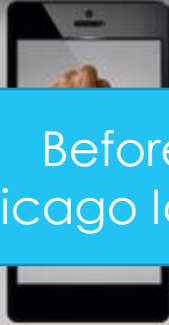


Before the presentation the Chicago IoT 1 minute movie is shown





Unlocking the potential of IoT

Dr. Joachim Schaper, Vice President Research

E-Mail: jschaper@agtinternational.com

www.agtinternational.com

AGT: European organisation, HQ in Switzerland

HQ in Switzerland Zurich

Management

Sales & Partner
Management

HR & Administration



R&D Locations

Established in Germany
DARMSTADT



Innovation Focus

30 PhD's working on
Advanced Analytics for
IoT and Big Data

100 R&D Scientists

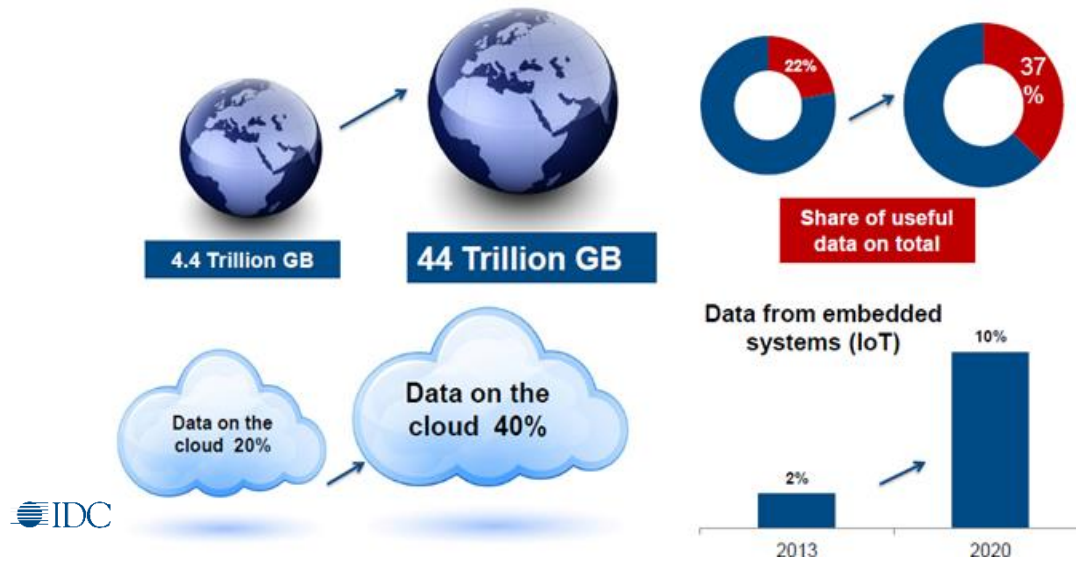


Academic Collaboration

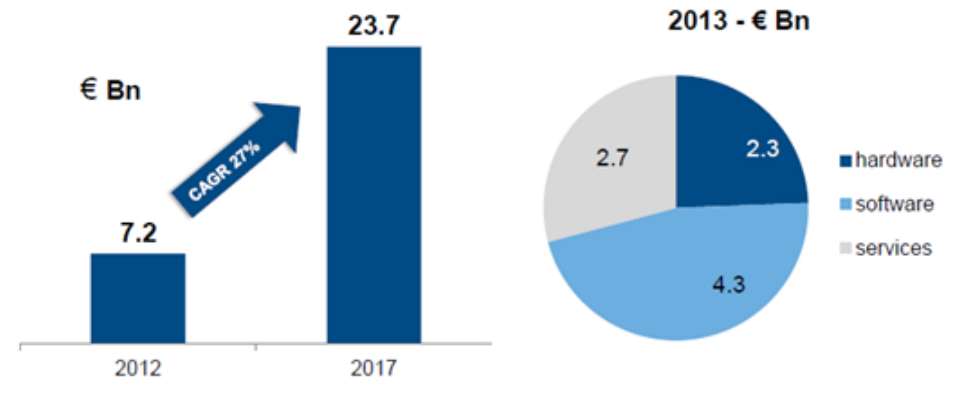
- **Technical Univ. Darmstadt** - Center for Advanced Security Research (CASED)
- **DFKI** (German Research Center for Artificial Intelligence)
- **Fraunhofer IOSB, SIT**
- **Karlsruhe Institute of Technology (KIT)**

