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BRABANT - DATA SCIENCE IN ACTION



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A data analyst at work, at InnoSportLab in 's-Hertogenbosch.



CREATING THE MOST WANTED JOBS OF THE 21ST CENTURY

JADS Brabant: data scientists with added value

THE INTERNATIONAL BUSINESS COMMUNITY is hungry for data science specialists. The brand new Jheronimus Academy of Data Science (JADS) is a response to this growing international demand. And a vigorous one! Thanks to the combined strengths of two universities and the support of local authorities, JADS produces data scientists with unique competencies.

The demand for data scientists is large and growing. Recruiting site *Glassdoor* rated 'data scientist' as the best job in the United States in 2016 - not least because of the large number of vacancies. In Europe data scientists are also sought after. It was apparent in 2014 that the Netherlands would need no less than 10,000 data scientists by 2018, against an estimated supply of only 2,000 (Nationale Denktank). Data specialists are not only popular with technology companies - most other types of organisations also want them. Thus the early 2016 announcement by consulting firm PriceWaterhouseCoopers: that it wished to double its global staff of data scientists in two years - to 1,500. While the Dutch tax authority had mentioned a year earlier that it would need the same number of data analysts in the near future.

Data-driven developments

The high demand for data scientists is the

prime reason for the founding of the Jheronimus Academy of Data Science (JADS). One of the founding fathers is Emile Aarts, now rector of Tilburg University, previously Dean at the Eindhoven University of Technology and with a long track record in business. According to him the high demand for data scientists in businesses is easy to understand. "A company like BrandLoyalty, for example, operates in the retail industry, a sector that applies data in business modelling to an extreme degree. BrandLoyalty maintains customer purchasing-behaviour data. This data is used extensively by retailers in strategy development and campaign implementation. Or take the case of Philips Health Tech, a company deeply involved in developing a business model using medical data to ensure that treatment procedures are tailored entirely to individual patients' needs. While in the surroundings of 's-Hertogenbosch the agri and food sectors are experiencing major developments in precision farming. This entails careful monitoring of the soil via sensors, as a result of which the ultimate yield from cultivated products is increased by a factor of two to three. And these are all data-driven developments - for which data specialists are required."

T-shaped people

Today's data professional must be capable of more than 'just' technical data analysis,

BRABANT INTERNATIONALLY POPULAR AMONG DATA SCIENCE STUDENTS

Data science may be a young science, but Brabant already has an excellent track record in the field. Eindhoven University of Technology plays a leading role in The European Data Science Academy (EDSA). People from all over the world come to Brabant to study data science. Online education is also popular - internationally. As an example, over 85,000 students from 180 countries have registered for the course MOOC *Process Mining: Data science in Action*. Thanks to the recent collaboration of Tilburg University and Eindhoven University of Technology in the form of the Jheronimus Academy of Data Science (JADS), the popularity of Brabant among data-science enthusiasts will only increase further. JADS aims to accommodate between 1,500 and 2,000 data science students from around the world.





JADS 's-HERTOGENBOSCH

*Innovative education and entrepreneurship
in a classic entourage*



THE HISTORICAL ENVIRONMENT of the Mariënburg convent provides an ideal setting for the Jheronimus Academy of Data Science (JADS), 's-Hertogenbosch. Here, a new campus is being created especially dedicated to the study and practice of data science entrepreneurship. Mariënburg will become a breeding ground, where data science professionals, international visitors, professors, students, (starting) entrepreneurs and members of the JADS network will meet and exchange ideas.

When the last nuns left the Mariënburg convent in 's-Hertogenbosch in 2015, they had a wish. They wanted the building to retain its educational function. The

's-Hertogenbosch location of the Jheronimus Academy of Data Science (JADS), will fulfil that wish. In the intimate and dynamic environment of the Mariënburg convent MSc, PhD and PDEng students will meet a range of professionals engaged in data science. These professionals will not only be entrepreneurs, but also employees of various organisations and researchers. JADS is totally committed to data science and totally committed to collaboration with businesses. Arjan van den Born, scientific dean JADS 's-Hertogenbosch: "We really believe there is much to gain when students, scientists and small to medium-sized companies come together. Here in Mariënburg we offer the best possible environment, with very fast data connections, big databases and all the knowledge

and research power needed to fuel new ideas. JADS wants to be an incubator for startups and an accelerator for companies that are ready for the next steps in their development." The MSc programme will commence in September 2016, initially in one of the wings of the convent building. As of September 2017 the fully renovated main building will be open to students. It is expected that around 70 students will live on campus.

