Eindhoven December 4, 2014

TU/e
Technische Universiteit Eindhoven
University of Technology

Where innovation starts
Waves: Visualizing spatio-temporal Soccer Data

Insight
Reports of sport events can be enhanced by real-time feature analysis.

Solutions
• Complex spatio-temporal sports-analytics algorithm that provides insights in the course of action during soccer games.
• Real-time model that visualizes important developments during sports events.

Impact
Infostrada Sports actually used Waves during the 2014 Soccer World Cup Championships.

MSc Marijn Grootjans
More insights
The Always-On Society connects

Connected devices

Providing connected Apps

Sensing and monitoring data

Extracting meaningful information

Enhancing the user experience

Connected Solutions
<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
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<tr>
<td>Body monitoring</td>
<td>Monitors non-intrusively biomarkers and body functions and feeds information.</td>
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<tr>
<td>Smart maintenance</td>
<td>Monitors performance remotely and enables long-distance control and maintenance.</td>
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<tr>
<td>Customer mapping</td>
<td>Analyses customer behavior and maps needs on potential business propositions.</td>
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<tr>
<td>Data security &amp; privacy</td>
<td>Investigates security and privacy issues related to the trade and use of data in a global setting.</td>
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<tr>
<td>City management</td>
<td>Enables adaptive outdoor lighting and supports urban service management and commissioning.</td>
</tr>
<tr>
<td>Home control</td>
<td>Monitors the habitation of buildings and/or homes and provides feedback on the use of resources.</td>
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Data Science is the next big thing

**Data science** seeks to use all relevant, often complex and hybrid data to effectively tell a story that can be easily understood by non-experts.

It does this by integrating techniques and theories from many fields, including statistics, data analytics engineering, pattern recognition, machine learning, online algorithms, visualization, security, uncertainty modeling, and high performance computing with the goal of extracting meaning from data and creating data products.
The Data Scientist is a new breed

- Too much data, too few analysts: in 2015 there is a need of 4.4 million analysts worldwide; only 25% can be met
- *Gartner, 2012*

- The “data scientist.” It’s a high-ranking professional with the training and curiosity to make discoveries in the world of big data - *D.J. Patil and Jeff Hammerbacher, 2008*

- “Data Governance is bound to become the trend” - *Bob Nieme, 2012*

- Simply hiring expensive data scientists isn’t enough; to create real business value with data scientists, top management must learn how to manage them effectively – *Sloan Management Review, fall 2014*
Data science will create new professions
It’s all about human capital

We need T-shaped people

Data scientist have knowledge and skills of

- **Engineering.** Develop ICT methods and tools to analyze, process, and visualize data intensive information
- **Governance and Business.** Develop procedures and processes to govern data handling and trading
- **Entrepreneurship.** Develop skills to create meaningful business solutions based on data processing.

The expertise is available in the Brainport region but needs to be profiled in a concerted action.
The business needs are confirmed by our Brainport partners

**Outcome Strategic Alignment Workshop, April 8th - 2014**

- We need hundreds of data scientists annually
- We need T-shaped people
- Set up a data science eco-system for us with a broad spectrum: high tech start ups, manufacturing industry, financial sector, consultancy, and publishers
- Connect us to what is happening in the world

The TU/e expertise is recognized but needs to be profiled more explicitly
We launched our Data Science Center

Launch Symposium
Turning Data into Value
Auditorium TU/e, Eindhoven
9:00-17:00, December 2nd, 2013
The DSC/e corporate story is straightforward

**Vision:** Data Science will become a new engineering discipline

**Proposition:** A multidisciplinary Academic Data Science Center

**Challenge:** Become world leading within 1000 days

**Right to Play:**
- Our world class set of competences
- Our capability of attraction (Inter)national talent
- Our lead playing position in the Brainport region

**Plan:** Combine and focus all our competence to drive education, research, and valorization in data science in a concerted action
There are five TU/e departments involved

