



Block C - Data Modelling

In block A, you explored the foundations of artificial intelligence and data science by developing an interactive data visualization dashboard. In block B, you went a step further and helped a real-life client gain insight into their data by applying various preprocessing and machine learning methods.

This block will focus on the ***Modeling*** phase of the ***CRISP-DM*** lifecycle (Figure 1). You will learn how to conduct market/consumer research and how to build transparent, interpretable, and fair deep-learning models for image classification. In addition, you will learn how to integrate these concepts for the development of user-centered applications.

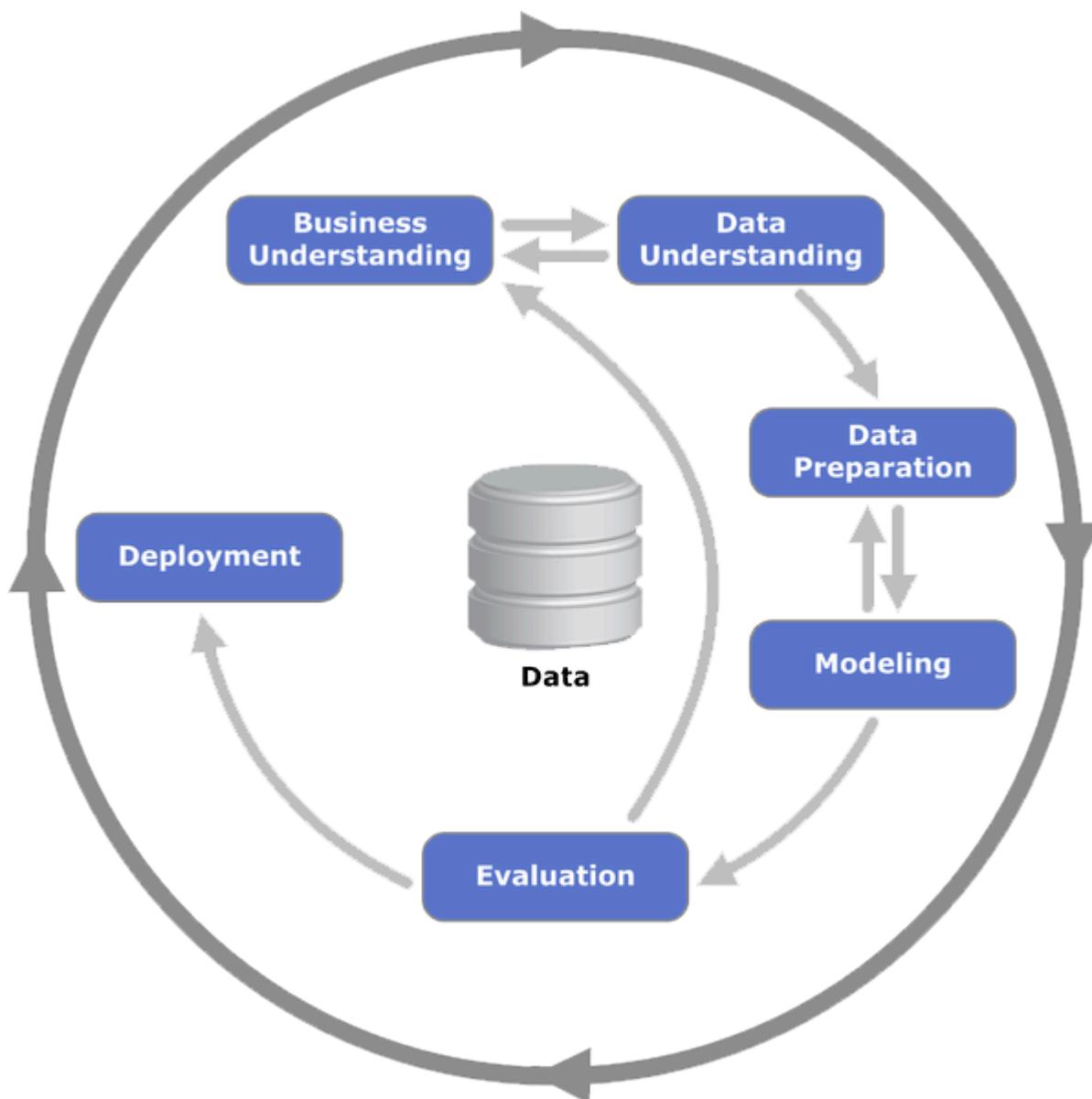


Figure 1. CRISP-DM Lifecycle.

Student Groups

Important: please notice that some student groups were changed for this block!

In order to balance the number of students per mentor group, the following changes were made to the student groups:

- **Group 9** and **Group 10** ceased to exist.
- Students from the lowest turnout groups (**Group 2** and **Group 10**), were allocated across multiple groups.
- Students from **Group 9** were integrated with some existing **Group 2** students. This is the new **Group 2**.