Perfect location

Ton Rombouts, mayor of 's-Hertogenbosch, is delighted to welcome the university to his city. "This initiative gives our city a younger and more international profile." The Jheronimus Bosch exhibition that ran until early May 2016 has, in his view,



demonstrated how the city can benefit from a stream of international visitors. Rombouts sees Mariënborg as the perfect location for the international Graduate School. "Both tourists and CNN journalists have commented on how easy it is to access our city from Dutch airports. The convent complex is within walking distance of our central station. And although it is in the middle of the city, it is a haven of peace. The convent gardens provide space for reflection and contemplation. You don't notice that you are in the middle of a beautiful, yet bustling, historic city centre. A wonderful place for students, researchers, (starting) entrepreneurs and other parties interested in data science."

Enterprising region

Mayor Rombouts expects that JADS will bring much to 's-Hertogenbosch. It will, according to him, fit in well with the robust ICT community in the immediate vicinity. "Our city is one of the leading ICT centres in the Netherlands and accommodates companies like SAP, Ricoh, Omron and Panasonic. We also offer a very fertile environment for ICT start-ups and scale-ups, which will be increasingly involved with data science. International companies interested in data science find Brabant to be fertile ground for collaboration and recruiting. Here they can immerse themselves in a family of universities and a strong ecosystem of data science businesses.



Arjan van den Born,
scientific dean JADS
's-Hertogenbosch

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- More information about JADS 's-Hertogenbosch business@jads.nl
- More information about the ICT community 's-Hertogenbosch m.vanderbroek@s-hertogenbosch.nl



Our province offers a good mix of leading tech players and young start-ups, together with top-class education and research.”

Socially responsible

Rombouts sees other benefits, in addition to economic ones. Data science can help in addressing social issues. According to him there are also opportunities for governments and public sector organisations to benefit more from this technology. “The police force and judicial authorities are interested in having research done by JADS. Our municipality will also make use of these opportunities,” he expects. It’s important to Rombouts that JADS curricula are also about people and planet. “JADS is not only concerned with commercial gain but

also with ethics and the regulation of data science. Students at Mariënborg are, for instance, encouraged to become socially responsible entrepreneurs.” In this, Mariënborg is dedicated to education and to the broader needs of society. Another aspect that will please the nuns.



Ton Rombouts, *mayor of 's-Hertogenbosch*

's-Hertogenbosch is one of the leading ICT centres in the Netherlands and accommodates companies like SAP, Ricoh, Omron and Panasonic. We also offer a very fertile environment for ICT start-ups, which will be increasingly involved with data science. For international companies interested in data science Brabant is fertile ground for collaboration and recruiting.

History

The building dates back to 1423. In that year Franciscan nuns established a convent here, also called Mariënborg. The so-called Walpoort, which dates back to that period, is still part of the current campus building. The current convent was built in 1896. It became the motherhouse of the Dutch province of the Roman Catholic Religious Congregation Society of Jesus, Maria, Josef, founded in 1822. The convent is famous for the number of primary schools it created for Catholic youth, especially girls, at the beginning of the last century. By 1922, the congregation – with 1,745 sisters – provided education to over 36,000 children.

Jheronimus Bosch

The Jheronimus Academy of Data Science is named after Jheronimus Bosch. This master painter was the most important Dutch painter of the Middle Ages. He is known as the innovator of the pictorial tradition. Bosch brought creative interpretation to established themes and introduced innovative compositions. In 2016 the exhibition, Jheronimus Bosch, visions of a genius, celebrated the 500th anniversary of his birth. The exhibition drew 421,700 visitors from all over the world.



DATA ANALYTICS FOR A BETTER WORLD

ALGORITHMS that make the World Food Programme more effective. Flood protection for the Netherlands using 'business analytics'. Tilburg University wants to use data analytics to achieve a better and safer world.

The United Nations World Food Programme helps people in crisis situations. One of the most important questions it faces is how the UN can help the maximum number of people within a given budget. In 2015 the UN approached Tilburg University with this challenge. A PhD student created a model involving all the variables. What kind of nutrition does a human being need every day - and how much? What are the applicable food prices and where should this food be sourced? What is required in terms of logistics - and at what cost? By using the results of these prescriptive analytics models the UN has considerably improved its World Food Programme in Syria, Iraq, Yemen and Ethiopia.

