ADS-AI



# Block A - Business Understanding

Block A focuses on the first stage of the ***CRISP-DM*** process, known as ***Business Understanding***. This phase entails acquiring a deep understanding of the business context and requirements.

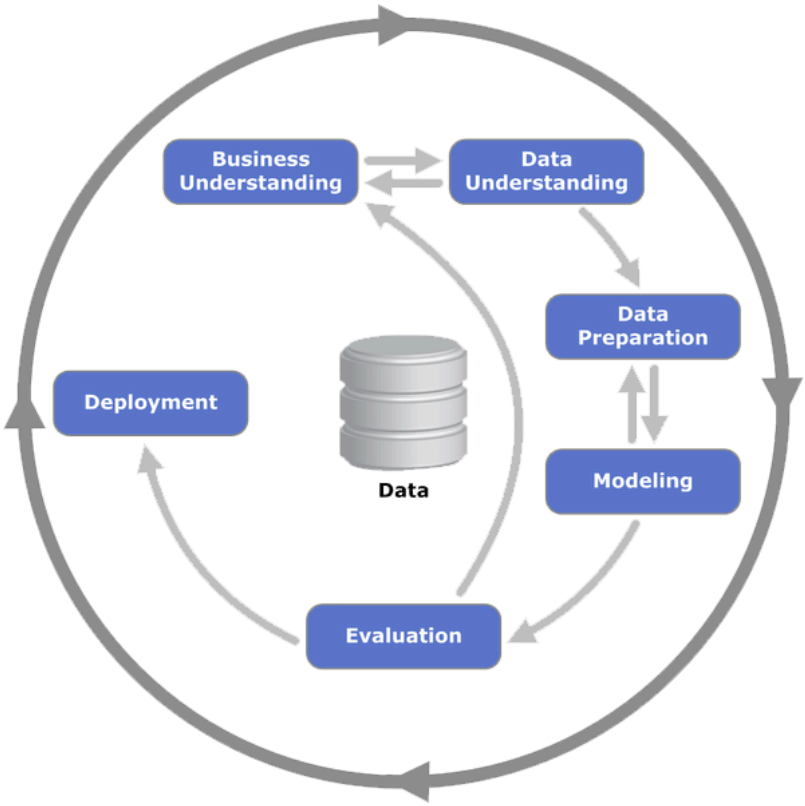



*Figure 1. CRISP-DM phases.*

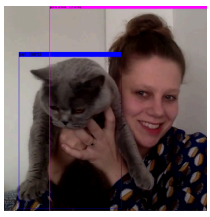
During this phase, you will acquire the skills necessary to formulate a research question that can be addressed through data analysis. You will learn how to find, and collect appropriate data from relevant sources, explore and analyze the collected data, and visualize your findings effectively using the programming language Python and the dashboarding tool Power BI. By doing so, you will be able to propose a solution to your research question, substantiated by sound arguments derived from your analysis. Finally, you will gain proficiency in presenting your findings to the client in a clear and concise manner.

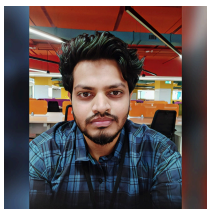
During this block, you are expected to be on campus during the Datalab Days on Tuesday and Friday from 9.00h to 17.00h. For details on attendance and notifying us about your absence, see the Datalab Attendence page. At BUas, we highly value professional and respectful

behaviour towards all lecturers, mentors, students and peers. You can read more about the BUas code of conduct and educational and exam regulations on this page. Violation of the code of conduct will be taken seriously. To avoid plagiarism, you always need to cite your sources. This includes the use of generative AI tools. Within the ADS&AI program, we use the APA citing style. You can find all information about citing APA, including citing generative AI, on this page from the BUas library.

## Staff Members

| Name | Availability | Mentor Group | Email | Responsible for Knowledge Module |
|---|---|---|---|---|
| Alican Noyan (Lecturer), Ph.D.  | Fridays through Teams/In-person | NA | noyan.a@buas.nl | Introduction to Programming with Python |
| Arash Sadeghzadeh (Lecturer), Ph.D.  | Fridays through Teams/In-person | NA | sadeghzadeh.e@buas.nl | Introduction to Fundamentals of Math |
| Dean van Aswegen (Lecturer), MSc.  | Mon, Tues, Wed, Thur, Fri | Block A, Group 1 (1FAI-01), Hn 2.001, Year 1 | aswegen.d@buas.nl | NA |
| Peiman Barnaghi (Lecturer), | Mon, Tues, Wed, Thur, Fri | Block A, Group 2 (1FAI-02), | barnaghi.p@buas.nl | NA |

