KU LEUVEN

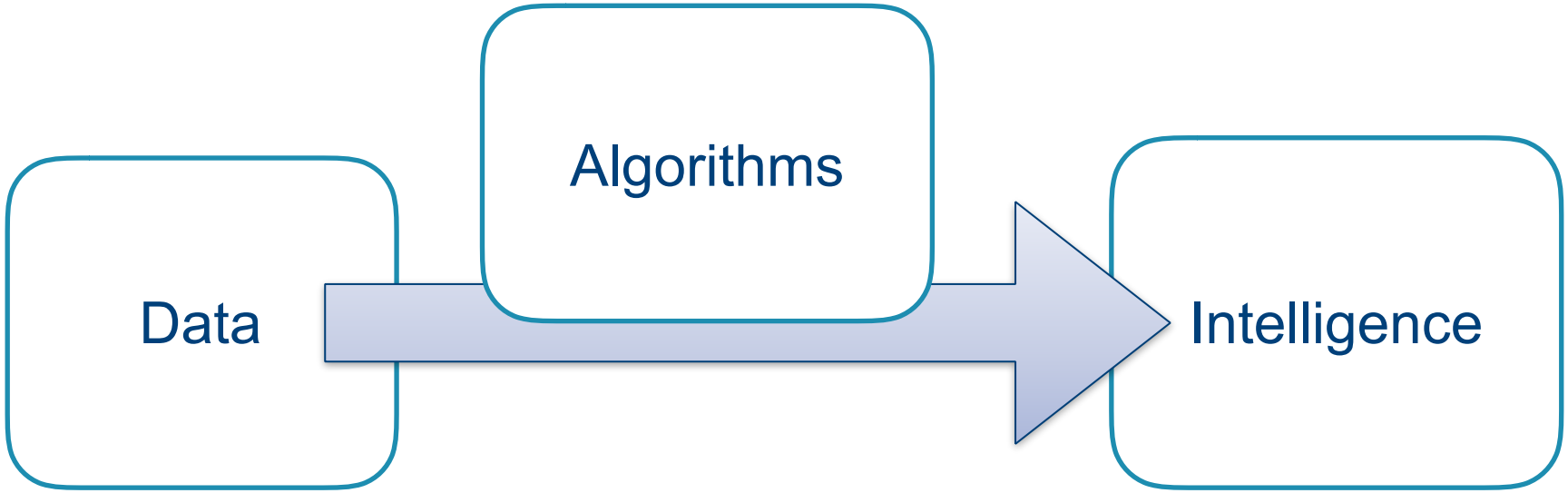
Connected Business Intelligence: TeTra Project “Intelligent Analysis of Time Series”

Prof. Joost Vennekens

joost.vennekens@kuleuven.be

What's it all about?

- TeTra = Technology Transfer from universities to industry
- Time series analysis