Man with a mission

Dick den Hertog is professor of Operations Research at Tilburg University. He is a man with a mission: "I want to improve our world using data analytics." He gives an example,

"The Netherlands has often been flooded. It is essential that the dykes are high enough to protect the Dutch population from rising water levels. However, the country has thousands of kilometres of dykes. So increasing their height is extremely expensive." The Dutch government asked Den Hertog to calculate the optimal balance between dyke heights, costs and safety. Numerous factors are involved in this. Tilburg University collaborated with many companies on the project. An example is Deltares, which was the lead in this project and provided all the data on costs and on the chances of flooding. Weather institute KNMI provided scenarios for climate change. This data enabled Den Hertog and his colleagues to calculate the optimum solution.

Cancer research

Research is also applied to more immediate, personal risks. Tilburg University is involved in cancer research, in collaboration with MAASTRO Clinic, Erasmus Medisch Centrum, and Harvard Medical School. Radiotherapy kills malignant cells, but must leave healthy cells unharmed. Large-scale optimisation models determine the best radiation treatment plan for a specific patient.



Dick den Hertog, *professor of Operations Research at Tilburg University*

The results of these calculations have helped the UN to considerably improve its World Food Programme in Syria, Iraq, Yemen and Ethiopia.





Optimisation of food baskets for refugees

Tazade refugee camp near Kalar city (North Iraq): here refugees receive food aid from the World Food Programme. Advanced analytics (such as optimisation) are used to make humanitarian operations like this more efficient and effective. Using software, the WFP's officers are improving the design of food baskets, sourcing plans, and delivery networks in several of its biggest operations. The optimisation of Syria's food basket, for example, has resulted in significant cost savings, without affecting the nutritional value for beneficiaries.

INFORMATION VISUALISATION BRINGS DATA TO LIFE

EVERY ORGANISATION generates and collects vast amounts of data every day. The answers to questions like, 'How do I make my product innovative?' or even, 'How can we address societal issues?' are hidden in this data. Information visualisation can help in understanding the data and in bringing it to life and unlock its hidden potential. The results of the work of the Eindhoven University of Technology (TU/e) Visualization Research group are used by companies and organizations all over the world.

Information visualisation is 'the use of computer-supported, interactive, visual representations of abstract data to amplify cognition'. Jack van Wijk, full professor in visualisation at the TU/e: "Data comes in different forms: tables and networks - but also as text and images. However, it is almost impossible to analyse vast amounts of data by, for instance, just looking at pages and pages of numbers. The human brain is better at processing images than vast amounts of numbers. With information visualisation we transform data into images, to provide

people with better insight. We don't ask them, 'What kind of image would you like?' We try to define their problem. Then we create an interactive, visualisation solution."

Flagship project

Van Wijk's research group has worked on many different topics for various companies and organisations. In a flagship project, run by TU/e together with Philips, the research group works on visualisation of workflow data that will contribute to more effective and efficient treatment of patients in hospitals. Other examples include visualisation of vessel traffic off the Dutch coast, use of medicine by epilepsy patients and phone calls in the Ivory Coast.

