



**M Applied Data Science
Utrecht University**

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Project code P2415

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Summary

Standard 1. Intended learning outcomes

The panel concludes that the master's programme Applied Data Science has a clear and distinctive profile, providing students with relevant academic knowledge and skills in data science practices across diverse fields. The panel appreciates the interdisciplinary focus of the programme and its orientation towards the work field. Students are adequately prepared for both advanced studies and professional careers in diverse fields. The panel finds the programme to be responsive to developments in the professional and academic fields, and suggests involving more industrial partners in the Advisory Board in the future to expand its scope. Additionally, ADS could benefit from more clearly aligning the motivation for being a one-year programme with its unique positioning within both the department and the faculty.

The ILOs of the programme match national and international requirements for master's programmes and reflect the profile of the programme. The panel recommends making the interdisciplinary aspects of the ADS profile more explicit in the ILOs. While it appreciates the attention to ethics and responsible data science in the programme, it emphasizes that incorporating responsibility into data science practices involves considering the broader social, ethical, and legal implications of the techniques used.

Standard 2. Teaching-learning environment

The panel considers the curriculum to be well-structured, with a balanced academic content. It values the diverse selection of electives, which offer students the flexibility to explore various fields, although the fast-paced programme somewhat limits these opportunities. The varied teaching methods and the colloquia on Fridays are also highly appreciated. The panel agrees with the students' suggestions to make the colloquia more hybrid and encourages the programme to use these sessions effectively to foster community building.

The panel supports the programmes' initiative to restructure the compulsory course towards a more interdisciplinary approach. It recommends further embedding interdisciplinarity as a core element throughout the curriculum, aligning with the programme's vision, as cross-faculty expertise is particularly valuable in ADS. This approach would also enhance the curriculum's coherence and long-term sustainability. In addition, providing high-performance computing facilities for teaching will benefit the programme.

According to the panel, the choice for an English name and language of instruction is well substantiated and in alignment with the international nature of the professional and academic field. The programme's international orientation is reflected in the international community of students and staff. The vibrant and inclusive learning community encourages students from various backgrounds to achieve their best. The variety within the student body and staff could be leveraged to strengthen the programme even further.

The panel determines that students are well-supported throughout the programme. It considers the programme to be feasible, and advises continued monitoring to maintain this. The panel is positive about the role of the study advisors as well as the mentoring programme, assisting students in navigating the programme. Nevertheless, the availability of more study advisors would help reduce their workload and would benefit the students. The admission criteria, the information provided to students, and the facilities available for students with functional impairments are all satisfactory. Students indicated that they prefer to receive information about electives at two separate moments for period 2 and period 3. They would also appreciate to receive more information on possible career paths and how to prepare for these. The panel concurs that this would support students in choosing suitable electives.

The international teaching staff are experts in their diverse fields. They represent a broad variety of domains, covering the academic scope of the programme, and provide a strong connection between teaching and research activities. Moreover, they are committed and responsive to students. The panel also values the efforts to enhance the programme's coherence, including a regular teachers' conference to unify standards.

Standard 3. Student assessment

The panel concludes that the assessment system of the programme is transparent and well-designed. Adequate procedures, such as the four-eyes principle and clear rubrics, are in place to ensure the quality of assessment. Amongst others, the panel appreciates the diverse and appropriate assessment methods used, the positive balance between individual and group work in the programme, as well as the comprehensive efforts to standardize the interpretation of assessment rubrics across the involved faculties. It is also positive about the interdisciplinary teams in the thesis assessment, while the final assessment is conducted on an individual basis. The Board of Examiners adequately safeguards the quality of assessments within the programme.

To further enhance the quality of assessment the panel recommends standardizing passing grade criteria. Additionally, the panel suggests providing more extensive feedback; ensuring that every thesis contains a reflection; using separate assessment forms for the two thesis examiners; standardizing the feedback process; and placing greater emphasis on presentations within the thesis assessment. The panel encourages the Board of Examiners to adopt a more proactive approach in monitoring the thesis process and recommends increasing the sample size of theses to be reviewed periodically.

Standard 4. Achieved learning outcomes

The panel concludes that the level of the theses is appropriate for an academic master's programme and that students achieve the intended learning outcomes. To further strengthen the programme, it recommends integrating a clear structure and place for the thesis project within the programme's vision, to ensure that students are prepared to achieve the ILOs throughout their studies, as well as verifying that the ILOs are consistently covered, considering students typically follow very diverse trajectories.

