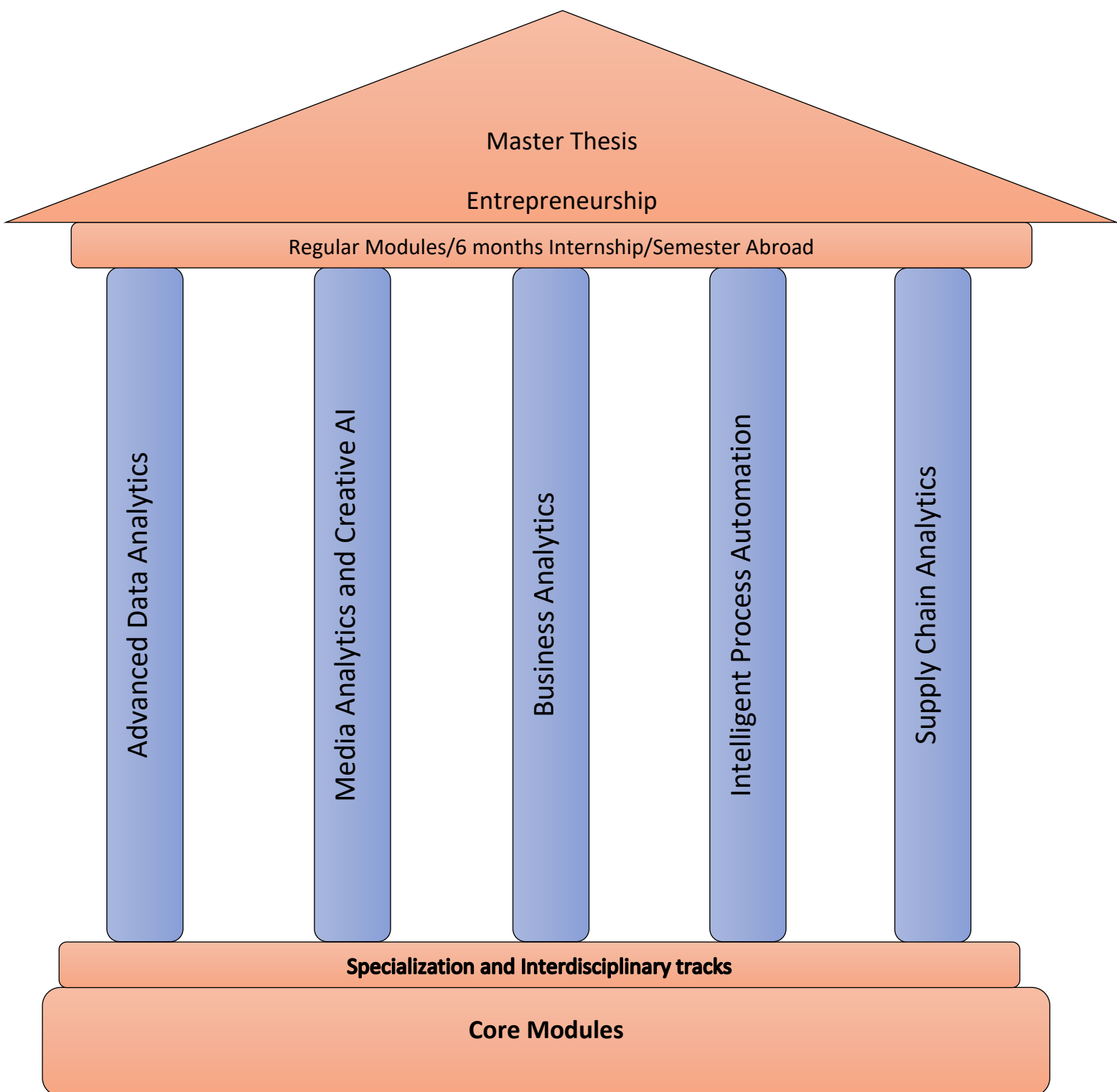## CONTENT OF YOUR STUDIES

In the Master's program in Applied Data Science & Artificial Intelligence, you will acquire in-depth knowledge and an understanding of the entire data science process. You will learn how to apply mathematical, statistical, analytical, and machine learning/deep learning techniques to gain insights from large and often unstructured data sets. You will also acquire technical expertise, analytical skills, and business acumen needed to drive innovation in AI, data science, and big data analytics.

With a strong industry focus, the program blends machine learning, data engineering, natural language processing, generative AI, cloud computing, and ethical AI principles with real-world applications across diverse domains.

