Target Field Lab

• The public-private project in the Netherlands for the development of data driven applications
• Provides state-of-the-art expertise and infrastructure
• Supports and hosts small and medium-sized enterprises and public organizations
• Collaborates with research institutions and IT companies

Target focuses on these domains:

- Sensor networks
- Open science
- Video mining
- Virtual reality
- Text mining
- Time series analyses
- Data tracing
- Object detection
- 360-degree visualizations
- Facts and fakes

Corporate Story

The Target Field Lab assists and facilitates the design, implementation and qualification of modern Big Data systems.

Edwin A. Valentijn, Target Field Lab Coordinator

And then comes the Target Field Lab

It was around the year 2000 when OmegaCEN, the astronomical research group of the Kapteyn Astronomical Institute of the University of Groningen (UG), started designing and building advanced information systems for handling large volumes of astronomical imaging data. Seven years later, our research group already anticipated that it would only be a matter of time before the Big Data avalanche slid down and engulfed not only astronomical and other scientific research, but also society matters and business enterprises.

Therefore, in 2009 we decided to start our Target organization. With a multi-disciplinary approach, Target was a collaboration between the Kapteyn Astronomical Institute, the Centre for Information Technology (CIT) and the Artificial Intelligence department of the UG. Target partners also included the biobank for health research Lifelines, ASTRON (who operates LOFAR, the largest radio telescope in the world which observes at the lowest frequencies possible from the Earth), IBM, Oracle and several small and medium enterprises (SMEs), like Target Holding B.V. which we founded.

The project was very successful and delivered many Distributed Data Federations, both in The Netherlands and Europe. At the same time it triggered many new investments and jobs. It also delivered an expertise centre with the know-how to initiate new Big Data projects for science and SME’s.

The Target project prospered until, in 2017, we established the Target Field Lab. This enterprise further deploys our expertise and hardware infrastructure to help SMEs and public research projects in developing their products. The Target Field Lab assists and facilitates the design, implementation and qualification of modern Big Data systems. The Target Field Lab invests in Big Data hardware at the CIT and in a 360-degree full dome imaging theatre: the DOTLiveplanetarium. In the Field Lab we develop new data platforms:

- 360 degree imaging with Horus VR Experience B.V.
- sensor data (e.g. ESA Near Earth Objects)
- advanced data tracing (e.g. Fact and Fakes)

Currently, we work with launching customers, SMEs, the 360-degree theatre DOTLiveplanetarium, ImagineRun, Deep Atlas (both in Groningen), the European Space Agency (ESA) and the scientific publishing company Elsevier. We welcome new customers and our eventual goal is to establish the Target Field Lab as a self-supporting unit.

And then there is the Target Field Lab! It’s fun - Join us!
About Target Field Lab

In a global, technology-driven and data-saturated world, understanding how to effectively manage and turn Big Data into organized information holds the key to the next big advances across science disciplines, industry sectors and daily life.

In the Target Field Lab the goal is to enable SMEs and other companies to design, develop and qualify innovative data-driven products. This is possible thanks to the collaboration between the highly experienced research groups of the University of Groningen (Computer Science, Artificial Intelligence and Astronomy) and the competence of two companies (Horus VR Experience and Target Holding) which make use of outstanding infrastructure and facilities.

Every day we read about the power of data and the opportunities presented by new algorithms, data science and artificial intelligence. But for many companies this is not their core business. They don’t have the expertise nor the facilities to enter this new world and explore these new opportunities. Thanks to the Target Field Lab this can change! This brochure describes the services we offer and the way we work.

Currently we focus on:

- Video Data (especially 360-degree video)
- Text Data
- Sensor Data

Our approach is data-driven but the way we work is very pragmatic. We started by several launching customer projects within these data domains. We start with a product idea with a basic business model and as the next step we do a proof of technology, which means: “Are we able to build a simple solution”? Then we make a real proof of concept which we use in a first pilot with a real customer. There we learn what is still needed for entering the market. At that point our work is over and it is up to the entrepreneur to continue it.