Big Data Problem Space

Growth of the Digital Universe from 2013 to 2020



The Big Data market grows 6 times faster than the traditional IT market



Needs for EVERYONE to remain competitive

Opportunities FOR ONLY A FEW

Big Data and IoT

IoT Market Size (by 2025)

McKinsey&Company

\$6.1T

 IDC

\$7.1T


CISCO™

\$14.4T

Connected Devices (by 2020)

Gartner®

26B

 IDC

32B


CISCO™

50B

Data Growth (2013 vs 2020)

 IDC

Total Data

4.4ZB → 44.4ZB

10X

IoT Data

.09ZB → 4.4ZB

49X

IoT data demands IoT analytics

IoT

Analytics

Collect



Fuse



Analyze



Visualize



Predict



Using Advanced Capabilities

Share



Recommend



Simulate



Alert



Applications Visualization



Data-Driven

Prediction



Model-Based



Optimization



Simulation

OPERATIONAL OPTIMIZATION - CORE ANALYTICS



Movement
Analysis



Activity
Recognition

Behavior
Analytics



Sentiment
Analysis



Anomaly
Detection



Tracking



Clustering

Aggregation
Enrichment



Classification



Event
Detection



Data Fusion

UNDERSTANDING - ADVANCED IoT ANALYTICS

COMMUNICATION



Audio



LPR



Traffic

Feature
Extraction



Environment



Electricity



Video



Cleansing / Filtering



Sensor Monitoring

SENSING - EDGE IoT ANALYTICS



SENSORS



Business Value Created by Time Series Anomaly Detection

Traffic



Crowding



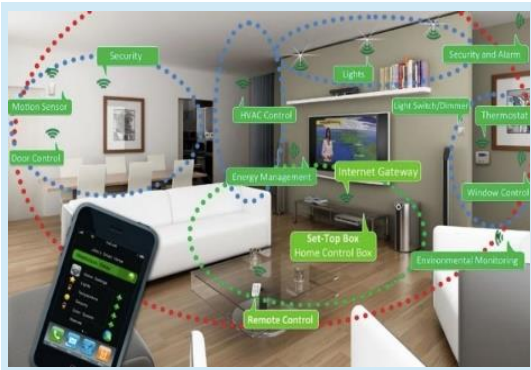
Water



Electronic Retail



Smart Home



Smart Grid



Manufacturing



Social Media





Traffic – improve flow



Case study

Safe City Pilot in Singapore - Detecting abnormal crowding in public transportation hubs and public places.



Customer angle

- Enabling operators to focus on relevant events detected
- Producing higher and more reliable detection rates

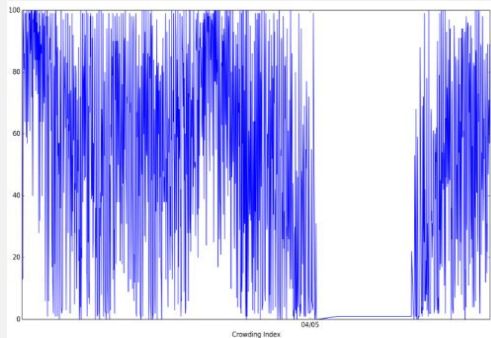


Impact

- Total number of alerts per day reduced by a factor of 20
- 75% of detected anomalies are relevant to operator KPIs