The programme effectively prepares students for the labour market in diverse sectors, as well as for pursuing postgraduate studies at the PhD level. Alumni find professional positions that match the programme's content and level. They are generally content with the programme and are well prepared to perform successfully in the academic and professional field in the Netherlands and abroad.

Score table

The panel assesses the programme as follows:

Master's programme Applied Data Science

Standard 1: Intended learning outcomes	meets the standard
Standard 2: Teaching-learning environment	meets the standard
Standard 3: Student assessment	meets the standard
Standard 4: Achieved learning outcomes	meets the standard

General conclusion positive

Prof. dr. S. (Sandjai) Bhulai, panel chair

Drs. C. (Carlijn) Braam, panel secretary

Date: 13 October 2025

Introduction

Procedure

Assessment

On 30 June and 1 July 2025, the master's programme of Utrecht University was assessed by an independent peer review panel. The assessment followed the procedure and standards of the NVAO Assessment Framework for the Higher Education Accreditation System of the Netherlands (April 2024).

Quality assurance agency Academion coordinated the assessment upon request of Utrecht University. Peter Hilderling acted as coordinator in the assessment and Carlijn Braam acted as secretary for the assessment of the programme. They have been certified and registered by the NVAO.

Preparation

Academion composed the peer review panel in cooperation with the institutions and taking into account the expertise and independence of the members. On 10 April 2025, the NVAO approved the composition of the panel. The coordinator instructed the panel chair on his role in the site visit according to the Panel chair profile (NVAO 2016).

The programme composed a site visit schedule in consultation with the coordinator (see appendix 3). The programme selected representative partners for the various interviews. It also determined that the development dialogue would be made part of the site visit. A separate development report was made based on this dialogue.

The programme provided the coordinator with a list of graduates over the academic years 2022-2023 and 2023-2024. In consultation with the coordinator, the panel chair selected 15 theses of the programme. They took the diversity of final grades and examiners into account, as well as the various faculties that supervised the thesis projects. Prior to the site visit, the programme provided the panel with the theses and the accompanying assessment forms. It also provided the panel with the documentation (see appendix 4).

The panel members studied the information and sent their findings to the secretary. The secretary collected the panel's questions and remarks in a document and shared this with the panel members. In a preliminary meeting, the panel discussed the initial findings on the self-evaluation report and the theses, as well as the division of tasks during the site visit. The panel was also informed on the assessment framework, the working method and the planning of the site visit and report.

Site visit

During the site visit, the panel interviewed various programme representatives (see appendix 3). The panel also offered students and staff members an opportunity for confidential discussion during a consultation hour. No consultation was requested. The panel used the final part of the site visit to discuss its findings in an internal meeting. Afterwards, the panel chair publicly presented the preliminary findings, general observations of the panel and suggestions for development themes.

Report

The secretary wrote a draft report based on the panel's findings and submitted it to the coordinator for peer assessment. Subsequently, the secretary sent the report to the panel for feedback. After processing this feedback, the secretary sent the draft report to the programme in order to have it checked for factual

irregularities. The secretary discussed the ensuing comments with the panel chair and changes were implemented accordingly. The panel then finalized the report, and the coordinator sent it to the faculty and Utrecht University.

Panel

The panel assessing the master's programme Applied Data Science at Utrecht University consisted of the following members:

- Prof. dr. S. (Sandjai) Bhulai, professor in Business Analytics at the Faculty of Science of the Vrije Universiteit Amsterdam [panel chair];
- Prof. dr. A. (Anna) Wilbik, professor in Data Fusion and Intelligent Interaction at the Department of Advanced Computing Sciences of Maastricht University;
- Prof. dr. T. (Thomas) Poell, professor in Data, Culture & Institutions at the Department of Media Studies of the University of Amsterdam;
- N. (Nienke) Wessel BSc., student in the MSc Data Science, MSc Conflict Studies and MA Linguistics at Radboud University [student member].

Each panel member and the panel secretary has filled out the Statement of Impartiality and non disclosure agreement, as required by the NVAO. They can confirm that the assessment was carried out in complete independence.