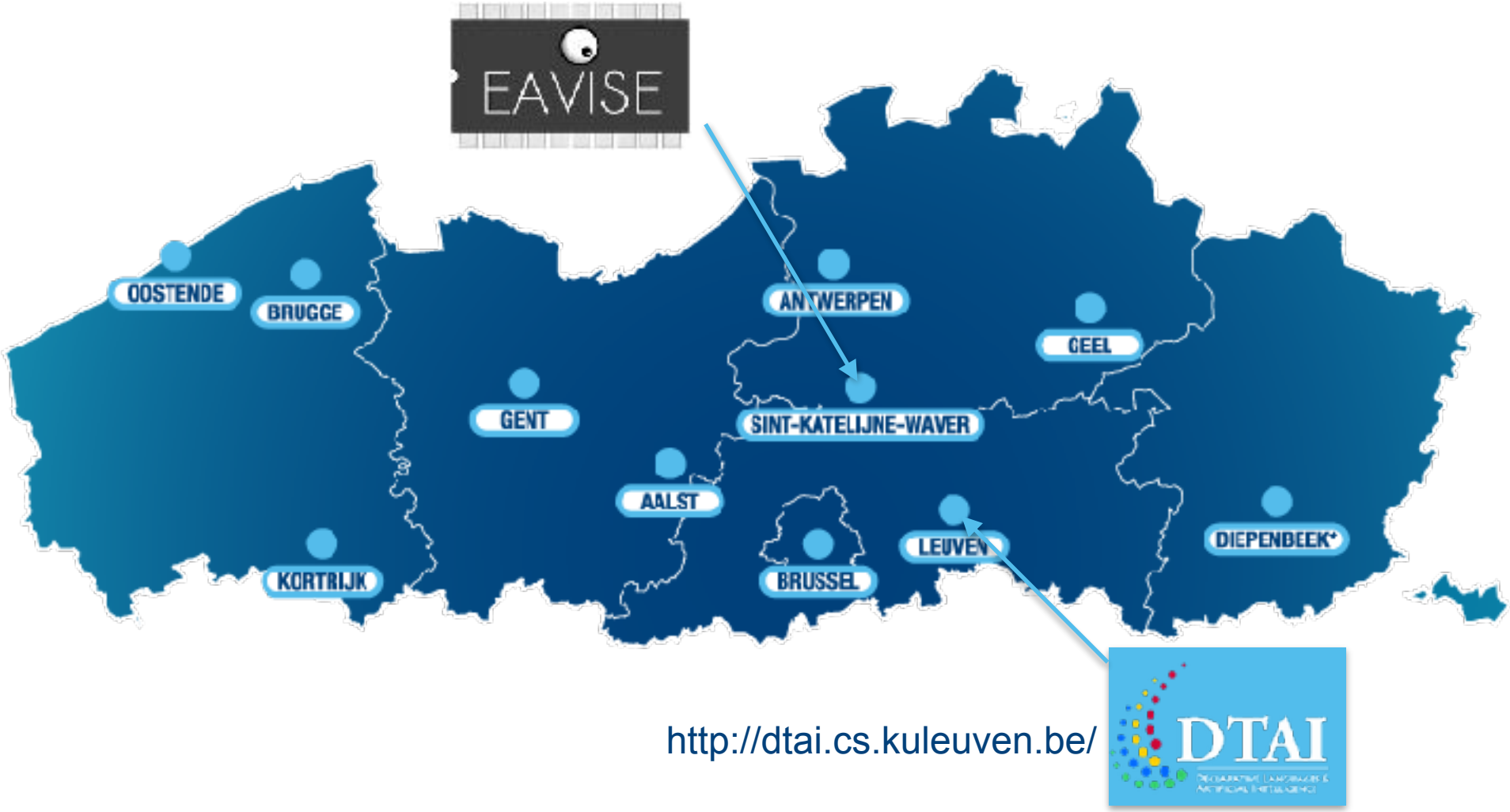


KU LEUVEN

Contents

Contents

http://www.eavise.be/



http://dtai.cs.kuleuven.be/

KU LEUVEN

EAVISE: Mission

- Application-oriented research
- In collaboration with industry
- Apply state-of-the-art technology
  - Artificial Intelligence
  - Computer Vision
- To solve practical problems

People

- 3 professors

- 15 PhD-students / researchers
  - 10 computer vision
  - 5 artificial intelligence