2.5 billion phone calls visualized

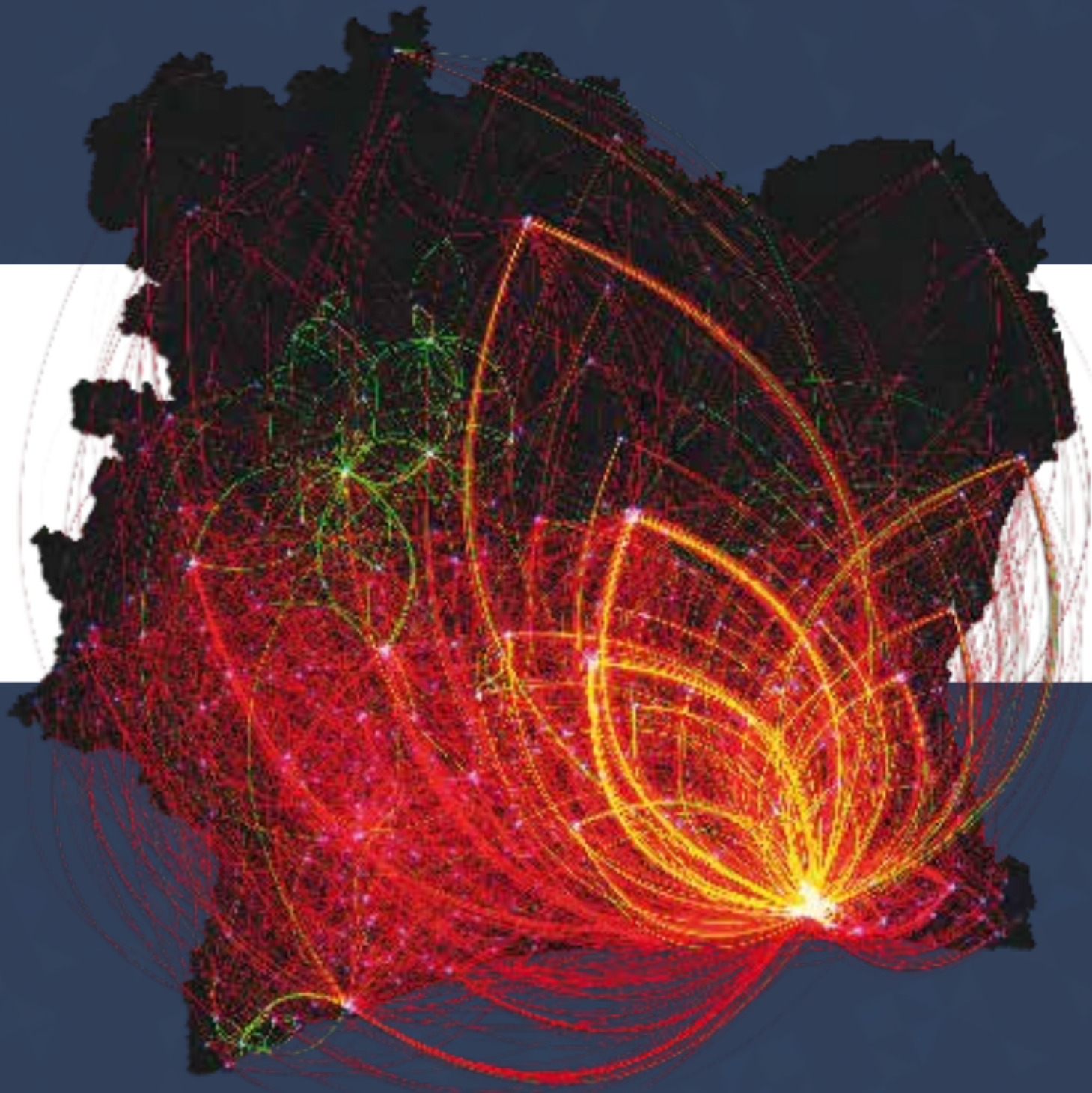
Stef van den Elzen, former PhD student at TU/e, is now visualisation architect at the successful TU/e spin-off company, Synerscope. He has visualised 2.5 billion phone calls in Ivory Coast, West Africa, in response to a data challenge by the telecom company Orange, the Massachusetts Institute of Technology and the United Nations. Using

a smart combination of analysis and visualisation he connected changes in telephone communications to social events.

In the near future, such visual analysis could perhaps be used to predict major social changes. Van Wijk: "For me, information visualisation is the most fun profession in the world. I can help solve real-world problems, all with their own challenges, using a mix of computer science, math, psychology, design and art."

The research group works together with Philips on visualisation of workflow data that will contribute to more effective and efficient treatment of patients in hospitals.





Phone calls in Ivory Coast

The map of Ivory Coast, West Africa. The colourful lines represent millions of phone calls that took place on one day in 2012. Each line is a communication channel between 2 telephone poles for mobile telephone services. A green line shows that there are more telephone calls on one day than the day before. A red line shows that there is less communication. Yellow lines appear when red and green lines overlap; when telephone poles are situated too close to each other. These kinds of visualisations can be used to show the effect of certain social events (fights, conflicts) on communication between people.





Brabant - data science in action

Brabant has brains. It distinguishes itself as a home to innovative businesses and by providing advanced research and teaching on technological and social issues. Not surprisingly, the region is also home to many of data science's elite. The huge demand for even more data science specialists stimulated Brabant's businesses, educational institutions and local authorities to join forces - in the tradition of innovation through good collaboration. This resulted in the Jheronimus Academy of Data Science (JADS). Founding fathers are Eindhoven University of Technology, Tilburg University, the province of North Brabant and the municipality of 's-Hertogenbosch. Many companies have joined this initiative. JADS is a unique concept for anyone interested in data science. It has three locations, Eindhoven, Tilburg and 's-Hertogenbosch, where data science can be studied, researched and applied. On offer here are bachelor and graduate programs, post-master PDEng and PhD education, data science centres and innovation programs with corporate partners. Brabant has created a new knowledge infrastructure. A one-stop shop for anyone interested in the leading technology of the 21st century.