

Versie 2022.01

Embedded Software for complex high-tech machines meet our community

*We invite you to meet our
community and discover
our success story!*

Brabant is the leading IT & Data Science province in the Netherlands and famous for a long tradition in creating innovative products and highly complex machines. Hardware and software have gone hand in hand in Brabant for many years, and from that tradition, enormous experience has been gained in complex embedded software development. Today, the region is home to the complete IT & Data Science supply chain. In addition, companies can rely on a top knowledge infrastructure including specialized embedded systems institutes and software companies.

BRABANT
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Embedded software for complex High-Tech machines

```
server_mod.use =  
mirror_mod.use_y =  
mirror_mod.use_z =  
elif_operation == "MI"  
mirror_mod.use_x =  
mirror_mod.use_y =  
mirror_mod.use_z =  
  
#selection at the  
mirror_ob.select=1  
modifier_ob.select=1  
bpy.context.scene.objs  
print("Selected" + str
```

TODAY

The Brainport region has been at the heart of machine-building in the Netherlands for decades and is a global leader. If there is one region in the world where they know how to build software to control a high-tech machine, then it is Brabant. And the exact same principle applies to developing embedded software.

The machine building companies in Brabant have a great deal of knowledge in embedded software available in-house. Examples include ASML's lithography machines, Philips' medical devices, NXP's chips that used for autonomous driving, and Thermo Fisher Scientific's electron microscopes.

They all underscore the facts that hardware and software are closely associated in Brainport Eindhoven. But these companies do not have to develop the solutions themselves, and they can also rely on a top knowledge infrastructure that includes institutes like the Eindhoven University of Technology, JADS, TNO-ESI, and software companies like Sioux, Dassault Systemes, The Mathworks, DVC Machinevision, and Process Gold.

Funfact: Since 2009, Eindhoven is home to the Embedded Systems Eindhoven Foundation. The members of the foundation get together in their spare time to robotics, electronics and microcontroller projects. They also host lectures and small events.

TU/e EINDHOVEN
UNIVERSITY OF
TECHNOLOGY

HIGH TECH CAMPUS
EINDHOVEN

PHILIPS
Healthcare

SIoux TECHNOLOGIES

JADS Jheronimus
Academy of Data Science

ASML

ADVANTECH

NXP

ThermoFisher
SCIENTIFIC

ESI
An initiative of industry, academia and TNO

DASSAULT
SYSTEMES

MathWorks

Why Brabant excels in Embedded software for complex high-tech machines?

INDUSTRY BASED ECOSYSTEM



The **Brabant HTSM cluster** can invent, design, engineer, assemble, manufacture, commercialize, install, and maintain any machine, integrated and/or cyberphysical system and also houses the whole spectrum of HTSM suppliers in the region.

HIGHLY-DEVELOPED CLUSTERS AND CAMPUSES



What sets Brabant apart are the various **innovation clusters and field labs** around specific themes. These public-private testing grounds are hotspots for co-creation and speed up innovation.

TOP RESEARCH



Brabant is home to highly specialized research institutes such as the **Eindhoven Artificial Intelligence Systems Institute**. Within the institutes you will find more than 1000 researchers that are specialized in AI & Data.

LEADING COMPANIES IN EMBEDDED SOFTWARE TECHNOLOGIES



Within the Brabant region, more than 500 organizations develop and apply AI solutions. Examples of these organizations are: ASML, Philips, Atos, Dassault Systems, Altran Engineering, TMC and Siemens Industry Software.

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Our Ecosystem

World Class Research

Within a radius of 150 km around Brabant, there are 27 universities in three countries: a total of 605,340 students, 255,680 of which in the field of nature, health or technology. These are the leading research institutes for IT & Data Science technologies.