Projects

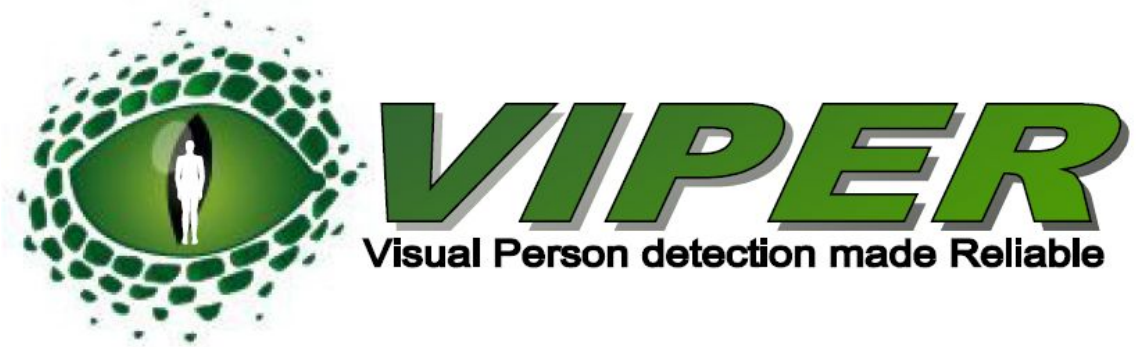
- Bilateral projects
  - Contract research
  - VLAIO R&D projects

- TeTra-projects

- Internal KU Leuven projects
  - More fundamental research
  - Or more general applied research

Example project: TeTra project VIPER

- Security & safety applications
  - Reliable person detection on (IR) cameras
  - AI for detecting abnormal behaviour



- End of project event: 9/11/2017 @ Campus De Nayer

Who is the DTAI Research Group?

Currently
9 Faculty
1 Research Manager
1 Research Expert
±7 Post-docs
±45 Ph.D. students

Alumni
~4 PhDs / year

DEPARTEMENT COMPUTER WETENSCHAPPEN

DTAI
Declaratieve Talen en Artificiële Intelligentie

KU LEUVEN

Mission Statement

1 To design **languages** to express complex, relational and uncertain knowledge

2 To develop techniques, theory, systems and software solutions for **Artificial Intelligence**

probabilistic programming, machine learning, data mining, automating data science, automated reasoning

3 To apply these in various **application** domains

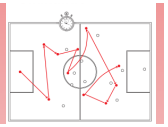
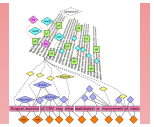
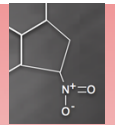
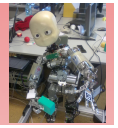
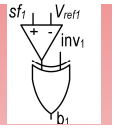
DTAI
Declaratieve Talen en Artificiële Intelligentie

KU LEUVEN

Basic Research

- Probabilistic Programming and Statistical Relational Learning
- Experiment Databases and Languages
- Predictive Learning and Decision Trees
- Exploratory Data Mining
- Graph and Network Mining
- Constraints
- Socially Aware Data Mining

Applications

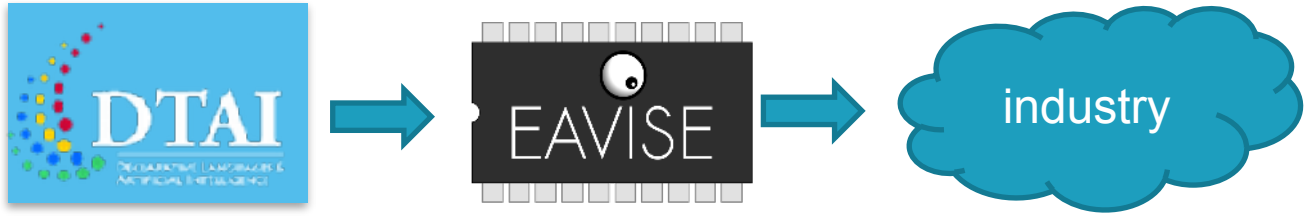
- Sports Analytics 
- Texts and Web 
- Health 
- Bio- and cheminformatics 
- Robotics 
- Games 
- Engineering and Sensors 