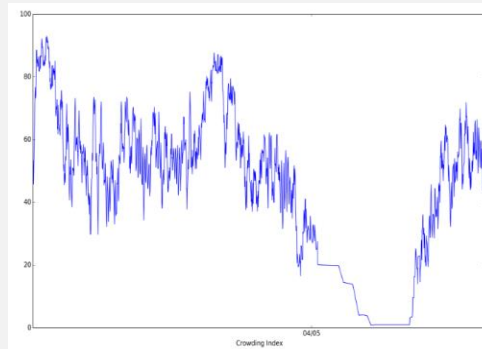
Abnormal crowding detection – analytics workflow

Crowd Measurements (Video Analytics)



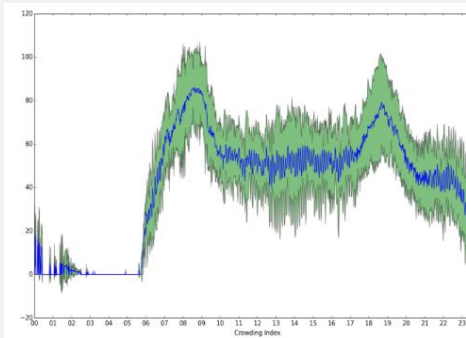
- Crowding index (0-100)
- High frequency noise
- 70% correlation to number of people in the scene
- Full/partial sensor outages

Preprocessed Data



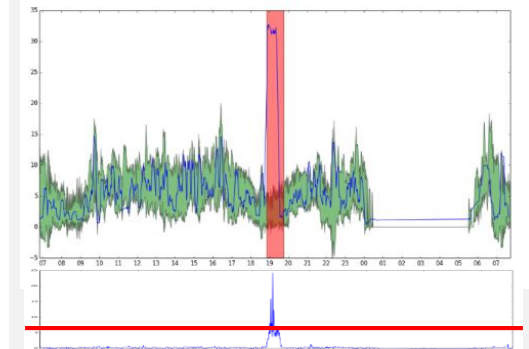
- Noise reduction
- Missing data imputation
- Low-pass filtering

Normal Pattern Model



- Normality learned from 14 days interval
- Normality depends on time of day, day of week, public holidays
- Robust algorithm applied to deal with noisy and incorrect data

Anomaly Detection



- Anomaly index indicates magnitude of deviation between model and measurements
- Index threshold (red line) determines detection sensitivity

Industry 4.0 – Predictive Maintenance

Customer Problem

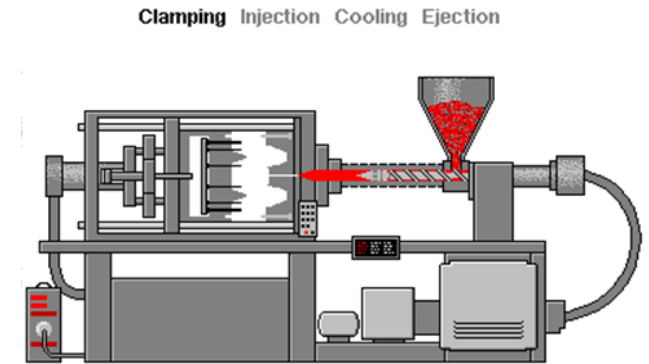
- Loss of production due to unpredicted failures
- Undetected quality issues
- High maintenance cost

Analytics Solution

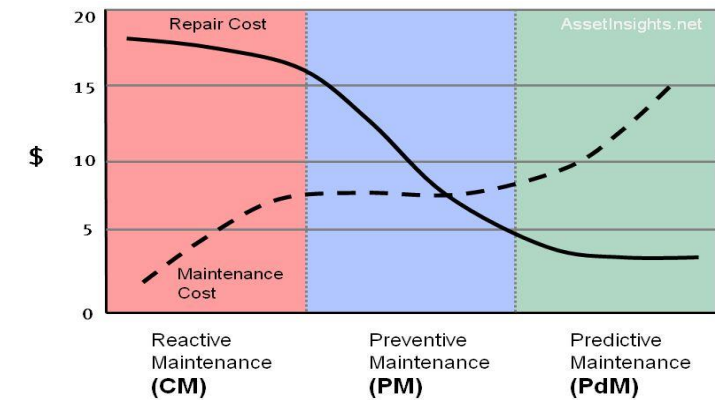
- Anomaly Detection as one step towards a predictive maintenance solution
- Activity recognition for reduction of false alerts + insight into operation