Information on the programme

Name of the institution:	Utrecht University
BRIN-number:	21PD
Address:	Heidelberglaan 8, 3584 CS Utrecht
Website:	http://www.uu.nl
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive
Programme name:	M Applied Data Science
ISAT number:	60971
Orientation of the programme:	wo
Level of the programme:	Master (NLQF7)
Number of credits:	60 EC
Language of instruction:	English
Specializations or tracks:	-
Professional requirements:	no
Location:	Utrecht
Mode(s) of study:	Fulltime
Awarded degree:	MSc.
Submission date NVAO:	1 November 2025

Description of the assessment

Organization

Utrecht University's master's programme Applied Data Science (ADS) is an interdisciplinary master led by the Department of Information and Computing Sciences, with contributions from six faculties of Utrecht University. These are the Faculty of Science, the Faculty of Humanities, the Faculty of Geosciences, the Faculty of Social and Behavioural Sciences, the University Medical Centre Utrecht (UMCU), and the Faculty of Law, Economics and Governance. ADS is part of the Graduate School of Natural Sciences (GSNS), which encompasses fourteen master programmes in the Faculty of Science. The task of the GSNS is to provide training, teaching and research for MSc students and PhD candidates and to manage and guarantee the overall quality control and consistency of the MSc and PhD programmes. The GSNS defines the curriculum framework of its programmes, regulates the admission procedure, is responsible for a common set of Education and Examination regulations (EER) and implements policy rules that come from the University Executive Board or from its own Board of Studies. This Board consists of the directors of master's education of the Departments of Chemistry, Information and Computing Sciences, Mathematics, and Physics. All master and PhD programmes of the Faculty of Science are also firmly embedded in Utrecht research institutes, with modern educational and research facilities. ADS falls within the Research Institute of the Department of Information and Computing Sciences.

The ADS Programme Council, chaired by the programme leader, has representatives from all the contributing faculties. Its task is to advise on programme content and quality control. The programme leader is responsible for the content, quality, and level of the ADS programme, assisted by two programme coordinators. Responsible for the quality assurance in the programme and the alignment of the programme with university and GSNS policies and regulations is the director of education for ADS, who is a member of the GSNS Board of Studies. The advisory board for ADS was set up in 2024, and is composed of academics, industry stakeholders and alumni. The advisory board is chaired by the education director.

Recommendations previous panel

The initial assessment of the master's programme ADS (TNO) took place in December 2019. In addition to two conditions, which the programme met in July 2020, the panel offered various recommendations for the programme: to formally and structurally involve the relevant work field in the further development, design, and evaluation of the programme; to explicitly specify the admission requirements; and to involve the Board of Examiners in the programme's further development and assessment. In response to these recommendations, the programme has established an Advisory Board, specified the admission criteria, and systematically involves the Board of Examiners. The panel concludes that the recommendations have been seriously acted upon by the programme and is generally satisfied with the improvement measures taken.

Standard 1. Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

Profile

The master's programme Applied Data Science (ADS) responds to the demand for data science applications in a wide range of knowledge domains. According to the self-evaluation report, the programme has an

interdisciplinary focus and recognizes similarities in data challenges across different fields. Students get acquainted with a broad range of data types and data analysis techniques, situated in different social, organizational and economic contexts, including governance, media, health, geosciences, language sciences, and social sciences. The programme aims to provide students with the skills to apply data science practices, an understanding of the knowledge domain where their activity is situated, a strong sense of responsibility and an ethically informed perspective. ADS explicitly maintains a flexible approach, without tracks or specializations. The programme representatives highlighted that the one-year duration of the ADS programme enhances its value by expanding students' employment opportunities compared to other two-year data science master's programmes. This design choice was strongly promoted during the development of ADS by industry stakeholders, who emphasized the urgent need for trained data scientists in the labour market. The one-year format was chosen to meet industry demands efficiently, recognizing that data science is a rapidly evolving field where on-the-job training is common. Additionally, the shorter programme appeals to students seeking practical skills for immediate employment rather than in-depth research knowledge, targeting a different audience than traditional two-year programmes.