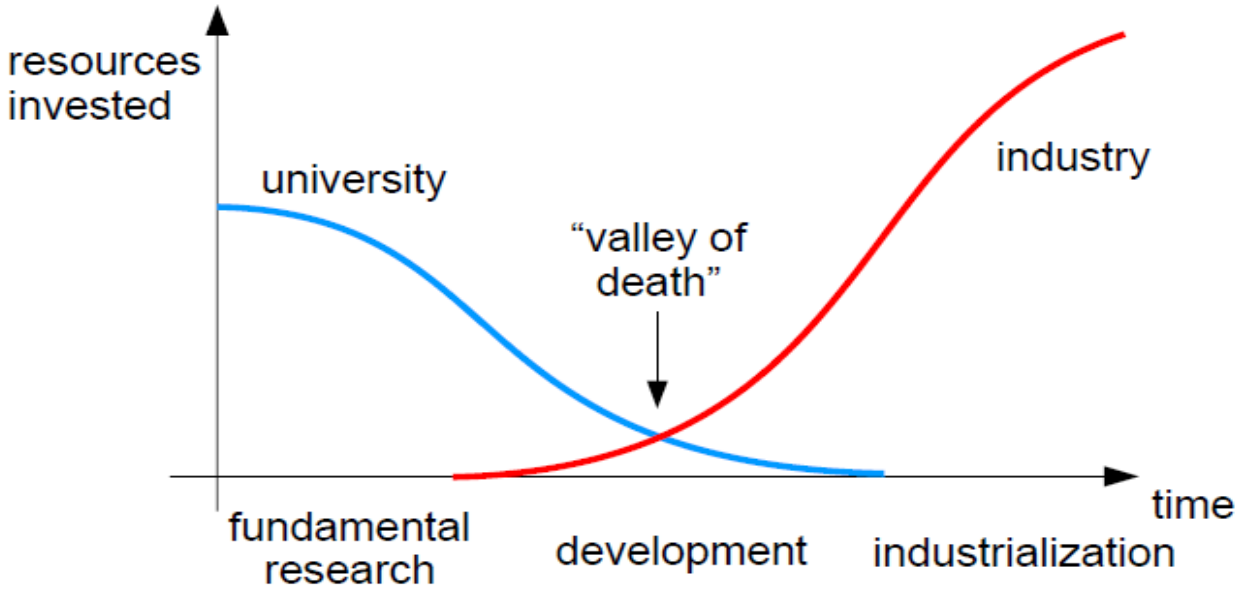
DTAI
Declaratieve Talen en Artificiële Intelligentie

