th?	Thanks! Amy
Best, Christian	Definitely. Here are some options (PST) Thu January 07 10:00 am - 12:00 pm Thu January 07 02:30 pm - 04:00 pm Please let me know what works best for you.
Hi Amy,	Thanks! Amy
I take Thu Janary 07 10:00 am - 10:30 am (preferred) or 11:00 am - 11:30 am Best, Christian	Perfect! I just sent an invite.
	Ату

Hi Christian,

I hope you are doing well. Does anytime during the following

slots (PST) work for a 30 min call with Bibop?

Sun December 20 10:00 am - 12:00 pm Sun December 20 01:00 pm - 04:30 pm Tue December 22 10:00 am - 12:00 pm Tue December 22 01:30 pm - 03:00 pm



#### **AI - CatBots**

Every repetitive task can easily be automated in order to be used with bots.

At Catalysts, our ChatBots are called CatBots. We use them to check meeting reservations, to get the lunch menu of nearby restaurants, or to rent a car. Reserve a parking lot for my client. 08:33

I've reserved parking lot 7. 08:33

When is the next bus leaving in front of our office? 09:17

In 17 minutes. 09:18

Which meeting room is available right now? 09:53

Room 302. It's available until 11 am. 09:53

Rent a car for tomorrow 9 am. 12:43

Which car do you prefer? 12:43



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#### AI - PAUL Recommender

Paul has an important role in speeding up the user's decision-making process and helping companies to maximize profit.

In this example, Paul helped us with learning about customer habits and tendencies across the whole website and increased sales volume significantly.

Customers who purchased this product have also purchased: Parkett-Bockrolle 25 x 13 Anschraubplatte Standard Designrolle Disky 2 ohne Kabeldurchgang rund, BLUM MOVENTO TIP-ON HEKNA 321 HEKNA 505 Zylinder-**HEKNA Zylinder**mm, TPE-Rad grau 36,5 x 36,5 mm, Stahl Bremse, Zinkdruckguss, Einbau ø 60 mm, 760H Unterbodenführung, Drehstangenschloss für Hebelschloss, links, Wechselkerne, verzinkt Kunststoffdekor RAL 9006 Kunststoff beige NL 420, TK 40 kg Rahmentüren rechts, Schließhebel gekröpft, L verschiedensperrend Art.-Nr.: 103355428 Art.-Nr.: 103355546 Art.-Nr.: 103356030 Art.-Nr.: 103357682 Art.-Nr.: 103365246 Art.-Nr.: 103365373 Art.-Nr.: 103365400 Art.-Nr.: 103355249 EUR 12,61 EUR 3,50 EUR 4,91 EUR 6,07 EUR 1,71 EUR 0,73 EUR 45,07 EUR 6,60 pro ST pro ST pro ST pro ST pro ST pro ST pro GT pro ST

In Online Shops for E-Commerce PAUL is verifiably responsible for 13% of purchase Source: Customer with approx. 500M€ turnover 2015

AI - PAUL MonStyle



Hello, what would you like to do today?

Talk to Sophie

Shop with Sophie

Get Inspiration



#### AI - ALVINA Predictor

Alvina makes reliable forecasts **in real-time**.

Huge amounts of sensor data are used to reduce the failure rate and maintenance costs.

Based on prediction, internal processes are started automatically, e.g. order and delivery of spare parts.



#### AI - ALVINA Predictive maintenance

Predictive maintenance is offering just in time warnings and alerts for any possible maintenance work

Highest possible availability of your equipment: reduced failure rate combined with less frequent maintenance



#### IoT & AI @ Predictive Maintenance & Condition Monitoring

Our customer is a prominent engine producer for special purpose cars, cruising ships, trains, ...

Competitors operate worldwide and have service partner networks. Our customer didn't until today.

Their advantages with our digitalization initiative:

- Liability management
- Nearness to customer
- **Global Service Partners**
- Network 27





1 KByte engine data per second over the air

2016: Starting with simulated engines. Mix of generated and real data for scaling tests.

Since Jan 17 in field-test

Many thousand engines equipped by 2018 - global missions.