A key component in the Field Lab is the Big Data Layer. This in turn consists of a generic layer which interfaces to the database and data storage systems. On top of the generic layer sit domain specific layers, on top of which applications can be speedily built.

In this brochure we will describe our current work, but we are always open to new ideas and concepts.

The Target Field Lab can help you create data-driven products and services using the latest data science technologies and computing facilities. Our mission is to enable entrepreneurs to accelerate the development and testing of new data-driven services using the Mining Big Data Field Lab – an innovation cluster pooling business ideas, data-science, IT expertise and facilities.

Video on the internet continues to expand explosively, with the use of video on mobile devices doubling every year. Moreover, video is rich in information: contains images, sound, metadata and movement. In spite of that, the mining of video data is in its infancy and rich rewards await those who can exploit it.

(Rees Williams, Field Lab Scientific Project Manager)
Text Mining – Facts and Fakes

Validating textual data and detecting the facts from fakes is an emerging challenge in the contemporary age of information – whether starting from social media, news media or scientific publications. Exploiting state-of-the-art deep learning algorithms and combining them with database architectures, we map unstructured text into a structured format. We subsequently check and extract factual information. Our expertise in natural language processing and fact-checking varies from sentiment analysis and handwriting recognition to automated question-answering and textual quality assessment.

Video Mining – Object Detection

With object recognition and classification we are able to analyse video and to automatically detect the objects that are in the video and to analyse these objects. This can be used in a broad range of applications. For example to inspect objects and then select those objects which need maintenance, to analyse videos and select those fragments which are of special interest or to create 3D models out of video data. There is a great range of specialized neural networks available in this field. We can train them and if needed add functionality.

Sensor Networks – Time Series Analyses

New network techniques like 5G enable the development of the Internet Of Things, where every device is connected to the Internet, transmitting data about its environment or communicating about the services that are delivered. A lot of this data is available for additional services and it is also relatively cheap to add sensors to devices to enable them to collect data. To collect the data from sensors you need specialized queuing systems and databases. For the interpretation of the data often time series analysis is used. But there are a lot of other methods depending on the use case. Application fields are: predictive maintenance, steering of installations and production, monitoring the environment, digital twins, and so on.

Open Science – Data Tracing

Under the framework of the Open Science initiative, we provide platforms to aid scientists and scientific publishers in publishing scientific data that is Findable, Accessible, Interoperable and Reproducible (FAIR). There is a particular emphasis on ‘reproducibility’ in order to identify potential fraud by track tracing. This validation of the scientific data is done by means of machine learning and database technology, enabling us to go back to the source of the data product – a technique known as ‘backwards chaining’.

Virtual Reality – 360-degree Visualizations

Seeing is believing and Virtual Reality (VR) takes that a step further. With VR you do not only see what you get but you can also interact with it. Science is all about data and how to visualise and interpret it. Big Data visualisation in particular can help you analyze the data and can help you interact with it. VR is also used in architecture and product design for buildings and landscapes. Furthermore, with a 360-degree video camera it is possible to transmit live streaming events, which can then also be material for subsequent video mining.

Domains

- Text Mining – Facts and Fakes
- Video Mining – Object Detection
- Sensor Networks – Time Series Analyses
- Open Science – Data Tracing
- Virtual Reality – 360-degree Visualizations
OmegaCEN, Kapteyn Astronomical Institute

OmegaCEN is the expertise centre for astronomical data science and information technology at the Kapteyn Astronomical Institute of the University of Groningen. It pools its human expertise (~15 people team), its WISE software technology and its hardware park at the University of Groningen Computing Centre in many data-intensive astronomical research projects. These include both ESO instruments (e.g. the MUSE integral field unit spectrograph at the Very Large Telescope, the OmegaCAM imager at the VLT Survey Telescope and the MICADO near-infrared imager and spectrograph at the Extremely Large Telescope) and ESA projects.