Students gain hands-on experience working with large-scale datasets, machine learning models, and AI-driven solutions while developing strategic problem-solving abilities through case studies, research projects, and industry collaborations. By offering specialized tracks, the program enables students to tailor their expertise to sectors such as supply chain analytics, business analytics, media analytics & creative AI, and life sciences analytics.

The curriculum is designed to be practical, industry-aligned, and future-focused, ensuring graduates are prepared for high-impact roles in data science, AI development, business intelligence, and research. With a combination of technical courses, hands-on workshops, global learning opportunities, and professional certifications, students are equipped with the skills necessary to thrive in today's data-driven world.

Master Thesis

Entrepreneurship

Regular Modules/6 months Internship/Semester Abroad

Advanced Data Analytics

Media Analytics and Creative AI

Business Analytics

Intelligent Process Automation

Supply Chain Analytics

Specialization and Interdisciplinary tracks

Core Modules

Your modules

Key features of the program include:

- Comprehensive training in data management, machine learning, deep learning, NLP, computer vision, and responsible AI.
- **Core Modules (Campus Heidelberg, Hamburg, Fürth, Munich)**
  - 📊 Data Management – Learn how to efficiently store, organize, and process large datasets using SQL, NoSQL, and cloud storage solutions (AWS, Google Cloud, Azure).
  - Data Engineering – Master ETL (Extract, Transform, Load), data pipelines, and distributed computing with Apache Spark, Hadoop, and Kafka.
  - 📝 Natural Language Processing (NLP) – Explore text analytics, sentiment analysis, chatbots, and language models using Transformer models (BERT, GPT), SpaCy, and NLTK.
  - 🧠 Deep Learning – Gain expertise in neural networks, reinforcement learning, and AI applications with TensorFlow and PyTorch.
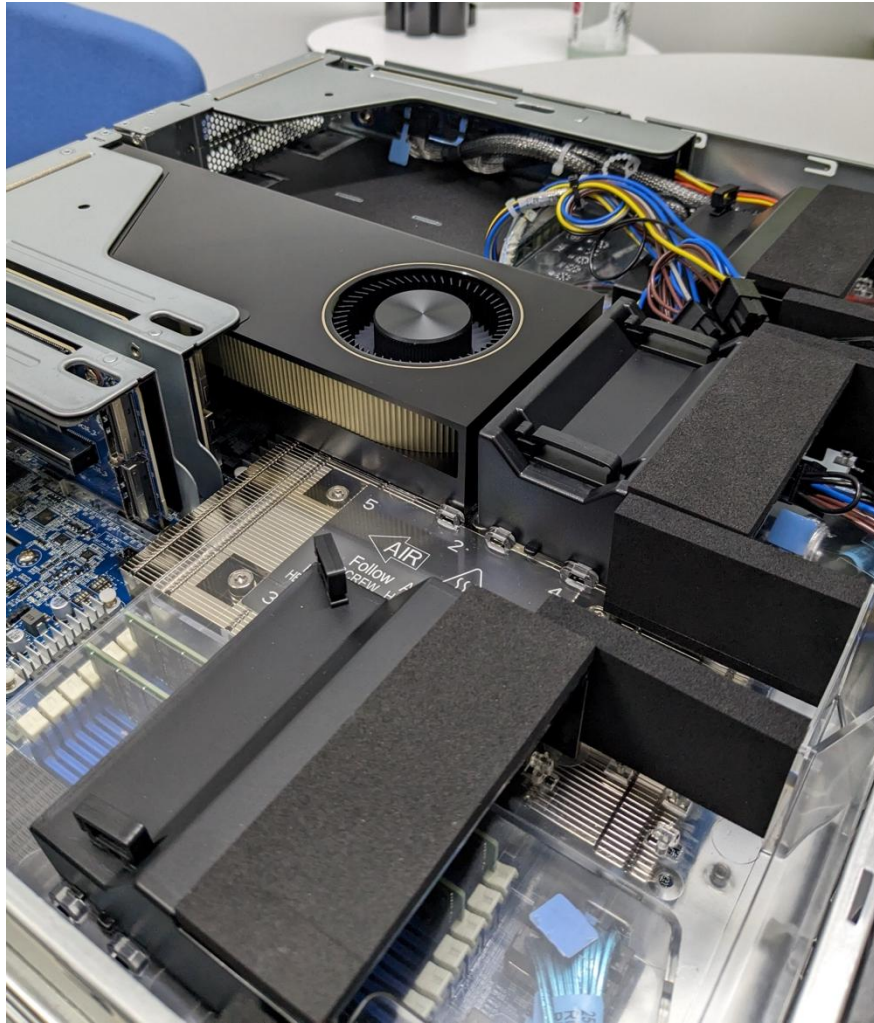 - 👁 Computer Vision – Work with image processing, facial recognition, and object detection using OpenCV, CNNs, and GANs.
  - 🤖 Responsible AI & Ethics – Understand AI bias, fairness, and ethical considerations in building trustworthy AI systems.
  - 📈 Statistics & Machine Learning – Master supervised and unsupervised learning, regression, classification, clustering, and statistical modeling with Scikit-learn and R.
  - Design Thinking for Data Science – Apply human-centered design approaches to develop innovative and impactful AI-driven solutions.
- **Specialization tracks - Advanced-Data Analytics (Campus Heidelberg)**
  - 📊 Data Visualization & Storytelling – Transform complex data into clear, impactful insights using Tableau, Power BI, and Matplotlib.
  - 🖼 Computer Vision – Work with image recognition, object detection, and facial recognition using OpenCV, CNNs, and GANs.
  - 📈 Time Series Analysis – Master forecasting and trend analysis techniques for financial markets, demand prediction, and sensor data.
  - 🎯 Recommendation Engines – Develop personalized AI-driven recommendation systems for e-commerce, media, and online platforms.