WORLD CLASS RESEARCH

1. **University of Technology (Eindhoven)** is a research university specializing in engineering science & technology. The university has a master of embedded systems and also a research group who is specialized in Embedded systems/software development.
2. **Fontys University of Applied Sciences (Eindhoven)** offers High Tech Systems & Materials programs. Fontys has also established a research group for High-tech Embedded Software, where students and teachers work together on the topic.
3. **TNO-ESI (Eindhoven)** is an open and diverse innovation research center for embedded software with strong partnerships with industry-leading high-tech companies.
4. **JADS (Den Bosch)** offers data science bachelor and master programs, PDEng education, professional education and help organizations shape their data driven future. The Health sector is a Priority Industry to JADS.
5. **EAISI (Eindhoven Artificial Intelligence Systems Institute)** is an AI research institute with a dedicated unit focusing on “ai for the industry”.

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Our Ecosystem

Leading companies

Brabant accounts for almost 10,500 IT & Data Science companies and 12.1% of all jobs of the total sector in the Netherlands. These are the leading companies in the field of Smart Health and Artificial Intelligence.



Den Bosch



PHILIPS
altran



SIEMENS
Atos

ADVANTECH



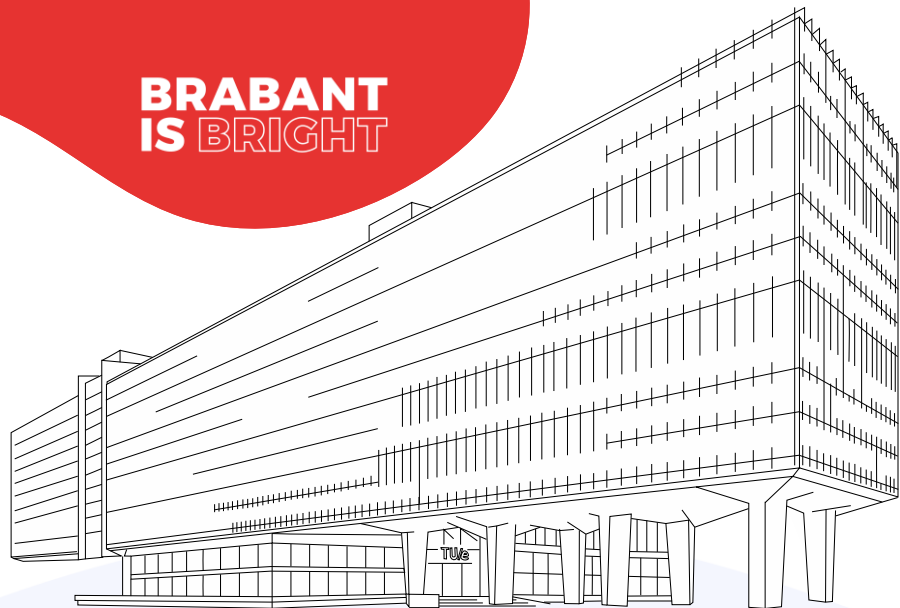
Eindhoven



LEADING COMPANIES

1. **Philips** in Eindhoven has an embedded software department that creates several Embedded software solutions to maximize the performance of devices.
2. **Altran** designs, develops, analyzes and integrates semiconductors, boards, software to create new & renewed electrical/electronic products. Altran is highly specialized in Embedded software development.
3. **Sioux Technology** specializes in embedded software for high-tech systems, developing and constructing complex high-tech products and production systems.
4. **Siemens industry Software** delivers embedded software solutions that enable device manufacturers to quickly design and build high quality connected devices across a wide range of industries.
5. **Atos**: Atos is an information technology service and consulting company. It specializes in hi-tech transactional services, unified communications, cloud, big data and cybersecurity services. The company is also highly specialized in Embedded software.
6. **Advantech**: is a leading company in IoT intelligent systems, Industry 4.0, machine automation, embedding computing and embedded systems. Advantech Embedded Software provides different solutions to ensure your IoT security, including backup cloud solutions, embedded BIOS, OS, API Library, and integrated service platforms in WISE-PaaS Marketplace.
7. **Dassault Systemes** is a software company that specializes in 3D product design, simulation and product lifecycle management (PLM) software.