You can check your current group by entering your student number here:

Student Number:

Rooms

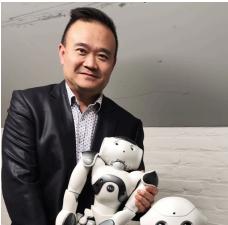
The room of each group also changed for this block. Here is the new distribution of groups and rooms:

Room ID	Groups
2001	4
2003	3
2007	1 , 2 , 5
2010	7 , 8 , 6

Staff Members

Name	Availability	Mentor Group	Email	Responsible for Knowledge Module
Arash Sadeghzadeh	Mon, Tues, Wed, Thur, Fri	Group 2 (1FAI-02)	sadeghzadeh.a@buas.nl	NA

Name	Availability	Mentor Group	Email	Responsible for Knowledge Module
(Lecturer), Ph.D. 				
Bram Heijligers (Lecturer), MSc. 	Mon, Tue, Wed, Thu, Fri	Group 3 (1FAI-03)	heijligers.b@buas.nl	NA
Edirlei Soares de Lima (Lecturer), Ph.D. 	Mon, Tue, Wed, Thu, Fri	Group 1 (1FAI-01)	soaresdelima.e@buas.nl	Deep Learning & Block Responsible
Elavendan Rajendran (Lecturer), MBA. 	Mon, Tue, Wed, Thu, Fri	Group 4 (1FAI-04)	rajendran.e@buas.nl	NA
Frank Peters (Program Manager), Ph.D. 	Mon, Tue, Wed, Thu	Omnipresent	peters.f@buas.nl	Omnipotent

Name	Availability	Mentor Group	Email	Responsible for Knowledge Module
Irene van Blerck (Lecturer), MSc. 	Tue, Wed, Thu, Fri	Group 5 (1FAI-05)	blerck.i@buas.nl	Responsible AI
Jason Harty (Lecturer), BSc. 	Mon, Tue, Wed, Thu, Fri	Group 8 (1FAI-08)	harty.d@buas.nl	NA
Jun Wu (Lecturer), Ph.D. 	Mon, Tue, Wed, Thu, Fri	Group 6 (1FAI-06)	wu.j@buas.nl	NA
Margot Neggers (Lecturer), Ph.D. 	Mon, Tue, Thu, Fri	Group 7 (1FAI-07)	neggers.m@buas.nl	Human-Centered AI
Zhanna Kozlova (Lecturer), MA. 	Mon, Tue, Wed, Thu, Fri	Group 3 (1FAI-03)	kozlova.z@buas.nl	Business Understanding
Borislav Nachev (Student)	Fri	Group 2 (1FAI-02)	220472@buas.nl	NA

Name	Availability	Mentor Group	Email	Responsible for Knowledge Module
Assistant)				
				
Hubert Waleńczak (Student Assistant)	Fri	Group 5 (1FAI-05)	220817@buas.nl	NA
Rebecca Borski (Student Assistant)	Tue	Group 2 (1FAI-02)	224315@buas.nl	NA

Creative Brief

The [Innovation Square](#) is your client in this block. The Innovation Square is a dynamic hub at Breda University of Applied Sciences that integrates education, research, and industry. It's a place where collaboration and innovation connect education and practice-oriented research to activities in the relevant industries. They approached you - as an aspiring **Data Scientist** - to apply your expertise in providing innovative data-driven solutions. In particular, they require your assistance in proposing and developing a creative and innovative application utilizing deep learning for image classification. The challenge is to identify a problem where image classification can provide significant business value and/or societal impact in any area or industry.



Figure 2. The Innovation Square.

Therefore, the main objective of this project is to develop an image classification application using deep learning and your own image dataset. To this end, you will need to create a project proposal that touches upon the following topics:

- Market/consumer research and risk assessment;
- The design and implementation of a transparent, interpretable (and fair) deep learning-based image classifier;
- The development of a user-centered prototype application for your image classifier.

The top 3 projects with the best business value will have the unique opportunity to present their results directly to the Innovation Square and a specially invited group of entrepreneurs from [BUas Startup Support](#) (like in the TV shows [Shark Tank](#) and [Dragons' Den](#)), which can provide valuable insights and even support for further development of the projects, potentially transforming your academic projects into viable and standalone business ventures. This is more than just a project; it's a potential launchpad for your entrepreneurial journey!



Knowledge Modules

The ADS&AI program is structured into 8-week blocks. On Monday, Wednesday, and Thursday you work individually on the development of fundamental skills, which are needed to successfully complete the Creative brief. In **DataLab** (Mandatory! See [DataLab Attendance](#), for more information), scheduled on Tuesdays and Fridays, you apply your knowledge to the Creative Brief by completing a list of tasks, which you can find in the [DataLab Tasks](#).

This block is centered around four ***knowledge modules***:

- [Business Understanding](#)
- [Responsible AI](#)
- [Deep Learning](#)
- [Human-Centered AI](#)

The project of this block aims to develop an image classification application prototype. Below, you will find the project timeline, which gives you an overview of the topics explored by each knowledge module:





Figure 2. Project timeline.