| Name | Availability | Mentor Group | Email | Responsible for Knowledge Module |
|---|---|---|---|---|
| Ph.D.  | | Hn 2.003, Year 1 | | |
| Irene van Blerck (Lecturer), MSc.  | Thu, Fri | Block A, Group 3 (1FAI-03), Hn 2.007, Year 1 | blerck.i@buas.nl | Introduction to Artificial Intelligence |
| Zhanna Kozlova (Lecturer), MSc.  | Tue | Block A, Group 3 (1FAI-03),Hn 2.007, Year 1 | kozlova.z@buas.nl | Introduction to Artificial Intelligence |
| Mekselina Doğanç (Lecturer), MSc. Mekselina profile picture | Mon, Tue, Wed, Thu, Fri | Block A, Group 4 (1FAI-04), Hn 2.007, Year 1 | doganc.m@buas.nl | NA |
| Avril Hayden (Lecturer), | Mon, Tue, Wed, Thu, Fri | Block A, Group 5 (1FAI-05), Hn 2.007, Year 1 | hayden.a@buas.nl | NA |

| Name | Availability | Mentor Group | Email | Responsible for Knowledge Module |
|---|---|---|---|---|
| MSc.  | | | | |
| Elavendan Rajendran (Lecturer), MBA.  | Mon, Tue, Wed, Thu, Fri | Block A, Group 6 (1FAI-06), Hn 2.010, Year 1 | rajendran.e@buas.nl | Introduction to Data Science |
| Karna Rewatkar (Lecturer), M.Sc.  | Mon, Tue, Wed, Thu, Fri | Block A, Group 7 (1FAI-07), Hn 2.010, Year 1 | rewatkar.k@buas.nl | Introduction to Data Science |
| Edirlei de Lima (Lecturer), Ph.D.  | Mon, Tue, Wed, Thu, Fri | Block A, Group 8 (1FAI-08), Hn 2.010, Year 1 | soaresdelima.e@buas.nl | NA |
| Bert Heesakkers (Lecturer), | NA | Workshops | heesakkers.b@buas.nl | NA |

| Name | Availability | Mentor Group | Email | Responsible for Knowledge Module |
|---|---|---|---|---|
| MSc.  | | | | |
| Frank Peters (Program manager), Ph.D.  | Mon, Tue, Wed, Thu | Omnipresent | peters.f@buas.nl | Omnipotent |

## Creative Brief

The Sustainable Development Goals (SDGs) were established by the United Nations in 2015 to guide countries in achieving a sustainable future. These 17 global objectives encompass a wide range of areas, including poverty eradication, education, gender equality, economic growth, climate action, and environmental protection.

The ***SDG Hub@BUas***, referred to as the client, has reached out to you as an aspiring - ***data professional*** - to apply your expertise in providing data-driven solutions. In particular, they require your assistance in monitoring and assessing the advancements made towards the SDGs on a global and/or country-specific scale.


*Figure 2. Team SDG Hub@BUas.*

The objective is to ***develop an interactive dashboard utilizing your newly acquired skills in data analytics and visualization***. The dashboard will provide valuable insights to policymakers, researchers, and activists, enabling them to make informed decisions and take targeted actions towards the SDGs. Moreover, it will serve as a tool to raise awareness among the general public, inspiring collective efforts towards creating a more sustainable and equitable world.

Good luck!

## 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*** (Also see DataLab Attendance), scheduled on Tuesdays and Fridays, you apply your knowledge to the Creative Brief by completing a list of tasks, which you can find here.

The block is further divided into two phases, centered around three ***knowledge modules***:

- Introduction to Artificial Intelligence
- Introduction to Data Science
- Introduction to Programming with Python
- Introduction to Mathematics

Below you can find the timeline overview of all the weeks in this block.


Week 1-3
Introduction to Artificial Intelligence
- Brightspace Quizzes
- 'AI in Science Fiction' Presentation
Introduction to Programming
- Variables & Conditionals
Week 2
Introduction to Artificial Intelligence
- Turing Test
Introduction to Programming
- Functions and Loops
Introduction to Mathematics
- Mathematics Test I
Week 3
Introduction to Artificial Intelligence
- 'AI in Science Fiction' Presentation
Introduction to Programming
- Data Structures I
Introduction to Mathematics
- Mathematics Test II
Week 4
Introduction to Data Science
- Formulating Research question
- Data Transformation
Introduction to Programming
- Data Structures II
Introduction to Mathematics
- Mathematics Test III
Week 5
Introduction to Data Science
- Exploratory Data Analysis
Introduction to Programming
- Files and Data
Introduction to Mathematics
- Mathematics Test IV
Week 6
Introduction to Data Science
- Storytelling
Introduction to Programming
- Algorithms
Introduction to Mathematics
- Mathematics Test V
- Final Math Exam
Week 7
Introduction to Data Science
- UI and UX design
- Advanced PowerBI
Introduction to Python
- Final Python Exam
Week 8
Introduction to Data Science
-Aligning with CRISP DM cycle

