Bachelor of Science in Data Science (4 Years, 240 ECTS)

A modern data science program covering statistics, machine learning, data engineering, and responsible AI, with project-based learning across real datasets and industry-style workflows.

Program Overview

- **Award:** B.Sc. in Data Science
- **Duration:** 8 Semesters (4 academic years)
- **Total Credits:** 240 ECTS
- **Delivery:** Lectures (L), Tutorials (T), Computing Labs (CL), Studio/Project (S), Internship (I)
- **Workload:** 1 ECTS ≈ 25–30 hours
- **Program Pillars:** Programming (Python/R) • Statistics & Probability • Machine Learning • Data Engineering (SQL, Pipelines) • Visualization & Storytelling • Cloud & MLOps Fundamentals • Ethics, Privacy & Governance • Domain Applications • Experimentation & Causal Thinking
- **Signature Experiences:** end-to-end capstone deployment, secure data sandbox exercises, and an industry internship.

Graduate Learning Outcomes

Graduates will be able to:

1. **Data Foundations.** Apply probability, statistics, and linear algebra to analyze data and uncertainty.
2. **Programming.** Develop clean, testable code for data ingestion, analysis, and modeling.
3. **Machine Learning.** Train, evaluate, and tune predictive models while preventing leakage and overfitting.
4. **Data Engineering.** Build reliable pipelines, use databases effectively, and manage data quality.
5. **Responsible AI.** Identify bias, protect privacy, and communicate limitations and risks of data products.
6. **Communication.** Create clear narratives using visualizations, reports, and stakeholder presentations.
7. **Product Mindset.** Translate ambiguous business questions into measurable metrics and experiments.

8 **Deployment.** Package models and analytics as reproducible services or dashboards with monitoring basics.

Curriculum Structure

Structured across 8 semesters (30 ECTS each). Most courses are 6 ECTS unless otherwise noted.

Year 1

Semester 1 (30 ECTS)

- Programming I (Python for Data) - 6 ECTS
- Calculus for Data Science - 6 ECTS
- Linear Algebra for ML - 6 ECTS
- Data Literacy & Visualization - 6 ECTS
- Scientific Writing & Communication - 6 ECTS

Semester 2 (30 ECTS)

- Programming II (Data Structures) - 6 ECTS
- Probability & Random Processes - 6 ECTS
- Statistics I (Inference) - 6 ECTS
- SQL & Relational Databases - 6 ECTS
- Data Ethics, Privacy & Security - 6 ECTS

Year 2

Semester 3 (30 ECTS)

- Machine Learning I - 6 ECTS
- Statistics II (Regression) - 6 ECTS
- Data Engineering I (Pipelines) - 6 ECTS
- Experiment Design & A/B Testing - 6 ECTS
- Technical Elective I - 6 ECTS

Semester 4 (30 ECTS)

- Machine Learning II (Tree Methods & Ensembles) - 6 ECTS
- Time Series & Forecasting - 6 ECTS
- Data Engineering II (Distributed Systems) - 6 ECTS
- Data Visualization Studio - 6 ECTS
- Technical Elective II - 6 ECTS

Year 3

Semester 5 (30 ECTS)

- Deep Learning Fundamentals - 6 ECTS
- Natural Language Processing - 6 ECTS
- Causal Inference - 6 ECTS
- MLOps Fundamentals (CI/CD & Monitoring) - 6 ECTS
- Technical Elective III - 6 ECTS

Semester 6 (30 ECTS)

- Big Data Analytics (Spark/Distributed) - 6 ECTS
- Recommender Systems - 6 ECTS
- Model Interpretability & Debugging - 6 ECTS
- Technical Elective IV - 6 ECTS
- Industry Internship - 6 ECTS

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Year 4

Semester 7 (30 ECTS)	• Cloud Data Platforms - 6 ECTS • Privacy-Preserving Analytics - 6 ECTS • Advanced ML (Generative & Self-Supervised) - 6 ECTS • Technical Elective V - 6 ECTS • Capstone I (Scoping & Data Acquisition) - 6 ECTS
Semester 8 (30 ECTS)	• Capstone II (Build, Evaluate & Deploy) - 12 ECTS • Responsible AI Governance - 6 ECTS • Product Analytics & Metrics - 6 ECTS • Advanced Seminar & Presentation - 6 ECTS

Technical Elective Tracks

Choose at least 5 electives; focus on one track for specialization.

Track A — AI & Machine Learning

- Advanced Deep Learning
- Computer Vision
- Representation Learning
- Generative Modeling

Track B — Data Engineering

- Data Warehousing
- Streaming Systems
- Data Quality & Observability
- Infrastructure as Code

Track C — Business & Product Analytics

- Customer Analytics
- Pricing & Revenue

- Marketing Attribution
- Decision Intelligence

Track D — Health & Public Data

- Clinical Data Science
- Epidemiological Modeling
- Fairness in Health AI
- Geospatial Health Analytics

Facilities & Learning Resources

Data Studio

Collaborative workspace for team projects, code review, and stakeholder-style demos.

Compute & Cloud Credits

Access to GPU resources and managed cloud environments for capstone-scale workloads.

Secure Data Sandbox

Controlled environment for privacy-sensitive datasets and governance exercises.

Career & Portfolio Support

Workshops for GitHub portfolios, technical interviews, and communication with non-technical audiences.

Capstone Project Examples

- **Churn Prediction with Interventions**
  Build a churn model and design an experiment plan for retention actions.
- **Real-Time Fraud Detection**
  Develop a streaming pipeline and anomaly detection model with alerting metrics.
- **Climate Risk Dashboard**
  Combine open climate data with socioeconomic indicators to visualize risk by region.
- **Healthcare Readmission Modeling**
  Train interpretable models and assess fairness across demographic groups.