- Department of Mathematics and Computer Science
- Department of Industrial Engineering & Innovation Sciences
- Department of Electrical Engineering
- Department of Industrial Design
- Department of the Built Environments
The DSC/e competences are manifold

- Probability and Statistics
- Process Mining
- Stochastic Networks
- Data Mining
- Visualization
- Data-Driven Innovation and Business
- Internet of Things
- Large-Scale Distributed Systems
- Data-Driven Operations Management
- Privacy, Security, Ethics, and Governance
- Human and Social Analytics
- Data-Intensive Algorithms
The competences cluster in three high-level groups:

- **Human and Social Analytics**
  - Probability and Statistics
  - Data Mining
  - Stochastic Networks
  - Process Mining
  - Visualization

- **Data-Driven Innovation and Business**
  - Privacy, Security, Ethics, and Governance
  - Data-Driven Operations Management
  - Data-Driven Innovation and Business

- **Data-Driven Operations Management**

**Context:** Why are we using data science, does it have the intended effect, and will people accept it?

**Analysis:** How to turn data into real value (models, answers/decisions, and visualization/insights)

**Enabling technologies:** How to get the data and deal with computational/infrastructural challenges

- Internet of Things
- Large-Scale Distributed Systems
- Data-Intensive Algorithms
The DSC/e has seven programs
The Data Science Flagship is a One-on-One PPP

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<td>De Bra (Math&amp;CS) &amp; Snijders (IE&amp;IS)</td>
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<td>2</td>
<td>Short-Term User-Centric Data Analytics</td>
<td>Snijders (IE&amp;IS) &amp; Van der Aalst (Math&amp;CS)</td>
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<td>3</td>
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<td>Linnartz (EE) &amp; Lakkien (Math&amp;CS)</td>
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The DSC/e online course Process Mining is truly successful

“Process mining is the missing link between model-based process analysis and data-oriented analysis techniques.”

• Massive Open Online Course (MOOC) “Process Mining: Data Science in Action”

• Started November 12th 2014 and has already attracted over 36,000 participants from 176 countries.

The course offers a novel perspective on data (big and small) and provides the tools necessary to start analyzing real behavior based on event data that can be found in any organization.

coursera.org/course/procmin
Progress in education is substantial

**Master Programs**
- Data Science track in Computer Science & Engineering Master’s in TU/e Graduate School
- EIT-ICT Data Science Master’s program (TU/e specialization in Process Mining in High Tech Systems, Healthcare, Visual Analytics, or Big Software)

**Life-long learning programs**
- Time Series Analysis and Forecasting  
  *March 6, 13, 20 – 2015*
- Data Mining and Business Analytics  
  *May 22, 29 – 2015 & June 5, 12 – 2015*
- Multivariate Data Analysis  
  *May / June - 2015; Final dates to be announced*
The DSC/e work plan 2014 has been completed

- 1. Setup Governance Structure
- 2. Develop DSC/e Business Plan
- 3. Identify Strategic Accounts
- 4. Describe Competence Base
- 5. Organize Lecture Series
- 6. Organize Summit
- 7. Develop Educational Plan
- 8. Develop Philips Flagship
- 9. Submit National Project Proposal
- 10. Submit European Project Proposal
- 11. Develop Brainport Ecosystem
- 12. Develop communication Strategy
- 13. Develop Professional Learning
Towards a new initiative
Brainport International School on Data Science

A joint TiU-TU/e initiative with the municipality Den Bosch and the Province Noord Brabant
Status: v1.0 November 15th, 2014
Brainport International School on Data Science: Three locations with four programs in Data Science
The work plan for 2015 sets demanding objectives

1. Grow the Data Science research program from 40 to 80 PhDs
2. Develop the Data Science bachelor and master programs
3. Develop a Professional Learning program in Data Science
4. Drive the development of the Data Science ecosystem in the Brainport region including ICT Labs
5. Advance the Brianport International School on Data Science
Have a nice day