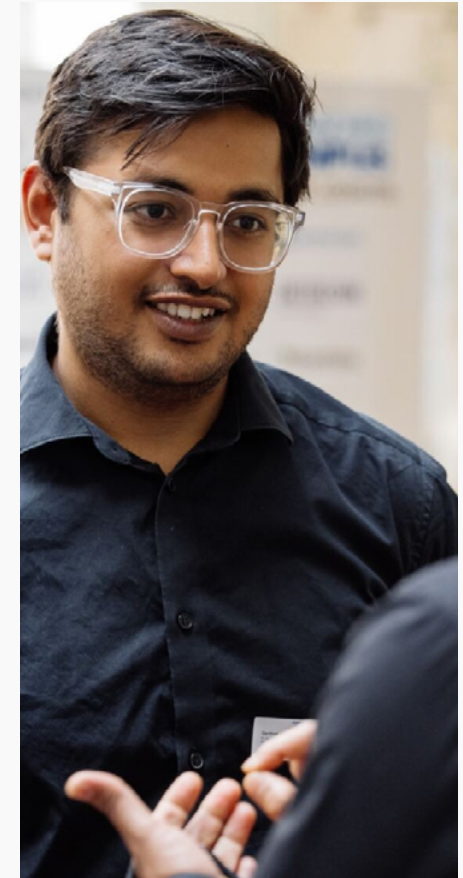


| INFO PAPER

# M.Sc. Data Analytics & Decision Science

Let's explore the bottom of things





## QUOTE

**“This unique combination of Data Science and Operations Research in one program is highly sought after by the industry.”**

– Prof. Dr. Michael Schneider, Academic Director

## | INTRODUCTION

# Become a Data Expert with Multiple Options

Learn how to generate true value from data and enhance your professional profile with essential management skills. By knowing how to apply the right set of methods from the fields of Data Analytics and Decision Science to any situation, you will become a real problem solver. Be it as a coding superstar, a mediator between tech and management, or even in a leadership position, with this degree, nothing will be stopping you from building your career.

## What's in it for You?

Essentials | **35 CP**

Application Areas | **15 CP**

Master Thesis | **30 CP**



Electives | **15 CP**

Internship | **15 CP**

# What's in it for You?



SEMESTER 1	SEMESTER 2	SEMESTER 3	SEMESTER 4
<p><b>Compulsory Courses</b></p> <ul style="list-style-type: none"> <li>• Statistics and Mathematics</li> <li>• Algorithms and Data Structures</li> <li>• Machine Learning</li> <li>• Predictive Modeling</li> <li>• Optimization Models</li> <li>• Design and Analysis of Algorithms</li> </ul>	<p><b>Compulsory Courses</b></p> <ul style="list-style-type: none"> <li>• Heuristic Optimization</li> </ul> <div data-bbox="667 659 1104 715" style="border: 1px solid blue; padding: 5px; text-align: center;"> <p><b>ANALYTICS PROJECT</b></p> </div> <p><b>Electives</b></p> <p><b>Management Electives (2 out of 4)</b></p> <ul style="list-style-type: none"> <li>• Management and Technology Perspectives</li> <li>• Strategic Negotiations</li> <li>• Start-Up and Growth Management</li> <li>• Service and Technology Marketing</li> </ul> <p><b>Data Analytics &amp; Technology Electives (1 out of 3)</b></p> <ul style="list-style-type: none"> <li>• Advance Machine Learning</li> <li>• Introduction to Soci Growth Analysis using Advanced Data Mining</li> <li>• Intelligent Monitoring of Engineering Systems</li> </ul>	<p><b>Application Areas (Compulsory)</b></p> <ul style="list-style-type: none"> <li>• Digital Operations and Supply Chain Management</li> <li>• Optimization of Logistics Systems</li> <li>• Economic Modeling of Energy and Climate Systems</li> </ul> <div data-bbox="1131 868 1568 924" style="border: 1px solid blue; padding: 5px; text-align: center;"> <p><b>INTERNSHIP</b></p> </div>	<div data-bbox="1592 667 2029 762" style="border: 1px solid blue; padding: 10px; text-align: center;"> <p><b>MASTER THESIS</b></p> </div>

# Essentials: Refresh Your Knowledge

By starting your program with relevant essentials, you refresh your previous knowledge and lay the foundation for successful studies.