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Eindhoven University of Technology in numbers

SCIENTIFIC PUBLICATIONS

3,000

PHD-AWARDS

140

PATENTS EVERY YEAR

40

IT GRADUATES 2020

499

NEW IT STUDENTS 2020

840

BACHELOR COLLEGE WITH
15 DIFFERENT MAJORS

MASTER PROGRAMS IN THE FIELDS OF:

- ARTIFICIAL INTELLIGENCE
- ENGINEERING & HEALTH
- HUMANS & TECHNOLOGY
- SMART CITIES
- SMART MOBILITY
- SUSTAINABLE ENERGY
- DATA SCIENCE
- ROBOTICS
- HIGH TECH SYSTEMS
- INTEGRATED PHOTONICS

Key University

Technical University of Eindhoven

One of the focus areas of the University is Embedded Systems / Embedded Software.



OBJECTIVES

The TU/e has been active in the field of artificial intelligence for decades. Using its traditional strengths in systems engineering and close ties with industry, the TU/e aims to leverage the huge potential of AI to real-world applications in industrial engineering systems.

The Master of Science program in Embedded Systems at the TU/e is illustrative of this active role, as it is a co-production of these two departments, awaiting students with a background in computer science, as well as graduates from the field of electrical engineering.



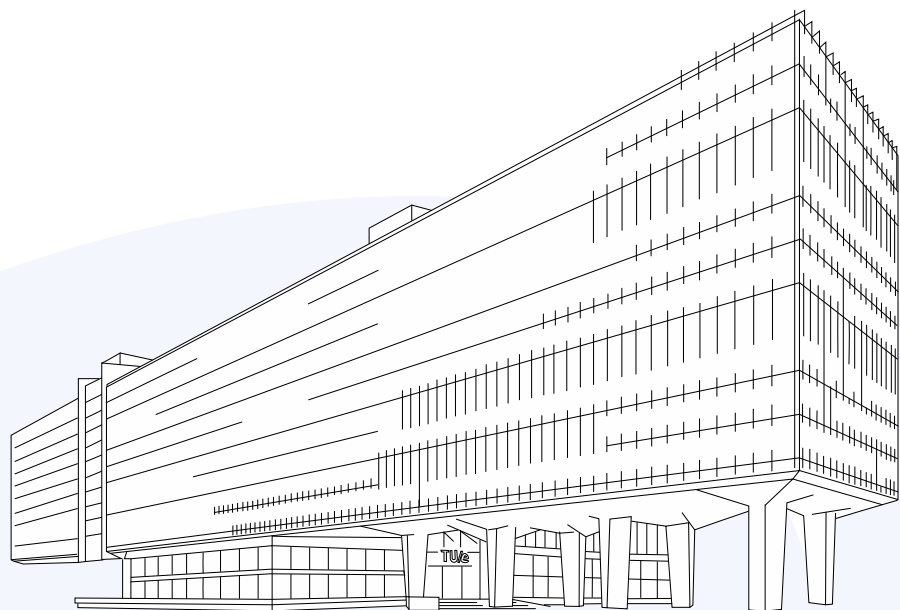
MAIN RESEARCH FOCUS

The Embedded Systems program focuses on the design of efficient and reliable systems. To be able to compose dependable protocols for the behavior of such systems, you need knowledge of algorithms, performance, hardware, methods of design and documentation, and an insight into the variability and maintainability of these protocols.



4TU FEDERATION

The Embedded Systems program at the TU/e is offered in close collaboration with **Delft University of Technology (TUD)** and the **University of Twente (UT)** in the context of the **4TU federation**.



Key Research Institute at TU/e

EASI Institute

World class Research: The Eindhoven Artificial Intelligence Systems Institute (EASI) is the new institute of Eindhoven University of Technology in the field of artificial intelligence (AI).