The panel recognizes the distinctive profile of the programme, its clear vision and its orientation towards the professional field. The panel is positive about the programme's interdisciplinary focus and flexibility, allowing students to learn how to work with data across a wide range of disciplines. As datafication affects all sectors of the economy and spheres of life, the panel believes it is fitting that the programme teaches students from different disciplines to work with and engage with data. The panel also appreciates the explicit attention to ethics and responsibility. At the same time, it noted from the discussions and course materials that these elements could be interpreted more broadly: ethics primarily seems to be interpreted as privacy-related. It emphasizes that incorporating responsibility into data science practices involves considering the broader consequences – the potential social, ethical, and legal implications – of the techniques used. This responsible data science extends beyond mere technical execution to ensure that the outcomes align with ethical standards and societal values. The panel advises the programme representatives to better align the rationale for the programme's one-year duration with its unique position within both the ICS department and the faculty, and to clearly articulate the aim for depth in the ethical and interdisciplinary dimensions, rather than in the technical domain, in its profile and communication. Additionally, the panel feels that the interdisciplinary character of ADS is one of its main strengths, which is however not reflected in the programme name. It suggests considering whether this could be better reflected in another name or otherwise strengthened in external communication.

Since 2024, the programme has had its own Advisory Board, which has met once so far. The panel notes that the Advisory Board primarily consists of internal and external academic members, alongside three industry partners/alumni. The programme representatives clarified that, for now, this composition appears sufficient, as the main focus of the programme is academic. The programme intends to maintain an open dialogue on its content, given the rapidly changing nature of the field. Additionally, there is ongoing contact with the professional sector through guest lectures, applied research projects, and a colloquium series designed to connect students with experts and practitioners in data science, including industry professionals. Based on feedback from industrial advisors, the programme plans to incorporate early opportunities for students to work with ('non-real world') data in collaborative projects in the first part of the programme. The panel considers the programme to be responsive to developments in the field and aligned with contemporary academic and societal debates. It appreciates the programme's strong engagement with external partners, particularly through thesis projects. The panel suggests involving more industrial partners in the Advisory Board in the future to expand its scope.

Intended learning outcomes

The programme's objectives have been translated into 12 intended learning outcomes (ILOs, see Appendix 1) which are grouped into 5 clusters: Knowledge and understanding; Applying knowledge and understanding; Making judgements; Communication skills; and Learning skills. The panel is of the opinion that the vision and profile of the programme have been translated well into the ILOs, which in turn are aligned with expectations from the international academic and professional fields. In addition, the panel notes that the ILOs are subject to annual checking and revision where necessary. During the site visit, the panel was informed that the ILOs are intentionally broad in scope to reflect the diverse, multidisciplinary nature of the programme. The programme intends to add the group work aspect, which is an important part of the programme, in the ILOs as well. While the panel views the ILOs as somewhat generic, they are nonetheless clearly articulated and appropriate for the academic master's level. The ILOs are formulated in accordance with the Dublin descriptors and thereby match level 7 of the Dutch qualification framework NLQF, and cover all relevant aspects of the master's programme. The panel recommends that the programme make the interdisciplinary aspects of its profile more explicit in the ILOs.

Considerations

The panel concludes that the master's programme Applied Data Science has a clear and distinctive profile, providing students with relevant academic knowledge and skills in data science practices across diverse fields. The panel appreciates the interdisciplinary focus of the programme and its orientation towards the work field. Students are adequately prepared for both advanced studies and professional careers in diverse fields. The panel finds the programme to be responsive to developments in the professional and academic fields, and suggests involving more industrial partners in the Advisory Board in the future to expand its scope. Additionally, ADS could benefit from more clearly aligning the motivation for being a one-year programme with its unique positioning within both the department and the faculty.

The ILOs of the programme match national and international requirements for master's programmes and reflect the profile of the programme. The panel recommends making the interdisciplinary aspects of the ADS profile more explicit in the ILOs. While it appreciates the attention to ethics and responsible data science in the programme, it emphasizes that incorporating responsibility into data science practices involves considering the broader social, ethical, and legal implications of the techniques used.

Conclusion

The panel concludes that the programme meets standard 1.

Standard 2. Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

Curriculum

The curriculum of the fulltime one-year master's programme consists of one core compulsory course (14 EC), a compulsory colloquium series (2 EC), an elective component (30 EC), and a thesis project (14 EC). The academic year is divided into four teaching periods. The first period is dedicated to the mandatory course Data Wrangling and Data Analysis, periods 2 and 3 to electives, and the fourth period to thesis projects. All courses have a duration of 10 weeks. Most courses have 4 to 6 contact hours per week, including lectures and smaller lab sessions. See appendix 2 for a curriculum overview.