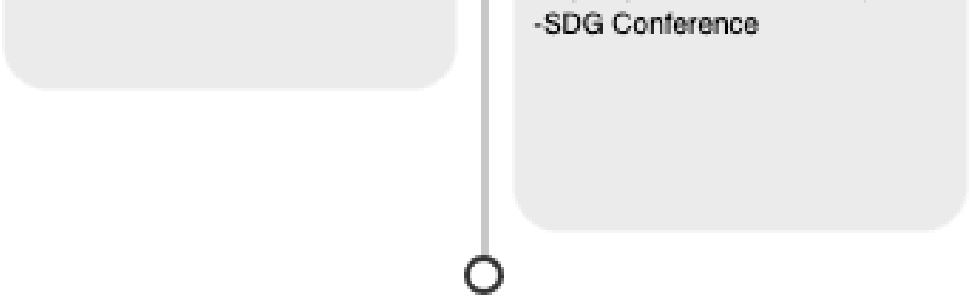



*Figure 3. Overview Block A, Year 1.*

## 1. Introduction to Artificial Intelligence (Week 1-3)

In the first three weeks of Block A, you will acquire foundational knowledge and understanding of the theories, principles, methods, and techniques related to the field of AI. For example, you will be made familiar with the philosophy, history, and taxonomy of AI, among others, by analyzing a Sci-Fi movie or (TV) series. In addition, we will teach you essential soft skills, such as presenting and citing sources.

In DataLab II, Week 3, you are required to give a presentation where you identify and describe an AI topic in a Sci-Fi movie or (TV) series, and place it within the Taxonomy of AI. Additionally, you will need to evaluate the technical feasibility of the AI topic by critically assessing its possible application(s) within a real-life (business) setting. Furthermore, you will need to articulate potential ethical and/or legal implications of the AI application. Lastly, in order to meet the information needs of the presentation, you will need to acquire, evaluate, and use information from various popular and/or scholarly sources, such as blogs and scientific journal articles.

## 2. Introduction to Data Science (Week 4-7)

To change the world, we must first be able to measure it. Measuring and quantifying what matters is a crucial component of evaluating progress. In September 2015, all countries agreed to adopt specific goals as targets or indicators for global development. Collectively, these goals are known as the United Nations Sustainable Development Goals (SDGs). Many institutions, organizations, and companies have decided to adopt these goals. One of them is BUas, its aim is to become more sustainable as well, but how?

To figure this out, you're going to track and explore global, country-level, or BUas-level progress towards the Sustainable Development Goals (SDGs) by leveraging data to gain insights into this progress and provide solutions related to sustainable development. Your responsibilities include framing a data-driven research question, gathering accurate data from the Sustainable Development Goals databank, conducting exploratory data analysis, analyzing and visualizing the data, interpreting the data to come up with your research findings, and ultimately presenting your conclusions to the client.

Throughout this process, you will be applying concepts and tools learned in workshops, such as SDGTracker for problem formulation and Power BI for visualization. The culmination of your efforts will be the presentation of your findings through an intuitive user interface, with a live demonstration of your dashboard to the client, staff, and peers. This presentation will also include an opportunity for everyone to vote on the best dashboard. Let's delve into the details of each step and embark on this meaningful journey towards understanding and promoting sustainable development.

This individual project consists of the following steps.

### 3. Introduction to Programming with Python (Week 1-7)

Data scientists use programming for a wide array of tasks, such as visualizing data, training machine learning models, and processing data. Therefore programming skills are indispensable for any data scientist. There are many different programming languages, for data science, Python is by far the most common one. Therefore, every Thursday in this Block until W7, you will study programming with Python. You can access the learning material from the timeline below or find everything here in one place.