All modules are worth 5 CP.



## Statistics and Mathematics

Become familiar with relevant mathematical and statistical concepts.

– Prof. Dr. Thomas Lontzek



## Algorithms and Data Structures

Gain basic knowledge about data structures and the design and analysis of algorithms.

– Prof. Dr. Britta Peis



## Predictive Modeling

Learn to understand the principles of (human) choice behavior and the steps necessary to build and validate models to analyze and predict choice behavior.

– Prof. Dr. Sven Müller

## Machine Learning

Understand basic and advanced machine learning concepts and when to use which machine learning technique.

– Dr. Rossana Cavagnini



## Optimization Models

Learn basic and advanced techniques of modeling decision-making subject to constraints and optimizing a given objective.

– Prof. Dr. Marco Lübbecke



## Design and Analysis of Algorithms

Become familiar with advanced algorithm design and analysis techniques.

– Prof. Dr. Britta Peis



## Heuristic Optimization

Learn how to use metaheuristic algorithms to address complex combinatorial optimization problems.

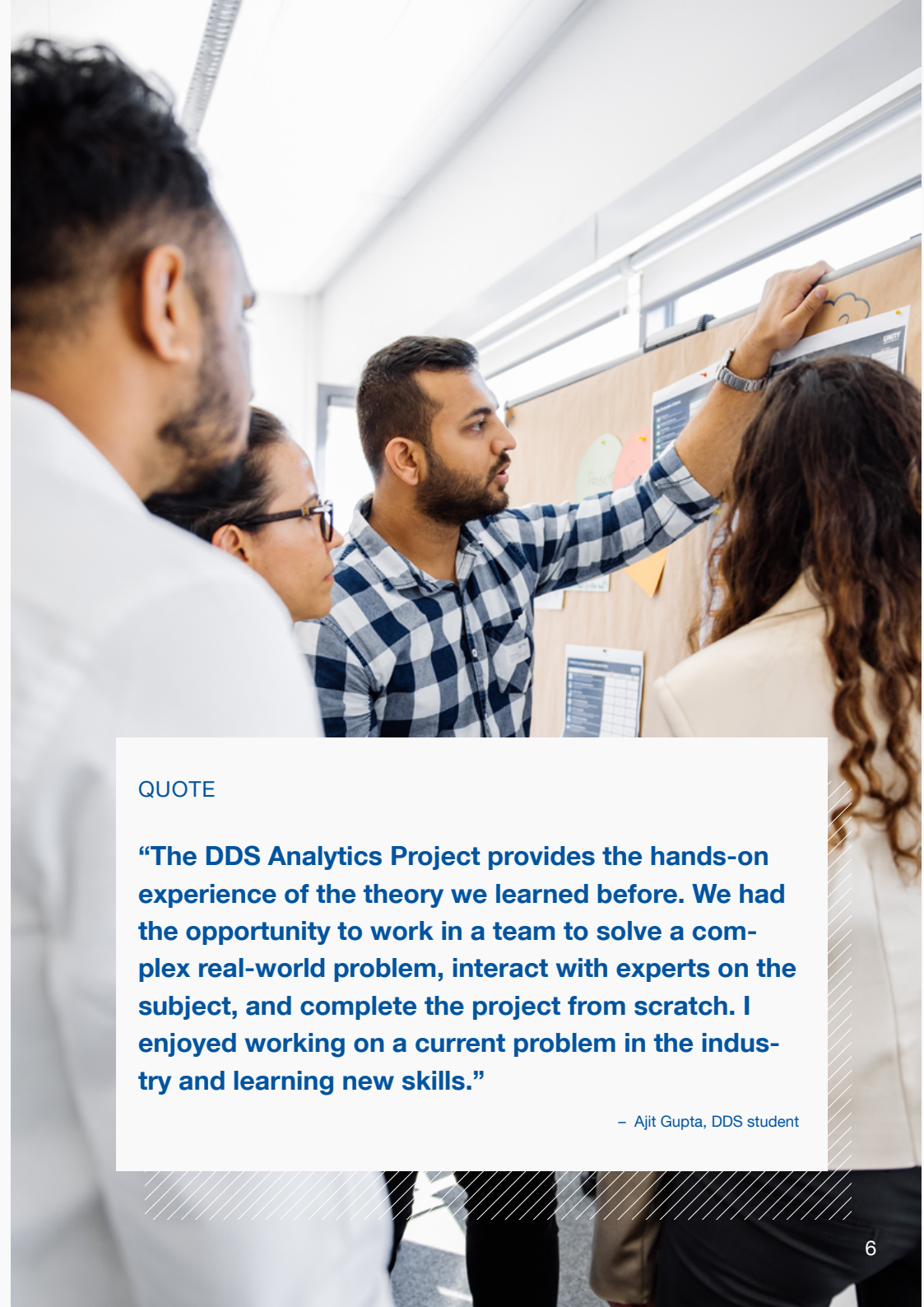
– Prof. Dr. Michael Schneider

## Analytics Project: Make Your Knowledge a Reality

### Solve a real-world optimization problem of a business partner from our ecosystem.

This challenge will prepare you for applying theoretical knowledge to real business use cases.

In this practice-oriented module, you will go through an entire analytics project and learn how to apply your theoretical knowledge to an actual optimization problem. Starting by identifying an individual business need, you can apply your machine learning methods and operations research techniques to collect, evaluate, and analyze data to make accurate predictions and well-founded decisions. At the end of the module, you will present your solution to business representatives and directly receive valuable feedback. The ideal preparation for your internship later in your studies!