OBJECTIVES

The Eindhoven AI Systems Institute combines all TU/e Artificial Intelligence activities. Top researchers from various research groups work together to create new and exciting AI methodologies and applications with a direct impact on the real world. TU/e has been active in the field of AI for many years, which gives the new institute an excellent starting position to build upon.



COLLABORATION WITH INDUSTRY

Building on the traditionally close ties of TU/e with industry, EASI is partnering with a number of leading companies and organizations, both at a regional, national and European level. These include among others: ASML Philips Healthcare, NXP Brainport Eindhoven AI NL Coalition 4TU.Federation EuroTech.



FOCUS AREAS

1 High Tech Systems and Robotics

- Guaranteed machine performance
- Autonomous machine operation and smart human-operator support
- Multi-agent robotics
- Predictive maintenance

2 Health

- Improved diagnostics
- Personalized and wearable health systems
- Better understanding of personal health states
- Preventive health management.

3 Mobility

- Vision and Sensor capabilities for autonomous driving
- Data analytics for effective transportation systems and distributed traffic management
- Advanced Driver Assistance Systems

Key Research Institutes

High Tech Systems Center

HTSC of Eindhoven University of Technology groups its research activities in the domain of complex high tech mechatronic systems into a one top level research center.



FUNDAMENTAL RESEARCH

At the TU/e High Tech Systems Center (HTSC), fundamental research and design around new concepts and prototypes takes place while focusing on the needs of the industry. Using systems design paradigms forms a central part of the program and challenges within HTSC.



FOCUS AREAS

The seven focus areas of HTSC are innovative and will continue to develop complex engineering: Robotics, Digital Engineering, Industrial Internet of Things, Scientific Instrumentation and Metrology, Optomechatronics, Artificial Intelligence and Contamination Control.



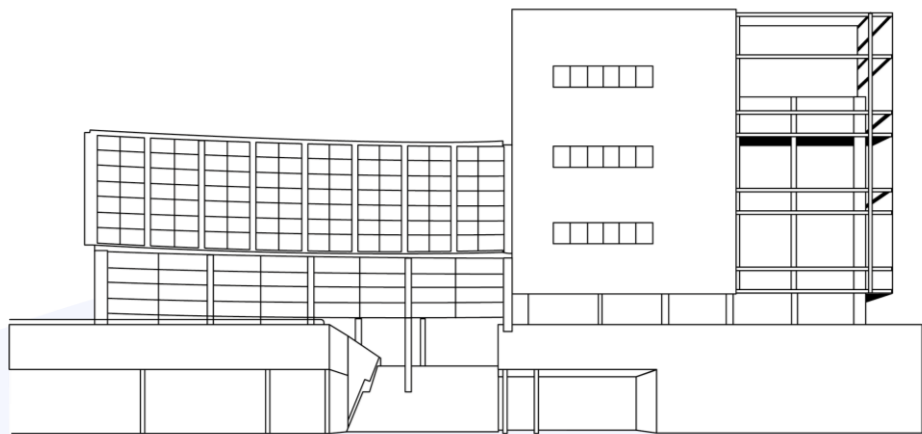
FOUR DEPARTMENTS

By combining the expertise from four departments: Mechanical Engineering, Electrical Engineering, Mathematics and Computer Sciences and Applied Physics, the HTSC addresses the complexity problem of future high tech systems design in a multi-disciplinary way, with strong emphasis on System Engineering. The High Tech Systems Center performs fundamental research and design of new concepts and prototypes, and understands the needs of the industry.



CURRENTLY HTSM HAS MORE THAN:

150 T-shaped engineers, of which 80% PhD students and 20% PDEng trainees, working on projects related to our center's focus.