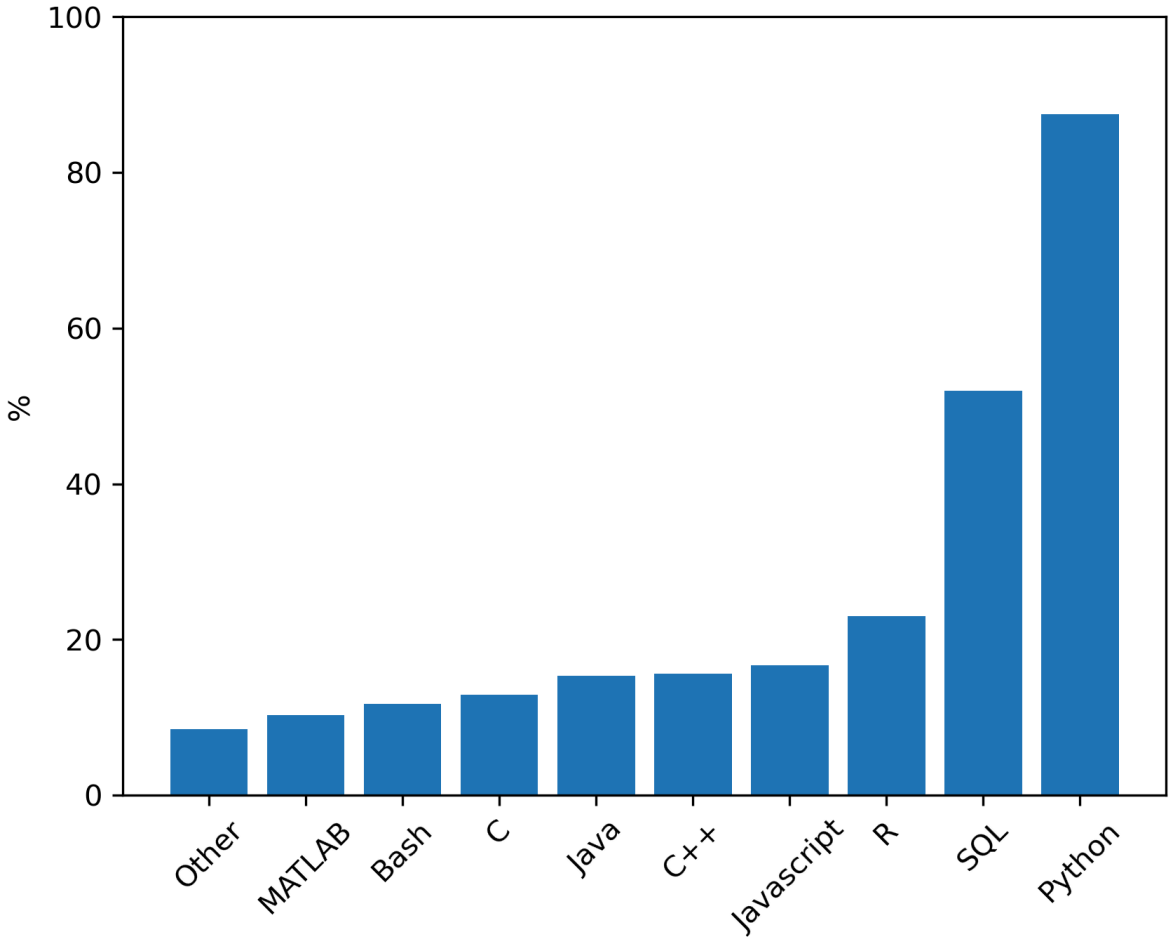



*Figure 4. "What programming languages do you use on a regular basis?" answered by 8902 data professionals on Kaggle Survey 2022.*

### 4. Introduction to Mathematics

Mathematics is foundational to data science and artificial intelligence, as it forms the theoretical backbone for the algorithms and models that power these disciplines. Concepts from linear algebra and calculus are essential for understanding the methods and algorithms available. Linear algebra helps in managing and analyzing complex, high-dimensional data, while calculus allows for the optimization and fine-tuning of models. A solid grasp of mathematics not only enables data scientists and machine learning practitioners to develop more effective and robust models but also empowers them to innovate and adapt existing methods to solve complex real-world problems.

In this block, you'll update your basic math skills, which are essential for understanding more advanced topics. This strong foundation will help you as we move on to more complex materials in data science and artificial intelligence in the later blocks. By mastering your math skills now, you'll be better prepared for the more challenging content ahead. To help you build this foundational math knowledge, we've provided 5 ungraded quizzes. Based on your scores, we'll recommend specific courses to help you improve your math skills. For some students, completing the quizzes may be sufficient, but for others who need to strengthen their understanding, additional effort and learning will be necessary. In Week 6, you will take an exam to evaluate your knowledge. The grade from this exam will contribute 20% to your final grade for this block.