#### QUOTE

**“The DDS Analytics Project provides the hands-on experience of the theory we learned before. We had the opportunity to work in a team to solve a complex real-world problem, interact with experts on the subject, and complete the project from scratch. I enjoyed working on a current problem in the industry and learning new skills.”**

– Ajit Gupta, DDS student

## Electives: Sharpen Your Profile

With this wide range of elective modules, you can choose your individual path. You will have the choice between two elective modules from the area of management and one from the area of data analytics and technology. [All modules are worth 5 CP.](#)

## Management Electives

### Management & Technology Perspectives

Find out what it means to work at an interface.

Successful mediators adopt different perspectives to work out the optimal solution for all parties by keeping a holistic view. In this module, you will learn how to operate at the intersection of management and technology, understand the challenges and perspectives of both sides, and be trained to make confident decisions under uncertainty.

– Prof. Dr. Malte Brettel

### Strategic Negotiations

Gain systematic skills to manage negotiations.

Professional negotiations involve communication, strategic behavior, and mediation skills. These skills are what you will practice in this module. After successfully completing this course, you will have a solid understanding of the core concepts of leading negotiations, using effective mediation skills, and engaging in conflict management. Moreover, you will learn to behave strategically to convince your negotiating partner.

– Prof. Dr. Thomas Lontzek

### Start-up & Growth Management

Learn how to think and act like an entrepreneur.

Do you have a career as a company founder in mind? Or do you have an innovative idea that you would like to launch on the market? Then this module will teach you the basics of entrepreneurship you need to succeed. You will learn about the challenges of starting a business, how to create a perfect pitch deck to convince investors, explore the elements of a business plan, and get an introduction to lean start-up principles and exit strategies.