Catalysts IoT-Cluster with physical wear models and AI Algorithms

Configuration Cluster බ බ බ බ	·		
Endpoint	Your Application		
• •	Storage Cluster		
·····•●			

NRT models for data cleaning and predictions

Detail warning and defect analysis for remote repair planning

Automatic spare part ordering and shipping

Replicated storage of all data Elastic & replicated infrastructure

Service Partner advertising engine to let service partners bid for orders

**C**atalysts Condition and Predictive Maintenance Web Portal



End user Care Portal for condition monitoring, predictions, service control, historical data statistics

Service Partner Portal for spare part order management, shipping control, cloud based repair planning, Virtual and Augmented Reality repair services

Analytics Portal to access live data streams and historical data. from simple viewers to full web based Integrated Developer Cloud Environments

#### Prediction of Energy Consumption



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#### Use Case "AI at Catalysts Airways"





## 2. Digitalization, Cluster, IoT, Cloud it is not just more automation

#### Digitalization

Digitalization is not solely automation.

It is finding new ways of how to make money, based on disruptive innovation focusing on the customer.

Eliminate/install a middleman.

Adapt and change all internal processes.



#### IoT - Cluster

Cluster backend receives data (streams) from devices -OBUs, Smart Meter, Cell Phones.

Less than 1 kW to process **1 Mio events** from devices per second.

Operated on-premise or in public cloud.

Fully Software Defined Cluster  $\Rightarrow$  Infrastructure as a Code



#### **Demo: Phone to Python**

Use your smartphone browser as an IoT sensor and send live data directly to a python backend.

We are able to visualize the data with every movement of the device.



#### Thrombotherm

Allows real-time analysis for blood platelets for the first time.

We are able to speed up research. Our software catalyzes innovation and science.

Thrombotherm was a collaborative project with universities and industry.



## avanti

#### **Condition Monitoring**

Communication satellite operators provide **hundred thousands** of VSAT terminals with internet services.

The signal strength of those stations is monitored, the attenuation properties of the atmosphere are predicted. The satellite signal strength is adapted to the predicted value to guarantee perfect data transfer.





The cities of the future are deploying a large number of IoT sensors in order to measure noise, humidity and temperature.

90.000 sensors on each street and traffic light in the city of Vienna yield a big data stream that is processed real-time for ingestion by derived services.

36 StaDt**;;Wi**en





Simulation is the starting point for your IoT System

Develop, Run, simulate and test your IoT or mobility application in a trustworthy industry standard environment.

Does your application scale for **millions of devices** and /or users? Instantly?

Try it - fully automized every time you make a critical code change. 37



SIMULATE

0 0

Real-time simulator Flexible scenarios Efficient process High performance

DEVELOP

Reliable operations Scalable infrastructure

OPERATE



# 5. Data Market Austria

#### Data Market Austria Showcase Project

The goal of DMA is to develop foundations for a sustainable Austrian Data-Services Ecosystem

Catalysts role is preparation and maintenance of infrastructure, cloud solution development and implementation of prototypes



DATA MARKET



#### Data Market Austria Taxi demand map

The leader on the market is a company that can predict its demand. In order to do that, you need all necessary data.

Data gathering:



Without DMA: 3 years







#### **Result: Taxi Demand Map**





## 6. Space / Earth Observation

#### EODC - Earth Observation Data Center

eocc

Catalysts built up the storage and the full cloud infrastructure

to allow customers like the World Food Program (1000+ people working daily with satellite data) to monitor crops, floods, droughts, ...

#### "Traffic light" early warning system based on the CCI soil moisture data set



35 PByte Disk Storage till 2018

- 2015: 2.5 PByte
- 2016: 10 PByte

Access to 32,000 Xeon Cores via the Vienna Scientific Computer since July 2014

21 customers operate key sectors of their business using the cloud









# eoch

#### EODC - Earth Observation Data Center

Catalysts managed that 8 TB of different data sources can be processed every day smoothly

by scientific-, community-, thematic- and large operational-services

#### Large Operational Services • PAC - Processing and Archiving Center • DISC - Data Innovation & Science Cluster • LTDP – Long Term Data Preservation • MPC – Mission Performance Center • PDGS - Payload Data Ground Segment . ... **ৰ্**ৰ্ **ৰ্থৰ্থ র্থ্র Community Services Scientific Services** Thematic Operational Services NRT Reprocessing Tuning R&D Validation Land Cover Soil Moisture Communication Integration & Aerosols )≣||≣| Dev & Test Deployment Dissemination **Crop Monitoring** Wetlands ৰ্থৰ Access Pattern 155 ସ୍ସସ୍ Usage Rights Redundancy ସ୍ସ୍ୟ Balancing SW Infra-Priorities structure Stack Recovery Dim PRIORITY abc 6 b 99 ସସସ থিথি Interconnection Network Storage HPC Cluster ସ୍ଥ୍ୟ Super Computer Data

#### **Snow Extent Monitoring**

Covering the **entire northern hemisphere** in a continuous monitoring process was a tremendous challenge for ESA.