We highly recommend that, starting from Monday in Week 2 through Week 6, you take the related quiz to evaluate your knowledge. These quizzes are designed to assess your understanding of the material. If the quiz results indicate that you need to improve in certain areas, you'll have the entire week to review the recommended materials and enhance your understanding to the desired level before the next upcoming quiz/exam.

You can see more details along with the related topics for each quiz here.

## Timeline

⚠️ To open the links below, you need to open a new tab. To do so, press 'CTRL + Click' on the link. ⚠️

### Week 1: Introduction to Artificial Intelligence

MONDAY

- Philosophy of AI & Information Literacy

TUESDAY

- DataLab I: Creative Brief

WEDNESDAY

- History of AI & GitHub

THURSDAY

- Programming: Variables and Conditionals

FRIDAY

- DataLab II: Creative Brief & Presenting

## Week 2: Introduction to Artificial Intelligence

MONDAY

- Intelligent Agents & Conversational AI

TUESDAY

- DataLab I: Creative Brief & Turing Test

WEDNESDAY

- Taxonomy of AI I

THURSDAY

- Programming: Functions and Loops

FRIDAY

- DataLab II: Creative Brief & Feedback

## Week 3: Introduction to Artificial Intelligence

MONDAY

- Taxonomy of AI II & State-of-the-art AI

TUESDAY

- DataLab I: Creative Brief

WEDNESDAY

- Risks & Benefits of AI

THURSDAY

- Programming: Data Structures I

FRIDAY

- DataLab II: 'AI in Science Fiction' presentations

## Week 4: Introduction to Data Science

MONDAY

- Quantifying our world into data

TUESDAY

- Datalab I: SDG Indicators

WEDNESDAY

- Intro to Variables and Data Transformation

THURSDAY

- Programming: Data Structures II

FRIDAY

- Datalab II: Exploratory Data Analysis (EDA) 1

## Week 5: Introduction to Data Science

MONDAY

- Descriptive Analyses and Visualisations

TUESDAY

- Datalab I: Exploratory Data Analysis (EDA) 2

WEDNESDAY

- Reporting and Visualising Data

THURSDAY

- Programming: Files and Data

FRIDAY

- Datalab II: Findings & Data Visualisations

SATURDAY

CWI is where Python is created. They are organizing an open day to present their current activities. It is a nice opportunity for you to expand your knowledge. However, note that this event is optional and not organized by us.

- CWI Open Day

### Week 6: Introduction to Data Science

MONDAY

- Variability

TUESDAY

- Datalab I: Presenting and Storytelling with Data

WEDNESDAY

- Analysing Relationships between Variables

THURSDAY

- Programming: Algorithms

FRIDAY

- Datalab II Discussion

### Week 7: Introduction to Data Science

MONDAY

- Explanatory Vs Predictive Modelling + Writing a Conclusion

TUESDAY

- Datalab I: Conclusion

WEDNESDAY

- User-Experience Design in Power BI

THURSDAY

- Programming: Practice

FRIDAY

- Python Exam
- Datalab II: CRISP-DM

### Week 8: Introduction to Data Science

During the last 7 weeks we've explored all fundamental concepts in the world of data science & AI; and applied them to our projects. Now, it's time to recap on all that you've learned and brush up your project deliverables (or catch up ;p ). If you're already happy with what you've created or don't know how to further improve on your project then it's highly recommended to explore the material linked below:

MONDAY

- Iterate on your project deliverables; e.g. dashboard.
- Delving Deeper: Advanced Data Science and PowerBI
- Case-Study

TUESDAY

- Datalab I: CRISP-DM

WEDNESDAY

- Iterate on your project deliverables; e.g. dashboard, while keeping the CRISP-DM in mind.

THURSDAY

FRIDAY

- Datalab II: SDG Data Science Conference

## 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 medal challenges. By achieving these, you can earn badges for your GitHub page, which mark excellent students. The requirements for medals in this block are described in the table below.

| Medal | Requirements |
| --- | --- |
| gold | To win a golden medal, you need to Devise a data driven policy plan to help BUas achieve one or more Sustainable Development Goals (SDGs) |
| silver | To win a silver medal, you need to Perform a linear regression analysis in either: PowerBI using dynamic data sources, other than Excel or using Python utilizing the Sustainable Development Dataset |

| Medal | Requirements |
| --- | --- |
| 🥉 bronze | To win a bronze medal, you need to create an infographic that provides an overview of the different roles that constitute a professional data team |

## Final Deliverables

**fixed text for all blocks** At the end of the block, on Friday *date* at 17.00h, you need to hand in the following work:

1. Learning log
2. Work log
3. Self-assessment rubric
4. etc.

TABLE OF CONTENTS



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