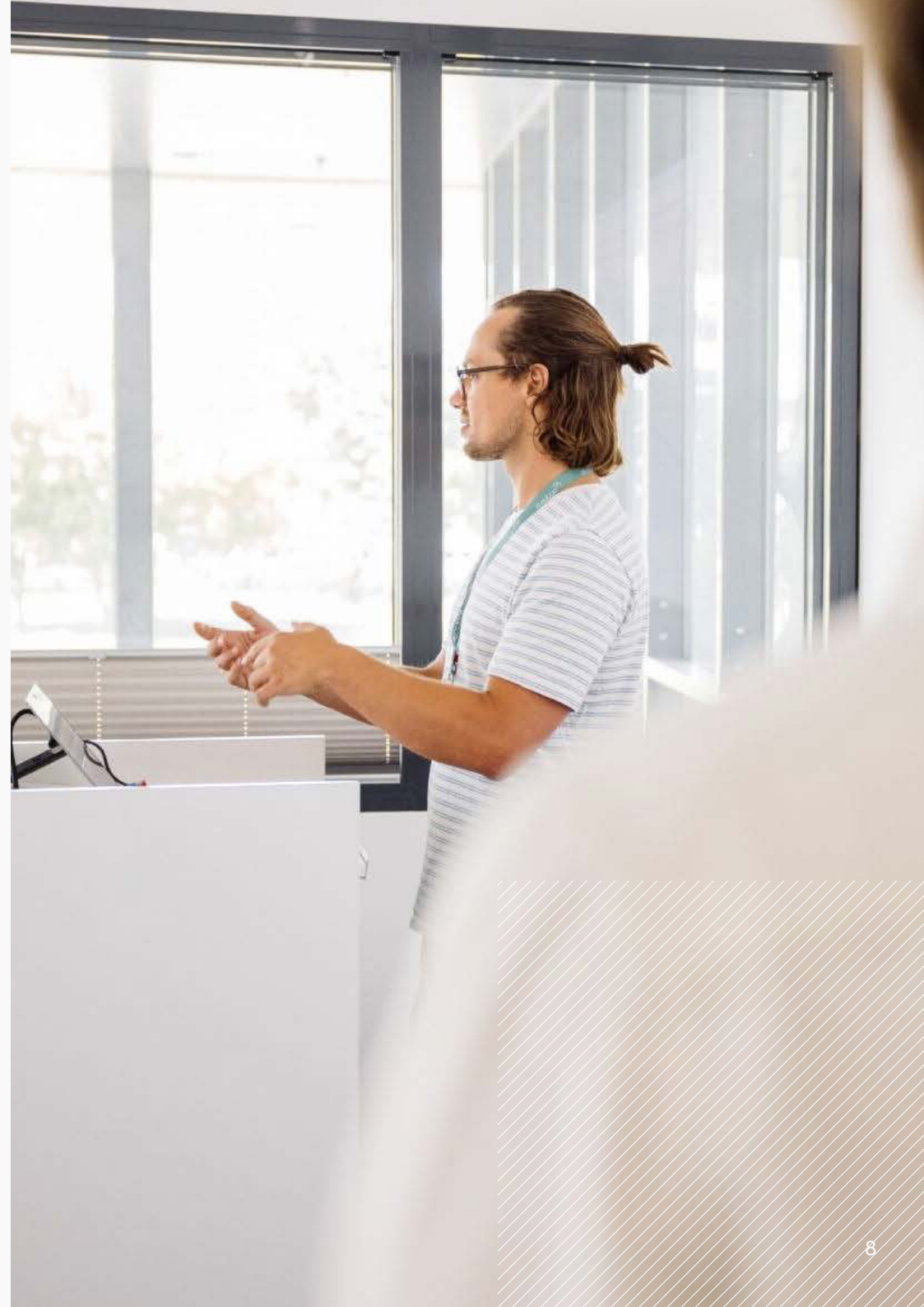
– Prof. Dr. Malte Brettel

## Service & Technology Marketing

Learn to understand customers and markets in a high-tech environment.

New digital developments are causing financial challenges in organizations. In this module, you will gain a theory-based understanding of capital market equilibria, learn about digital trends in the finance domain, and will be able to describe their consequences for corporate finance, valuation, and capital market conditions.

– Prof. Dr. Stefanie Paluch





# Data Analytics & Technology Electives

## Advanced Machine Learning

Identify which machine learning approach can best solve a specific problem.

This elective module shows you the difference between interpretable and explainable machine learning. You will deep-dive into the basis of neural networks and deep learning, learn how to devise a deep-learning network architecture for the most common machine learning problems, and learn how to train a feed-forward neural network via backpropagation. You will apply your knowledge in high-level and technical discussions and learn how to implement your models.

– Dr. Rossana Cavagnini

## Introduction to Social Network Analysis using Advanced Data Mining

Recognize the impact of social network analysis on business decisions.

Social networks such as Facebook or TikTok are playing an increasingly important role in our society. There is a lot of unexplored potential in their data. While, for example, marketing campaigns use this data for business, organized crime is also taking advantage of this approach. In this module, you will lay the foundation for social network analysis by delving into advanced data mining techniques. Applications with actual data from social networks using the respective software tools conclude the course.