The compulsory course *Data wrangling and data analysis* is designed to introduce students to the fundamentals of data analysis and visualization, methods for data wrangling, and basic machine learning methods. Thus, students from diverse backgrounds can be brought up to a baseline level of knowledge in core techniques. The panel learnt that one of the core assignments focuses on data within an ethical context. Two colloquium series, each of 1 EC, are organized throughout the year to give students a broader basis. One is designed to bring students in contact with experts and practitioners in data science; the other is designed as a forum for discussion of ethical and legal aspects of data science. In the elective component, students are offered a broad variety of courses enabling them to put the core techniques into practice in different fields. It is composed of four elective courses of 7.5 EC each, selected from among 13 available options, with various contributing departments/faculties. In the final period, students undertake independent (applied) research in a thesis project under supervision with real-world data, to address a specific question in one of these domains. Thesis projects include a significant number of projects hosted by social and industrial partners, as well as by all the participating faculties in the programme.

Although ADS spans multiple domains, it is not designed around tracks or specializations; all students are becoming specialized in data science techniques and applications. Since data science is by definition interdisciplinary, according to the programme, exposure to multiple domains, data types, techniques and formalisms is essential. This exposure is provided, amongst others, through practical use cases and real-world expertise presented in the colloquia.

During the interviews, the students expressed their general satisfaction with the programme, appreciating its multidisciplinary and the diversity in (elective) courses as well as in the backgrounds of students and teachers.

The quality of courses is evaluated after each teaching block. The responsibility for keeping track of evaluations and communicating the outcomes rests with the Education and Advisory Committee (EAC). The EAC further communicates the findings from evaluations to the ADS Programme Council and advises on possible actions.

Overall, the panel considers the curriculum to be well-structured, with a balanced content. It appreciates the variety of options available to students, particularly the diverse set of electives specifically for ADS students that cover a broad range of areas. These offer students significant flexibility in selecting specific domains to explore in greater depth. Also valued are the role of Education and Advisory Committee (EAC), and the weekly colloquia. Students emphasized the value of these colloquia on Fridays, providing more in-depth knowledge and higher-level discussion on topics. According to the students, the attention to labour market orientation in the programme through the weekly lectures on either data science in practice or data science ethics is evident. Instead of an online meeting, some students would prefer a hybrid form for the colloquia, to stimulate interaction and networking options. The panel concurs with the students' suggestion to make the colloquia more hybrid and encourages the programme to utilize these more extensively for community building. In addition, students would like to see greater cohesiveness among courses from different faculties, to avoid repetitions or gaps. The panel appreciates that, based on the evaluations by students, the need for more consistency and coherence was taken on board and culminated in two programme-wide initiatives, namely, the organization of a regular Teachers' Conference and the setting up of an exercise to harmonize rubrics and grading practices. Furthermore, some students would welcome increased emphasis on specific technical skills, such as practical coding and Power BI. The panel notes that there is room within the courses to include extra work if they wish to do so, although both students and staff have noted that the programme

is quite fast-paced, somewhat limiting opportunities for in-depth exploration of topics. Therefore, the panel advises to keep monitoring the feasibility of the programme.

According to the panel, the interdisciplinarity within the programme could be further developed in a more systematic way, in line with the programme's vision. It supports the programmes' initiative to restructure the compulsory course, which current focus is on technical skills, towards a more interdisciplinary approach, also encompassing responsible data science. The panel recommends embedding interdisciplinarity throughout every part of the programme, thus better leveraging the diversity of the student body and staff, particularly in relation to themes such as ethics and responsible data use. For instance, by involving staff members from other faculties in all elective courses, since cross-faculty expertise is particularly valuable in this programme. Making interdisciplinarity the central focus of the programme would also enhance the coherence and sustainability of the overall curriculum. Furthermore, the panel advises to maintain alignment of the curriculum with the ILOs.

Language of instruction and communication

As all GSNS programmes, the programme is taught in English and uses an English-language name, although some thesis projects – usually for external partners – require competence in the Dutch language. Since English is an important language of communication in the international workplace and in data science research, the panel views the use of the English language as appropriate in preparing students for further education and careers in an international and English-speaking environment. The programme's student population includes both Dutch and international students. Additionally, the teachers and supervisors in the ADS programme are international, resulting in an international and inclusive English-language learning environment for the students.