Key Benefits

- Yield improvement
- Reduction of maintenance cost
- Quality improvement
- Process optimization



Maintenance costs vs. repair costs (normalized)



Business Value Created by TSAD for e-commerce

Customer Problem

Web site software bugs and server issues result:

- Bad customer experience
- Lower conversion rates
- Higher call-center costs

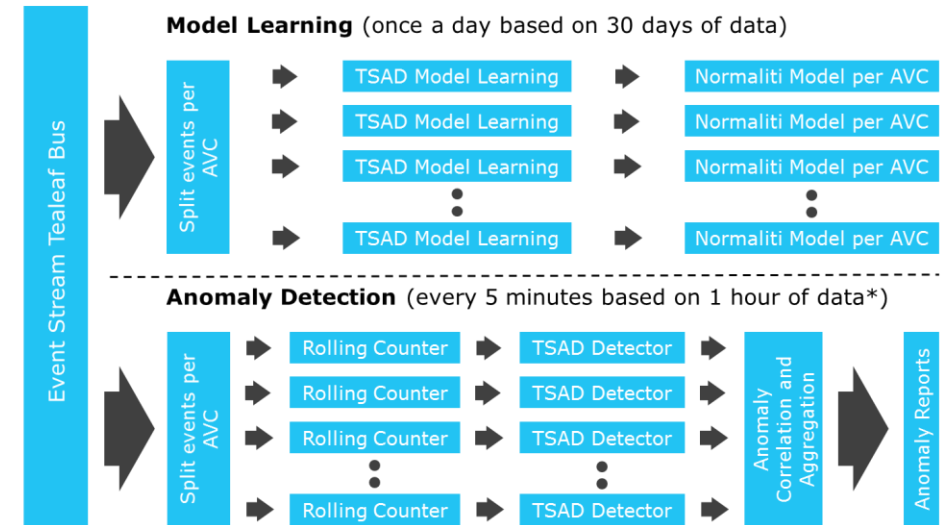
Analytics Solution

Anomaly Detection on web log data

- High-resolution detection of recurring errors experienced by many customers
- Error correlation for root-cause identification

Key Benefits

- Faster detection and resolution of web site issues
- Less customers affected
- Less inbound calls to call-center



Anomaly report: 04/26/2015, 9:00-10:00 CST

Anomaly Index	Unique Session ID	Actual Event Count	Actual Event Count in time	Event	Country	Segment	Commonalities
4.8	151	238		1333 (5) Error: Http 404 for eSupport/drivers [TEC]	UK	BR DE SIC BSD CH	
3.1	35	44		1333	UK	BIZ	54%
2.3	6	32		1333	BR	BIZ	43%
5.4	12	95		1333	UK	CHN	89%
6.7	98	127		1333	UK	BSD	81%
3.2	2	24		1333	DE	BSD	29%
4.2	348	943		3157 (6) EZE: 6w Client Error for insight TEC	US FR UK CHN B R		
3.8	4	9		3157	UK	CHN	82%

Commonalities	Description
45%	URL: /content/public/nc/ncfound.aspx IP: 213.105.245.209 SessionID: 331737609 TLTSID: B8912A5ED9B48F6A6A794210FE0E6E75 Referrer: http://www.dell.com/support/home/uk/en/ukbsad1/product-supportip...
21%	URL: /content/public/nc/ncfound.aspx IP: 213.105.245.209 SessionID: 331725369 TLTSID: B8912A5ED9B48F6A6A794210FE0E6E75 Referrer: http://www.dell.com/support/home/uk/en/ukbsad1/product-supportip...



Unlocking the potential of IoT

Dr. Joachim Schaper, Vice President Research

E-Mail: jschaper@agtinternational.com

www.agtinternational.com