– Dr. Richard Weber

## Intelligent Monitoring of Engineering Systems

Gain insights into recent monitoring strategies closely linked to the field of structural health monitoring and computational intelligence.

In this elective module, you will get an overview of current trends in structural health monitoring (SHM) and understand their theoretical foundation in the context of engineering applications. You will become familiar with sensing systems, filtering methods, and computational intelligence. After successful completion, you will be able to analyze engineering, mainly mechanical systems, and monitor the relevant system parameters.

– Prof. Dr. Bernd Markert

## Application Areas: Apply Your Skills

In addition to providing you with the necessary theoretical knowledge and data-driven techniques and methods to succeed in a digitized economy, the program also offers detailed insights into potential application areas. **All modules are worth 5 CP.**



### Digital Operations and Supply Chain Management

Gain knowledge about the challenges and opportunities in the digitalization of material and information flows in logistics, production, and the supply chain.

– Prof. Dr. Julia Christine Arlinghaus

### Optimization of Logistics Systems

Learn how to use mathematical modeling techniques and optimization methods to achieve the fundamental goal of logistics planning: Always the right item at the right cost and in the right quantity at the right time in the right place.

– Prof. Dr. Michael Schneider

### Economic Modeling of Energy and Climate Systems

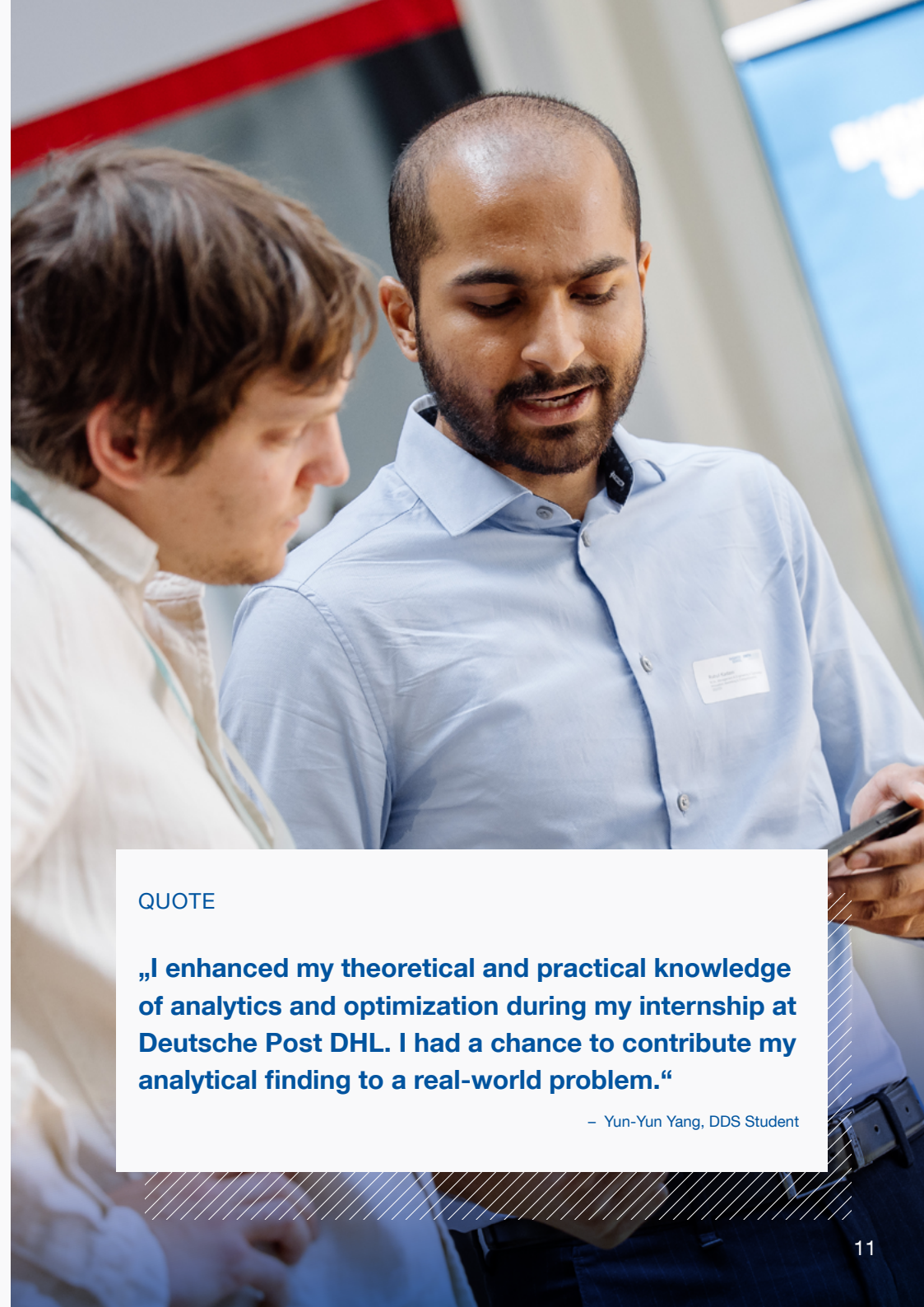
Become familiar with advanced concepts in energy and climate systems economics. Learn how to understand climate and energy-related problems arising in economics and business and gain advanced knowledge in modeling interactions between climate, energy, and economics.