Fontys facts and figures

STUDENTS

44,230

INTERNATIONAL STUDENTS

5,200

GRADUATES A YEAR

7,697

BACHELOR'S, MASTER'S,
AND OTHER COURSES

477

IT RELATED RESEARCH GROUPS

8

IT RELATED RESEARCH CENTERS

4

IT GRADUATES 2020

578

NEW IT STUDENTS 2020

1,135

Key University

Fontys University of Applied Sciences

Fontys is the largest university of applied sciences in the southern Netherlands.

Education and research at Fontys are directly in line with the current and future demands and needs of students, the professional arena, and (regional) society. Relevant Research Groups: **High Tech Embedded Software & Distributed Sensor Systems.**



FONTYS CENTRE OF EXPERTISE HTSM

The Fontys Centre of Expertise High-tech Systems and Materials (HTSM) connects higher education to the business community. Together, they carry out research and develop innovative technologies. The center is home to the research group: **High-tech Embedded Software**



HIGH TECH EMBEDDED SOFTWARE FOCUS

The department focuses on two areas of application – mobile robots and sensor networks. These systems are examined from a systems perspective, with four system aspects identified, being architecture, integration and testing, modeling and learning, and software quality

State-of-the-art facilities

High Tech Campus Eindhoven

Often recognized as the smartest square km in Europe, the **HTCE campus** is built around an ecosystem of 235 companies with a range of application fields. Home to over 12,000 innovators, researchers, engineers that create the technologies and business of tomorrow.



OBJECTIVES

High Tech Campus is Eindhoven, the smartest km² in Europe is an ecosystem of 235 high tech companies. It's home to more than 12,000 innovators, researchers and engineers. Each company at High Tech Campus Eindhoven shares a common goal: developing new technologies and applications that help solve social problems and challenges, and successfully bringing these to the market.



KEY CHARACTERISTICS

- 42% of all patent applications in the NL come from the Campus
- >85 nationalities
- AI innovation Centre
- 12,500 Smart People
- Total 350,000 m²
- 25,000 sqm R&D facilities
- 1 billion private R&D
- Top 7 incubator for start-ups



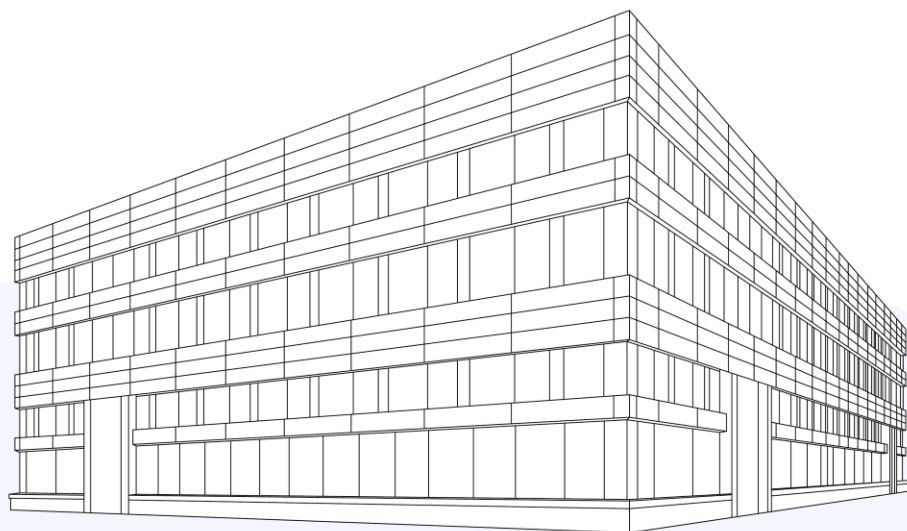
LEADING COMPANIES

- Multinationals such as Philips Healthcare, Teleledyne Dalsa, NXP and Intel
- Research institutes like the Holst Centre, Philips Research and Innovation lab
- Scale ups and startups like Usono, Lifesense Group, Bambibelt, GTX medical and Sirius Medical



APPLICATION AREAS

HTCE is a global hotspot in the areas of Health & Vitality, Sustainability, Applied Intelligence, Smart Environments & Connectivity and Software & Platforms.