- o 🧠 Reinforcement Learning & Agentic AI – Explore autonomous decision-making, multi-agent systems, and AI-powered automation using Deep Q-Networks (DQN) and Proximal Policy Optimization (PPO).
- o 🚀 Entrepreneurship & Innovation – Learn how to apply data science and AI to business ventures, develop AI-driven startups, and understand product-market fit, funding, and business strategy.
- **Industry-relevant interdisciplinary tracks.**
  - o **Media Analytics & Creative AI – Understanding Trends & AI-Driven Content Creation (Campus Heidelberg)**
    - Work with natural language processing (NLP), recommender systems, and sentiment analysis.
    - Explore AI-generated content (text, images, videos), automated journalism, and deep learning applications in media and entertainment.
    - Analyze consumer engagement, digital marketing trends, and media consumption patterns.
  - o **Supply Chain Analytics – Optimizing Global Logistics & Operations (Campus Hamburg)**
    - Learn how AI, machine learning, and big data enhance demand forecasting
    - Explore inventory management and logistics optimization.
    - Gain expertise in predictive analytics, route optimization, and supply chain risk analytics.
  - o **Business Analytics – Data-Driven Strategy for Competitive Advantage (Campus Fürth)**
    - Develop quantitative and qualitative analysis skills to support strategic decision-making in business environments.
    - Master tools like Tableau, Power BI, and Python for financial modeling, market analysis, and customer segmentation.
    - Collaborate with companies on real-world business intelligence and predictive analytics projects.
  - o **Intelligence Process Automation - Automation of complex business processes (Campus Fürth)**
    - Design, implement, and manage automated systems that enhance operational efficiency.
    - Tools for analyzing and optimizing business workflows
    - Change management and digital innovation strategies
  - o **Life Sciences and Bioinformatics – AI & Data Science in Healthcare and Biotech (Campus Munich)**
    - Learn how AI, machine learning, and big data transform biomedical research, personalized medicine, and pharmaceutical analytics.
    - Work with healthcare datasets, clinical trial analytics, and genomics research.
    - Develop expertise in biostatistics, predictive healthcare models, and medical image analysis.

With a strong emphasis on innovation, interdisciplinary learning, and ethical AI, this program prepares graduates to become leaders in data science and analytics, capable of solving complex challenges and shaping the future of AI-driven industries.

Infrastructure

- Cloud services provide scalable and on-demand computing resources for data science applications. They include **computing power**, **storage**, **databases**, **networking**, and **AI/ML tools** from AWS, Azure, and Google Cloud providers. These services enable efficient **big data processing**, **real-time analytics**, and **machine learning model deployment**.
- A **data center with 8 NVIDIA RTX A6000 GPUs** is a powerful computing setup designed for high-performance tasks such as **machine learning (ML), deep learning (DL), data analytics, and scientific simulations**. These GPUs provide **parallel processing capabilities**, significantly accelerating computations compared to traditional CPUs.
- A **100 Gbit/s dark fiber connection** to Frankfurt provides a **high-speed, low-latency**, and **dedicated** optical fiber link for **data centers, enterprises, and research institutions** requiring ultra-fast data transfer.

Program Highlights

Real-world case studies

- Real-World Case Studies with Industrial Partners in collaboration with leading global companies, AI startups, and research institutions. Students apply data science and AI solutions to real-world business challenges in fields such as finance, healthcare, logistics, and media and solve complex industry problems using big data analytics, machine learning, and cloud computing, guided by mentors from top organizations.