The team has extensive experience in designing, building and operating advanced survey data-handling systems for astronomical instruments. In addition they exploit their expertise to design and develop other Big Data archives, including access via the Big Data layer and search systems to efficiently extract meaningful information from them.

OmegaCEN’s role in the Target Field Lab project is to lead the Big Data layer, contribute to 3D visualization and to ‘Facts and Fakes’. OmegaCEN sees the Target Field Lab project as a challenge to further develop data science by means of valorization in industrial applications.

Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence

The mission of the Bernoulli Institute is to perform outstanding academic research and teaching in Mathematics, Computer Science, and Artificial Intelligence. The institute aims to maintain international leadership herein; to foster these disciplines as a living body of knowledge, and to make it relevant to society in its broadest sense.

The symbiosis between pure and applied science, and between mono and multidisciplinary research and teaching, is a distinguishing characteristic of our institute. As an important part of this mission we aim to transfer our results to other areas of science and technology, and initiate and expand inter- and multi-disciplinary research collaborations.

In the Field Lab the institute develops expertise on several fields: Computing Science, Visualisation, Image Processing, Neuroimaging and Artificial Intelligence. The research groups we work with are specialized in fields like Text Mining, Astronomical Visualisation, Medical Imaging and Computer Vision.

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The Target Field Lab consortium is formed by a unique collaboration between leading IT researchers of the University of Groningen (UG) – from Computer Science, Artificial Intelligence and Astronomy – and two companies in the North of the Netherlands.

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Donald Smits Center for Information Technology

The Center for Information Technology (CIT) at the University of Groningen is a leading national and European institute in the field of information technology. CIT supports and facilitates scientific research and university teaching with Data and IT solutions.

Our mission: education and research, supported by innovative and reliable IT.

In the research field the CIT has an outstanding track record as a data science center which enables researchers to collect, transform and interpret their data. The CIT has the expertise and the facilities to work with big data sets. It has three data centers in Groningen and several teams of specialists ready to help you.

Data science is about discovering hidden patterns in data. Whereas IT infrastructure and applications make it possible to collect large quantities of data, it is the data scientist who can convert this into valuable information. We use a combination of skills applied to the fields of statistics, artificial intelligence, machine learning, computer science and more.

Seeing is believing. Our Visualisation and VR team is able to make data come to life with beautiful visuals and 3D models. We even can make these models interactive so you can use it to design objects or manipulate (work) with your data.

Geo Services works with technological innovation in the field of applications of spatial information technology (data, software, visualisation). Multidisciplinary specialists in the field of spatial computing and Geographic Information Systems (GIS) support you with customized software, analytics and visualisations.

CIT’s High Performance Computer Team manages the infrastructure on which our applications run. They are also specialized in the design of special purpose infrastructure to tackle a certain problem with optimized cost effective infrastructure that beats the common clouds.

Within the Field Lab the CIT delivers the infrastructure and expertise to use it and to develop applications. CIT also hosts the Netherlands National Science Datcenter for the Euclid satellite to be launched in 2022. The Euclid information system is one of the most advanced distributed systems, serving over 200 institutes over Europe, and builds on the Target technology.
The Field Lab opens up the computer and visualisation facilities of the University of Groningen.

Currently available resources:

- The large scale Data Handling Facility, which currently has a capacity of 3,000 TBytes (3 PetaBytes) of data on a lustre file system and 20 application servers;
- The Peregrine computer cluster, which currently has almost 6,000 cores;
- The Merlin cluster, providing flexible virtual machines and storage using Openstack;
- An Oracle database Real Application Cluster with a capacity of 150 TBytes on solid state drives. Oracle is one of the leading multinational corporations for computer technology, developing enterprise software and hardware solutions;
- A large capacity tape backup facility using IBM’s Tivoli Storage Management;
- Access to the 250-seater Virtual Reality dome theatre in DOT-DOT liveplanetarium (3D);
- A portable 3D system is available for very large audiences, on-site presentations;
- Data-archiving systems using a choice of iRODS or dCache;
- Alternatives to Oracle for database management systems, such as PostgreSQL.