1. Business Understanding (Week 1)

In **week 1**, you will conduct market research to identify an industry or company that might have a problem. Based on the stakeholder analysis and DAPS diagram, you will then create your first idea for an application aimed at solving a potential problem within that company.

2. Responsible AI (Week 1 and 6)

In **week 1**, you will perform an exploratory data analysis to uncover hidden biases in the Imsitu or your custom image dataset.

In **week 6**, after you have built and trained the model, you will learn how to make it more transparent and interpretable by applying various explainable AI methods.

3. Deep Learning (Week 2 - 5)

In **weeks 2-5**, you will explore different artificial neural network architectures from which you will gain the skills to create your own image classifier. This model does not have to be the final product but will serve as a proof of concept for your application prototype.

4. Human-Centered AI (Weeks 7 and 8)

In **weeks 7-8**, you will design an application (wireframe prototype) based on your idea and DAPS diagram that incorporates your image classifier model. While designing the application, you also will conduct user tests (think-aloud study and A/B testing).

Medal Challenges

You are encouraged to get the best out of yourself. Therefore, within the ADS&AI program, we regularly allow you to push yourself further by giving you so-called bronze-silver-gold challenges. By achieving these, you can earn badges for your GitHub page, which mark excellent students:

 **ADS&AI 1x** Load, pre-process, and classify video data with Python.

 **ADS&AI 1x** Implement a fully functional application for the project, which includes the process of deploying the image classification model on a server and building a functional client interface to use the model.

 ADS&AI 1x Get selected as one of the top 3 projects that will present their results to the Innovation Square and BUas Startup Support team. The selection of the best projects will be mainly based on business value, but keep in mind that other factors, such as model accuracy, interpretability, and interface design, also contribute to the viability of the project.

Timeline

Week 1: Responsible AI (Bias and Fairness) & Marketing

Monday

- Fairness & Bias: Definitions

Tuesday

- DataLab I: Kick-Off Presentation & Image Dataset
- Kick-Off Presentation + Guest Lecture: 10:30 - 12:30 (Where? Lecture Hall Fe1.017)

Wednesday

- Fairness & Bias: Individual Fairness vs. Group Fairness

Thursday

- Market Research for Product Development, Stakeholders & DAPS

Friday

- DataLab II: DAPS Diagram & Fairness Metrics

Week 2: Introduction to Deep Learning with Keras

Monday

- Introduction to Deep Learning

Tuesday

- DataLab I: Multilayer Perceptrons
- Review session assessment Block B: 15:00 - 17:00

Wednesday

- Keras and Fundamentals of Machine Learning

Thursday

- Improving Models Performance

Friday

- DataLab II: Multilayer Perceptrons - Deep Dive

Week 3: Multilayer Perceptrons from Scratch

Monday

- Understanding Neural Networks

Tuesday

- DataLab I: Multilayer Perceptron from Scratch

Wednesday

- Machine Learning Project Lifecycle Overview

Thursday

- Gradient Descent

Friday

- DataLab II: Multilayer Perceptron from Scratch
- Week 9-10 Challenges for Block C: 15:45 - 16:00 (Lecture hall Fe1.016).
- Guest Lecture by Myrthe Polfliet and Julia Wijngaarden from Accenture: 16:00 - 17:00 (Lecture hall Fe1.016).

Week 4: Convolutional Neural Networks with Keras

Monday

- Introduction to Convolutional Neural Networks

Tuesday

- DataLab I: Convolutional Neural Networks

Wednesday

- Convolutional Neural Networks and Error Analysis

Thursday

- Working with Small Datasets

Friday

- [DataLab II: Convolutional Neural Networks](#)

Week 5: The Machine Learning Project Lifecycle**Monday**

- [Machine Learning Project Lifecycle](#)

Tuesday

- [DataLab I: Machine Learning Project Lifecycle](#)

Wednesday

- [Error Analysis and Data Iteration](#)

Thursday

- [Data Definition, Labeling, and Scoping](#)

Friday

- [DataLab II: Machine Learning Project Lifecycle](#)

Week 6: Responsible AI (Transparency and Interpretability)**Monday**

- [Transparency & Interpretability: Definitions](#)

Tuesday

- [DataLab I: Accuracy vs. Interpretability](#)

Wednesday

- [Methods I: Model Specific](#)

Thursday

- [Methods II: Model Agnostic](#)

Friday

- Good Friday

Week 7: Prototype - Human-Centered AI

Monday

- Easter Monday

Tuesday

- [DataLab II: Implementing XAI for Image Classification](#)

Wednesday

- [HCAI Introduction and Information Processing](#)

Thursday

- [Interface Design](#)

Friday

- [Datalab II: Think-aloud Study](#)

Week 8: Prototype - Human-Centered AI

Monday

- [User testing](#)

Tuesday

- [Datalab I: A/B user tests](#)

Wednesday

- [UX-Design for AI](#)

Thursday

- Wrapping up final deliverables

Friday

- Final project presentations

Next 

Contact : [Frank Peters](#)