http://dtai.cs.kuleuven.be/research

KU LEUVEN

Our Team



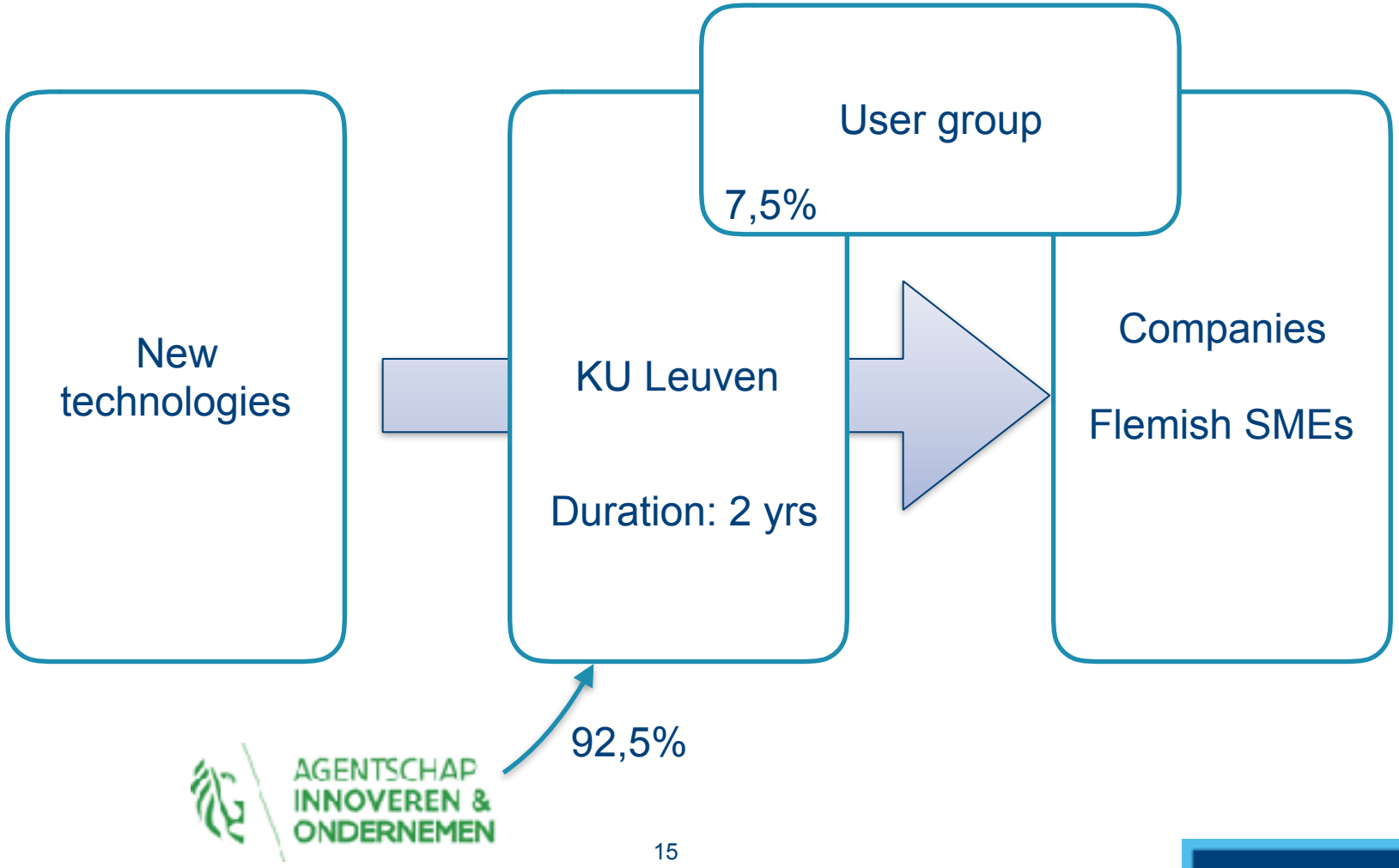


KU LEUVEN

Contents

KU LEUVEN

Technology Transfer (TeTra) project



KU LEUVEN

User group


cubis


ROBOVISION
DEEP LEARNING APPLIED


TenForce
The Pragmatic Company


BRAIN 2


Enervalis


JUVO


oxya
A Hitachi Group Company


DRONEMATRIX


RØAD VIKINGS

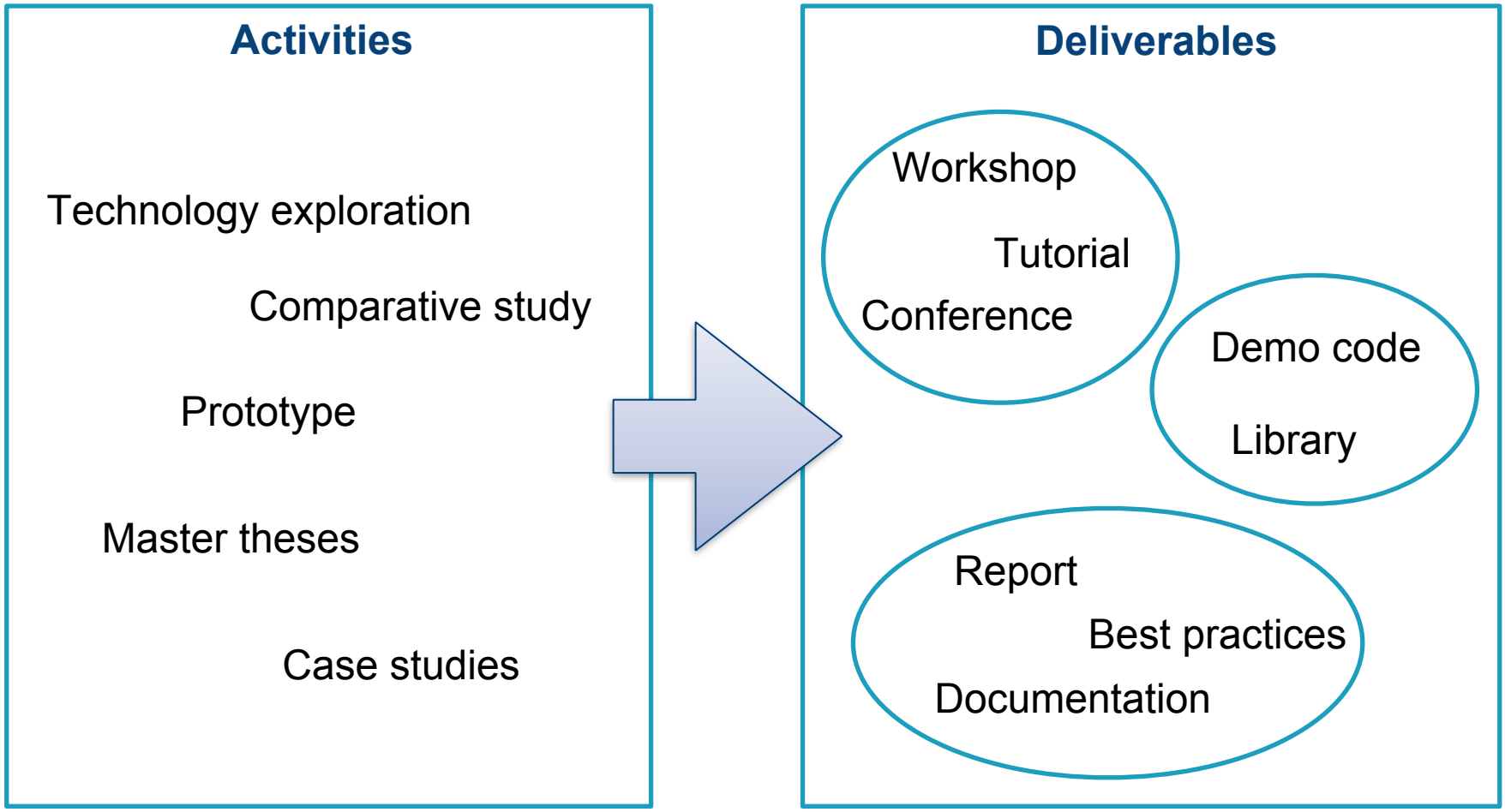

cegeka


OCTINION
Engineering the future


skyline
communications

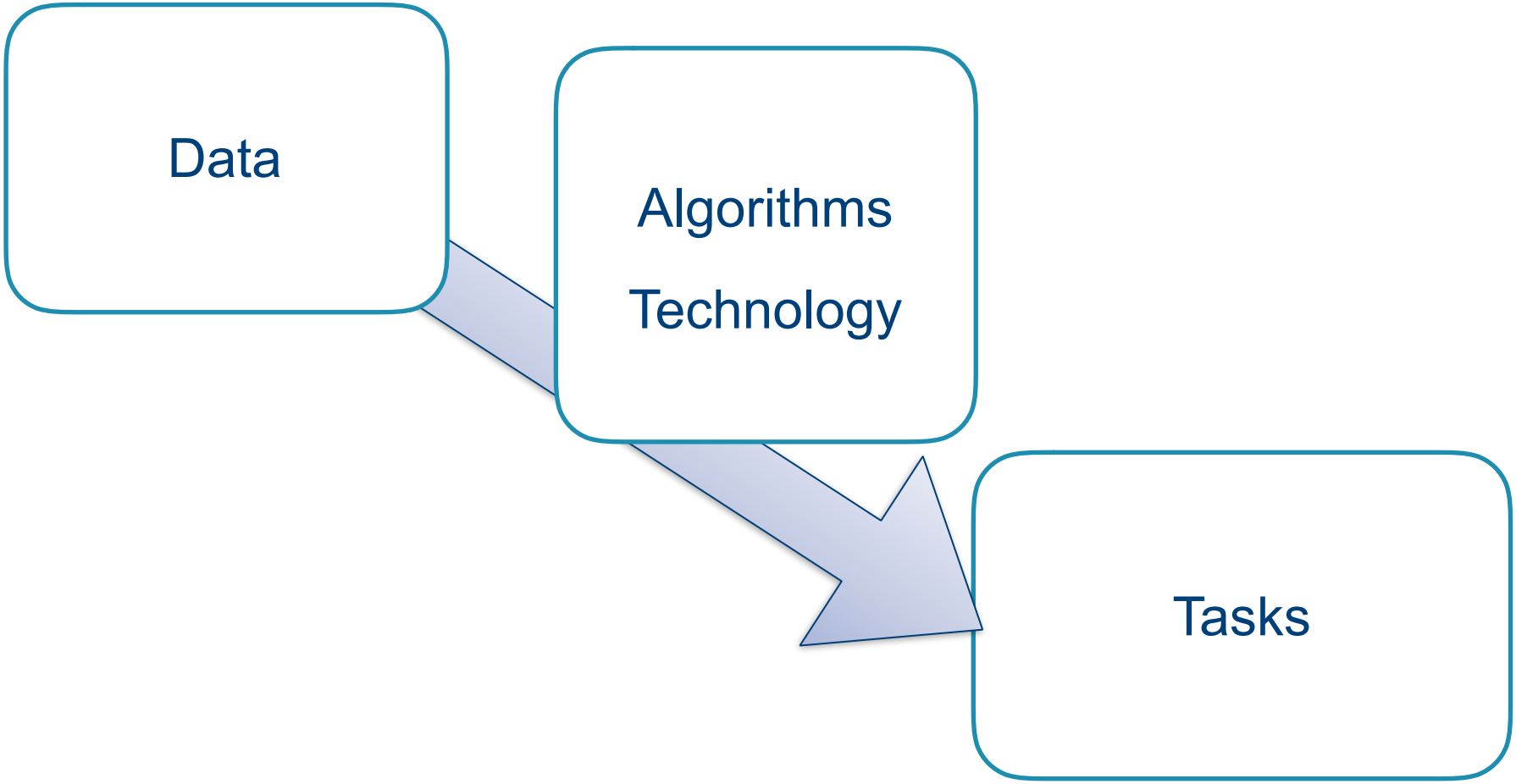

seris

Technology Transfer (TeTra) project



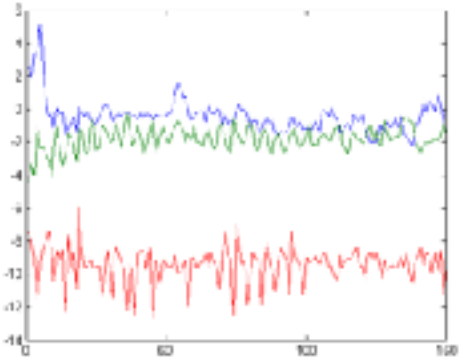
KU LEUVEN

Time Series Analysis



Time series data

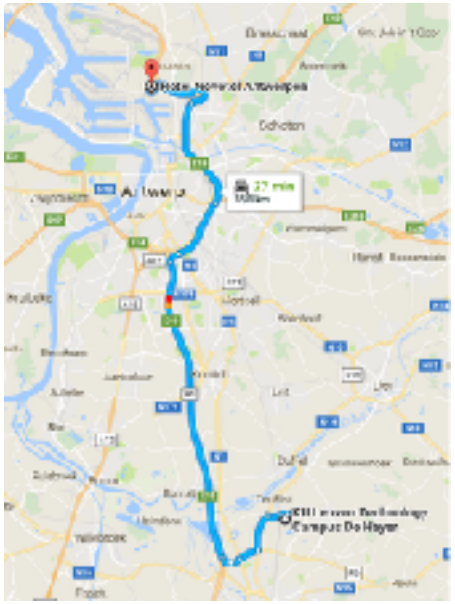
Analogue sensor



Transaction/communication log