#### As a solution, we utilized data from two satellites: Sentinel 2-for high resolution observations and Sentinel-3 for frequent coverage and

made an optimal combination.

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#### Alpine Region seen from Space

- > True Color composite image
- > Based on Sentinel-2 observations
- > Covering Bad Mittersill and Zell am See

#### **Platform: Coastal-TEP**

This online service provides access to over **20 years** of Earth Observation **data** focusing on coastal areas, which is used for maritime management and R&D sector.

IT resources are infinite, maintenance costs are minimal and we are able to deliver it on a big scale, for ESA and all other partners.



#### Use Case: Aqua Culture

Mussels weight after 2 years growth

#### Use Case: Carabinieri

#### Illegal build-up detection





Other Use Cases: Storm Surge Observation, Water Quality Indicators

## 7. Large-Scale Projects



Customer: Porsche Bank

CarFin is our project that connects the Porsche Bank, their customers and service partners.

Maintenance and warranty contracts and their handling runs over this system, concerning all brands of the Volkswagen concern.

- ① Customers put their company pool cars to service.
- (2) The service partner sends a repair request to the Porsche Bank.
- ③ The Porsche Bank may involve the Customer.
- ④ The Porsche Bank approves or declines the repair request.
- ⑤ The service partner sends the invoice to the Porsche Bank where the invoice is verified and billed.





**Carfin** *Modularization* 

Customer: Porsche Bank

#### **Large Scale Projects**

**Agile Software Development** 

We support you in your large projects with scalable high-performing teams.





## 8. Hyperloop

revolution of transportation

#### Hyperloop Transportation Technologies

HTT is a collaborative organization founded in 2013 with the goal of revolutionizing transport over long distances.

- 1,200km/h in a vacuum tube
- no external power
- environmentally friendly
- safe
- high comfort





#### **Hyperloop Big Picture**

Catalysts, as an investor and developing partner of Hyperloop builds the backend







## **10. Blockchains**

a nice subline

#### **Blockchain Technology**

New level of security and traceability

Blockchain technology doesn't require centralized server for your data.

Everything what is currently centralized will/can be eliminated (all registers, e.g. register of land tiles, driving licenses ...)



#### **Blockchain Technology**

Most famous use case: bitcoins

Other applications are numerous. e.g you can interact directly with your client, or all electronic devices of your client can interact with you

Everything what is currently centralized will/can be eliminated (all registers, e.g. register of land tiles, driving license, ...)







**2.** Robert creates and digitally signs his transaction.

? ? ?  $\approx$ (c 3 ? ))) (((

**3.** This transaction is broadcast to every party in the network.



**4.** Those in the network approve the transaction and validate

9 0 9

5. So called miners collect transactions and put them together in a block which is added to the chain. This chain provides a permanent, non-repudiable and transparent record of transactions.



11. Projects Is there any more of it?

#### **Individual projects**



Thrombotherm

Real time analysis of thrombocytes.



Web Catalog

Development and implementation of the Web catalog for Schachermayer



Predictive Maintenance Project Connecting Engines worldwide





CI4CIOUUS

With Machine Learning, we retreive cloud data from a satellite which was initially built for different purposes. Thereby we improve the whole processing chain.



ÖSV – Biathlon App

Lead by technology. Use innovation and tailor-made solutions for a headstart.



Together with the University of Vienna, we develop the portal for a centralized overview for 95.000 students and 6.500 teachers.



CORE soft

The unique tool for an employee relationship management.



Software Quality Engineer Senior Software Developer DevOps Engineer Senior Software Developer Software Developer Security Engineer Frontend Webdeveloper be part of the Catalysts family!

Catalysts jobs@catalysts.cc

#### **Events @Catalysts**

We at Catalysts don't keep our ideas and expertise just to ourselves.

We want to share it with others and to Inspire them! This is a basic concept behind our events: Get Inspired by Catalysts.

Feel free to schedule your Inspiration event any time: marketing@catalysts.cc







# Get inspired by Catalysts