– Prof. Dr. Thomas Lontzek, Prof. Dr. Reinhard Madlener

## Get Prepared to Re-enter the Professional World

During an internship in the third semester, you will apply your skills and gain hands-on work experience in an industry work placement at global enterprises such as Deutsche Post DHL, BMW, Bosch, and others. You acquire knowledge about technical materials and processes used in current practice and corresponding economic considerations and procedures. Equally important are the insights into social processes and structures in the companies.

The internship lasts at least 14 weeks and is worth 15 CP.



### QUOTE

**„I enhanced my theoretical and practical knowledge of analytics and optimization during my internship at Deutsche Post DHL. I had a chance to contribute my analytical finding to a real-world problem.“**

– Yun-Yun Yang, DDS Student



| MASTER THESIS / 30 CP

## Master Thesis: Getting Ready for an Exciting Career

### **Your final thesis completes your study adventure.**

Create a moment of pride and look forward to a promising future.

Demonstrate your ability to solve a methodological or analytic challenge using the knowledge acquired during the program and scientific research methods. **The final dissertation is worth 30 CP.**

## Quick Facts

 Degree	Master of Science RWTH Aachen University
 Language	English
 Duration	4 Semesters
 Costs	30.000 EUR*
 Early Bird	3.000 EUR Discount until January 15
 Start	October 1 of Each Year

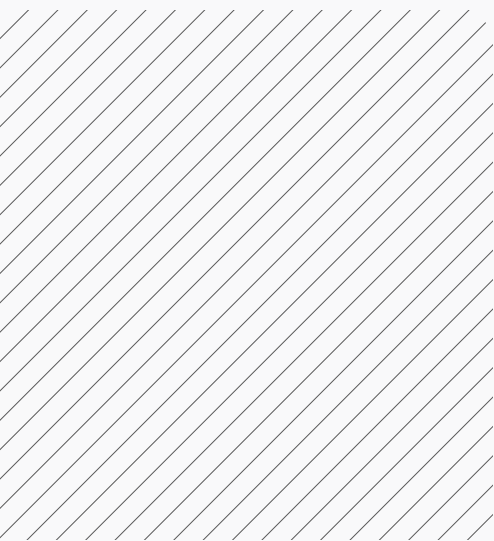
\*plus semester fee from RWTH Aachen University

## Admission Requirements

- degree completed in Engineering or Science in a related STEM field
- at least 125 credit points mathematics and/or natural sciences and/or computer science and/or engineering including a minimum of 15 credit points in the fields of higher mathematics or statistics database and information systems, programming, algorithms and data structures, complexity theory, quantitative methods/operations research
- at least one year of professional work experience
- English language proficiency

## Application Process

Our online application portal is open from October 1 until March 01 for all applicants with a degree from a non-EU country and until August 31 for all applicants with a degree from an EU-/EEA-country. Our application process is entirely online and there is no application fee.



| CONTACT

**Any questions?**  
**We are happy to advise you!**

Student Recruitment Team  
master@business-school.rwth-aachen.de  
+49 241 80 20010

**BUSINESS** | **RWTHAACHEN**  
**SCHOOL** | **UNIVERSITY**