t time (ms)	CPU time (ms)	DB req. time (ms)	VMC elapsed time (ms)	VMC CPU time (ms)	Load + Gen time (ms)	Memory used (kB)	Transfered Bytes	Phys. DB changes	Processing time (ms)	Load time (ms)	Generating time (s)	Roll (l+w) time (ms)
	0	0	0				0	0				
0	10359.210	9.619.146	0	0	17	170	377.096,6	122.518	10872.456	37	0	2.185
0	2.864.344	2.707.495	0	0	6	170	240087,5	45.452	1.979.598	6	0	350
0	393.172	172.451	0	0	7	1.909	70.825,0	1.087	3.436.857	7	0	241
0	545.281	121.485	0	0	3	981.658	485328,5	0	534.233	3	0	492
0	144.388	292.426	0	0	3	170	213817,1	6.632	134.734	3	0	215
0	203	4.135	0	0	1	1.770	46,7	0	202	1	0	0
0	656	572	0	0	0	581.826	157,2	0	1.073	0	0	757
0	16	0	0	0	0	909	0,0	0	2.924	0	0	0
0	0	0	0	0	0	909	0,0	0	2.912	0	0	0
0	266	1.175	0	0	0	23.953	285,1	0	191	0	0	0
1	16	5	0	0	0	11.935	31,3	0	25	0	0	96