Workshops

- Our program offers **hands-on workshops** covering **soft skills, Scrum, conflict management, and strategic communication** to enhance professional and leadership capabilities.

Hackathon

- Our program features **hackathons** that challenge students to solve **real-world data science and AI problems** in a **collaborative, fast-paced environment**.

Guest Lectures

- **Guest lectures** by **leading industry and academia experts provide** students with **firsthand insights into emerging trends in AI, data science, and cloud technologies**.

Blended-Intensive Programs

- Our **Blended Intensive Program (BIP)** combines **online learning with in-person sessions**, offering students a **flexible and immersive educational experience**. This approach integrates **virtual coursework, interactive workshops, and short-term on-site training**, ensuring both **theoretical knowledge and practical application**. BIP fosters **international collaboration**, enabling students to work on **real-world projects** with peers and experts from diverse backgrounds

Semester Abroad/6- months Internship

- Our program offers a **semester abroad** opportunity, allowing students to gain **international exposure** at leading universities and research institutions.

Scrum Training

- Our program includes **Scrum training**, equipping students with **Agile project management skills** essential for **collaborative and efficient workflows**. Students learn **Scrum principles, roles (Scrum Master, Product Owner, Development Team), sprint planning, and backlog management**

Technologies Used

Our program equips students with **cutting-edge technologies** used in **data science, AI, and cloud computing**, ensuring they are industry-ready.

Certifications

- Our program offers the **SAS Viya Analytics Certificate**, providing students with expertise in **cloud-based analytics, AI, and machine learning**. This certification covers **data preparation, model building, advanced statistical analysis, and AI-driven decision-making** using the **SAS Viya platform**. For more information, https://www.sas.com/en_ca/home.html

- Our program offers students the opportunity to earn the **NVIDIA Certificate in Fundamentals of Deep Learning**, equipping them with **industry-recognized expertise in AI and neural networks**. This certification covers **deep learning fundamentals, model training, optimization techniques, and deployment on GPUs**, using **TensorFlow, PyTorch, and NVIDIA CUDA**. It provides hands-on experience with **real-world AI applications**, enhancing career prospects in **machine learning, AI research, and cloud computing**. For more information, https://learn.nvidia.com/courses/course-detail?course_id=course-v1:DLI+C-FX-01+V3

Academic Collaboration

DataCamp, a leading platform for **interactive data science and AI learning**, to provide students with **industry-relevant training** in **Python, R, SQL, machine learning, cloud computing, and big data analytics**. Through this collaboration, students gain **access to hands-on courses, real-world projects, and certifications**, ensuring they develop **practical skills** aligned with industry needs. This partnership enhances **self-paced learning, career readiness, and continuous professional development** in **data science and AI. (**https://www.datacamp.com/**)**

Tableau for Teaching – Data Visualization & Analytics

Our program integrates Tableau (https://www.tableau.com/academic/teaching) , a leading data visualization and business intelligence tool, to enhance students' skills in data storytelling, dashboard creation, and analytics. Students learn to analyze complex datasets, create interactive visualizations, and derive actionable insights for real-world decision-making. With hands-on training in Tableau Desktop and Tableau Public, they develop expertise in exploratory data analysis, reporting, and business intelligence, preparing them for careers in data science, analytics, and consulting. 🚀

Career Opportunities

With a Master of Science in Applied Data Science and Artificial Intelligence and a qualification at all levels of data science, you will have the best opportunities in all sectors, including the manufacturing industry, banks, insurance companies, the IT sector, consulting, public or industrial research institutes, the healthcare sector and at colleges and universities.

Graduates from previous years now work at ABB, Heidelberg Cement, Airbus, Accenture, Adidas, Audi, Bosch, BMW, BASF, Deloitte, Deutsche Börse, DKFZ, PWC, SAP and Verivox, as well as successful medium-sized companies. Our program also qualifies you for a public sector position, research work, and doctoral programs.

Possible fields of work:

— **Diverse Roles**: Data Scientist, ML Engineer, Business Intelligence Analyst, Data Engineer, Consultant, Operations Analyst, Market Research Analyst
— **Industry Applications**: technology, content generation, healthcare, e-commerce, and manufacturing, automotive etc

- Data Scientist
- Data Analyst
- Data Engineer
- Data Architect
- Machine Learning Engineer
- Data Steward
- Business Intelligence Analyst
- NLP Engineer/Language Model Expert
- Quantitative Analyst
- AI Consultant
- Data Warehouse Architect
- Cloud Data Engineer