Key Research Institute

Embedded Systems Innovation by TNO

TNO-ESI is a research institute that focuses on design and engineering of high-tech embedded systems. Its extensive research programme aims to advance high-tech industry in improving lead-time and effectiveness of their product innovation process, as well as the functionality and quality of their products.



FOCUS

- System Architecting
- System Dependability
- System Evolvability
- Exploiting Systems context
- System performance



THEMES

- Digital twin
- Diagnostics
- Software legacy
- Reflexion
- Enable-S3

In the TNO-ESI research programme, multi-disciplinary teams of experts of renowned (multi)national high-tech enterprises, SMEs, and leading academic research groups work together on the latest technologies and innovations.

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Artemis Industry Association

Advanced Research & Technology for Embedded Intelligent Systems

ARTEMIS Industry Association is the association for actors in Embedded Intelligent Systems within Europe. As private partner, the association represents its members - industry, SMEs, universities and research institutes - in ECSEL Joint Undertaking.



FOCUS AREAS

- Embedded & Cyber Physical System
- Internet of Things
- Digital Platforms



APPLICATION AREAS

- Health & Well-Being
- Digital industry
- Transport & Smart Mobility
- Digital Life
- Energy

ARTEMIS
Industry Association

State-of-the-art facilities

Brainport Industries Campus

The most innovative and successful companies and institutions in the Brainport region come together as one on the **Brainport Industries Campus**.



HIGH TECH MANUFACTURING

Brainport Industries Campus is the place to be for far-reaching partnerships between suppliers, specialist companies and innovative education and knowledge institutes. This is where the next generation of professionals in the hightech manufacturing industry is trained in a state-of-the-art working and learning environment.



COOPERATION

Brainport Industries Campus is the very first location where high tech suppliers innovate and manufacture together, where the most successful companies share high-quality facilities, such as cleanrooms, flexible production areas, warehouses, and other advanced facilities, and where they present themselves as a unified force that they can showcase to their national and international customers.



KEY FIGURES

- Over 35 companies
- 2,000 high level staff
- 1,500 students
- Surface 105,000 m²
- 6,000 m² of shared facilities
- 6,000 m² of shared warehousing



Key R&D Cluster at BIC

High Tech Software Cluster

The High Tech Software Cluster is an alliance of over 30 innovative software companies, research organizations and educational institutions that support you in making the digitization of your business affordable and practical.

Main focus: software for the 4th industrial revolution



FOCUS TECHNOLOGIES

- Virtual Prototyping and Design
- Artificial intelligence and Machine Learning
- Big Data Analytics and Data Services
- Industrial Internet of Things
- Industrial 5G and Wireless Communication
- Model-based Software Engineering



SOFTWARE COMPETENCE CENTER

At the HTSc Software Competence Center companies can find out about the competences, products, services and knowledge that HTSc members can provide and you can experience at first hand the software technologies that you can use to innovate in and with software.

Showcase

Fieldlab Flexible Manufacturing

In the Flexible Manufacturing field lab, more than 20 companies and knowledge institutes work together to demonstrate the opportunities that automation and robotization offer for the flexible and high-quality execution of small series production at mass-production costs.



ONE OF THE EIGHT FOCUS AREAS IS

Self learning

The aim of self-learning assembly lines is to realize a production system in which widely varying products with a high complexity can be assembled flawlessly.



EXAMPLES OF USE CASES

1. Active Cockpit automatically retrieves data (sensor info, tasks) from the assembly process and displays it in a dashboard
2. Demonstrator to test and further optimize machine learning assembly
3. Video assistance and image capturing, for analyzing and optimizing task speed and accuracy



“It’s all about cooperation and synergy. Nowadays, it’s not about the winning company, but about the winning supply chain.”

EDWIN VAN DE WEELE