The Target Field Lab consortium is a unique collaboration between leading IT researchers of the University of Groningen - from Computer Science, Artificial Intelligence and Astronomy - and several companies in the North of the Netherlands.
The Expertise Centre

Innovation is never done alone. The creation of a new product is hard work, you will need the right partners with the right expertise. This is often done with multi-disciplinary teams where each discipline needs to understand some of the basics of the other disciplines.

It takes time to create this understanding and to come to a shared vocabulary and vision. Then the role of each partner is clear and creativity and synergy grow.

In the Target Field Lab we are used to working this way thanks to our corporate history and the experience we have. We combine the expertise from science with that of entrepreneurs. Our experts come from different higher education disciplines like computer science, international business, astronomy, artificial intelligence, geo-spatial sciences and economics.

The most important science areas from information technology are present: Computer Science, Astronomy and Artificial Intelligence. Astronomy is the science area which is all about collecting large amounts of data with all kinds of sensors, structuring this data, storing it in distributed databases and then making it available for scientific study with appropriate tools.

The Target Field Lab has a pragmatic culture, aimed at building solutions and maintaining them and our SME partners have a track record of successful creations of innovative products and know how to make a valid business case. These are the capabilities needed to enter new markets.

Our core expertise is the design, implementation, and operations of complex information systems. We have built extensive systems and platforms. Our user can either use these, or we can help in designing and implementing custom made systems. Most of our software is open source. For the processing of large amounts of data we are able to design special purpose clusters tailored both to the needs of a data pipeline and to the way the data is processed. These platforms can outperform standard cloud platforms in performance and cost. Our work methods are based on Agile principles and co-creation.

Geo Data

Technological innovation in the field of spatial information technology (data, software, visualization) is growing. Multidisciplinary specialists in the field of spatial computing and Geographic Information Systems (GIS) can support customers with software, analytics and visualisations.

This can answers questions about our environment in fields where the combination of spatial data with other data gives new insights. For example municipalities and water authorities need insight into the effects of climate change and cost effective measures to mitigate these effects, preferably at the street or even house level.

Facts & Fakes

There is a huge amount of text data from the Internet or other sources. With Natural Language Processing techniques text can be analysed. We focus on the topic of Facts and Fakes.

The aim? To trace information to the source, to create tools which help to analyse the origin of facts and to filter out the fakes. The reliability of data and the way data is used to produce new facts is extremely important. For doing this, we use a combination of database technology and machine learning which is called: ‘deep data tracing’.
Solutions Offered

The ‘Big Data Layer’ of the Field Lab has common access layers which make it easy to use. There are access layers for video data, text data and sensor data. It combines smart data modeling and machine learning for the interpretation and processing of data. It uses open source software and can be tuned for special purposes to outperform common clouds. This platform is available for product development and testing. There are common access layers for video, text and sensor data.

An example of the use of this platform is one of our launching customer projects about indexing 360-degree videos. The videos are uploaded and then each 360-degree image of the video is sliced in 8 images. With image recognition tools, objects or scenes in the image are recognized and metadata describing the video is added to a database. The original is transformed to an internet ready form and made available on a website together with the metadata. With the help of the metadata, you can now search through the video and play those scenes you are looking for.