1	30.813	77.731	0	0	5	855.092	582.341,1	0	26.416	5	0	1.121
0	16	0	0	0	0	11.839	0,0	0	11	0	0	0
0	203	31	0	0	1	8.130	648,3	1	286	1	0	0
0	0	0	0	0	0	1.744	1,4	1	37	0	0	0
0	0	0	0	0	0	1.761	0,0	0	2	0	0	0
0	0	0	0	0	0	1.761	0,0	0	1	0	0	0
0	0	0	0	0	0	1.761	0,0	0	2	0	0	0
0	0	0	0	0	0	1.761	0,0	0	1	0	0	0
0	16	0	0	0	0	364.004	0,0	0	30	0	0	461
0	0	5	0	0	0	1.764	0,0	0	2	0	0	0
0	0	0	0	0	0	1.761	0,0	0	1	0	0	0
0	63	0	0	0	0	1.764	0,0	0	74	0	0	0

Geospatial



KU LEUVEN

Algorithms

- Statistical (ARIMA)
- Hidden Markov Models, Dynamic Bayesian nets
- Deep learning
- Relational methods

Technology

- Open source:

  scikitlearn, R, Elasticstack, Tensorflow, …

- Amazon Web Services
- Microsoft Azure
- SAP HANA
- …

Tasks

- Forecasting

- Anomaly detection / prediction

- Pattern recognition

- Pattern discovery

Contents

Industrial safety

- E.g., in chemical industry
- Continuously monitor processes
- Detect / prevent problems *before* critical thresholds are reached
- → Anomaly prediction

(Sub-)Contractor management

- Historical data of performance of subcontractors
- Predict performance of contractor for new job
- Goal
  - Help select the best contractor
  - Monitor & potential problems *before* they occur
- → Forecasting & anomaly prediction

KU LEUVEN

Contents

KU LEUVEN

Conclusions

- Opportunity for KU Leuven
  Apply state-of-the-art methods to real-life case studies

- Opportunity for TenForce
  Extend products with innovative features

- Opportunity for you?
  - Stay informed of state-of-the-art
  - Broad dissemination events

joost.vennekens@kuleuven.be
http://www.eavise.be

KU LEUVEN