For data management, we work with the Integrated Rule-Oriented Data System (iRODS). iRODS is an open source data management system used by research, commercial and governmental organizations worldwide. iRODS is released as a production-level distribution aimed at deployment in mission-critical environments. It virtualizes data storage resources, so users can take control of their data, regardless of where or on what device the data is stored.

iRods offers:
- Data Visualization
- Data Discovery
- Workflow Automation
- Secure Collaboration

For data visualization, OpenSpace is available in the Reality Center of CIT, in DOTliveplanetarium and on your desktop. OpenSpace brings the latest techniques from data visualization research to the general public. OpenSpace supports interactive presentations of dynamic data, from observations, simulations, space mission planning and operations. OpenSpace works on multiple operating systems, with an extensible architecture, powering high-resolution tiled displays and planetarium domes. It makes use of the latest graphics card technologies for rapid data throughput. In addition, OpenSpace enables simultaneous connections across the globe, creating opportunity for shared experiences among audiences worldwide.

Our VR-viewer is able to read in data from several standard design tools like autocad. These designs are then available for real-time analyses in our Reality Center. The design is also made interactive. With a group of designers you can review and alter the design in real-time. Many successful projects in the field of architectural and landscape visualization have been carried out in this way.

For the production of 360 degree video movies, we can use existing material or record events with 360 degree cameras. Images from data visualizations can be added or can be created from 3D virtual reality models. The result can be viewed with a VR headset in the Reality Center or you can organise an event in DOTliveplanetarium.

Our core expertise is the software development of VR and other applications, and the design of specialized computing platforms.

We are also available for consultancy, business development and contract research. We like to be challenged!
DOTliveplanetarium in Groningen as a 360-degree venue allows research and knowledge dissemination thanks to various events.

The European Southern Observatory is an intergovernmental research organisation for ground-based astronomy. ESO has provided astronomers with state-of-the-art research facilities and access to the southern sky. Its observatories are located in northern Chile.

ImagineRUN is a free eRoutes App that allows you to discover walking and running routes of your desired distance from your location.

The European Space Agency is an intergovernmental organisation dedicated to the exploration of space. ESA’s space flight programme includes the launch and operation of uncrewed exploration missions to other planets and the Moon; Earth observation and science and telecommunication.

Elsevier is a Dutch publishing and analytics company specializing in scientific, technical, and medical content.

Deep Atlas is a consultancy firm with a strong focus on clay science and services to the oil and gas industries. Deep Atlas offers specialised geological knowledge to companies in the Netherlands and abroad.
Our Events

It is our core mission to spread knowledge of innovative mining big data technologies, to serve our customer’s needs and reinforce the scientific, economic and social growth of the North of the Netherlands.

To put into contact our experts with private and public parties, we organize regular public events where we actively participate with keynote talks, presentations and conference posters on the services and products we offer. Most of our events take place in one of the Target Field Lab infrastructures, opened in 2014, the DOTliveplanetarium.

DOTliveplanetarium is a spectacular 250-seater Virtual Reality dome theatre used to visualize data and encourage further research; this dome offers the great advantage of offering a very intuitive, interactive and highly immersive experience, which is exceptionally helpful in conveying complex scientific content and visualizing different kinds of data.

Some of the events which took place last year are:

- National and international conferences: The Second Information Universe (IU) and IVOA 2019
- Networking events: Tech Talks, The Power of VR, Let’s GRO, VR Meet-Ups
- VR events
- Seminars open to the public
- Public lectures
- Open day events

These events help to settle the contact with local SME’s and to demonstrate the possibilities to handle Big Data also in a small enterprise environment.

If you are interested in: participating at our events, getting in contact with our experts and sharing knowledge and ideas, please follow us on the social media (see below) or visit our website www.rug.nl/target or just scan the QR code in the back page of the brochure. In the section News&Events you will find all details.

Explore. Try. Use. Events that give back. Be our guest.
We are here for you

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Images:
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Target Field Lab is supported by the University of Groningen (UG), Target Holding B.V. and Horus VR Experience B.V. with the financial contribution of Samenwerkingsverband Noord Nederland (SNN), the European Regional Development Fund (ERDF) and the Dutch Ministry of Economic Affairs and Climate Policy (EZK).