Admission and characteristics of incoming students

The ADS programme employs a competency-based admissions model that promotes a diverse student intake. It emphasizes interdisciplinary competencies, such as statistical knowledge and programming skills, over specific grades or disciplinary backgrounds; the entry requirements are relatively minimal, requiring only 15 EC in specific areas. Applicants from all academic fields are eligible, provided they have completed a bachelor's degree. However, there are additional technical skill requirements. Applicants must, among other things, demonstrate solid knowledge of statistics at an academic level, including at least 7.5 EC in coursework covering descriptive and inferential statistics, as well as at least 7.5 EC of academic coursework in programming, with demonstrated knowledge of data analysis and statistics in both R and Python, acquired through formal university courses. Admission is handled by the Admissions Committee, and the screening of application dossiers is a core responsibility of the programme coordinators. The Admissions Committee also assesses additional entry requirements, such as English proficiency.

The programme draws a diverse student population, including students from both EU and non-EU countries. In line with the GSNS goal, international students make up approximately 30-35% of the annual intake, which varies between 88 (2020) and 189 (2021) students, with 165 first-year students in 2023. Since the entry requirements are relatively minimal, requiring only 15 EC in specific areas, ADS does not have an official premaster's programme or designated deficiency courses. Students can usually complete the requirements within the elective space of their bachelor's curriculum. In recent cohorts, there is a strong representation of students with a computing or informatics background, complemented by students from backgrounds such as economics, social sciences and humanities. The panel considers that the programme has clear and reasonable entry requirements that fit the programme goals.

Teaching methods

ADS follows the Utrecht education model, which emphasizes flexibility. By offering a broad selection of electives, which is continuously extended, freedom of choice based on personal interests and goals is maximized. In accordance with UU's vision on teaching and research, the courses are designed to reflect the research interests of staff members, ensuring a strong connection between teaching and research activities. Moreover, ADS is one of the focus areas in which the university is committed to investing. The panel agrees with the programme representatives that access to high-performance computing facilities is essential for both ADS students and teaching staff.

Most teaching occurs in lectures, small lab groups, and colloquia. The programme exploits different pedagogical techniques, ranging from instructional modes in the classroom to self-study, supervised research carried out individually and in groups, and laboratory experimentation. Group work is incorporated into every course. Students mostly have positive experiences with group work, as they shared with the panel, and find the balance between individual and group work to be good. They find the diversity of the student group to contribute to their learning experience. The panel values the varied teaching methods and the active learning community, enabling students with different backgrounds to perform optimally.

Feasibility and guidance

The panel views the guidance provided to students during the programme and the accessibility of programme-specific services and facilities positively, providing ample opportunities for the development of an academic community. These include an introduction week and an annual student event at the start of the year, which is organized in collaboration with the student ambassadors. Furthermore, a mentoring programme is in place, with alumni acting as mentors for ADS students seeking advice. These connections are often facilitated by the programme leader. The two programme coordinators proactively monitor progress of students throughout their studies, and meet with students whenever necessary. Students also benefit from the faculty-wide student advisory service, who are easily accessible. The panel notes that there is an active learning community, backed by the student association. It appreciates the activities organized for and by students, as well as the availability of alumni as mentors. Students confirmed that they feel well supported throughout the programme and have close lines of contact with teachers and the programme management team. Some students feel that the feedback provided to those who voice concerns, such as the needs of diverse learners, could be improved.

In accordance with university policy, facilities are available to accommodate students with functional impairments or other special needs. These include provisions such as extra time for exams. Tailored solutions are developed for individual students who are in need of them. The panel finds that the programme sufficiently addresses studying with a functional impairment.

In general, the students find the workload to be appropriate and well-balanced, and the programme to be feasible, although the workload may depend on their background. The panel notes that ADS has the best success rates of the GSNS master's programmes; most students (around 75-80%) successfully complete the programme within one year. In addition, the proportion of students who discontinue the programme has dropped from 13% in 2021 to 5% in 2023.

The panel concludes that the study guidance is well-organized and that the programme is generally feasible. It has a positive impression of the study advisors, who are well embedded in the quality control cycle and maintain close contact with the ADS team. However, programme representatives would welcome the addition of more study advisors, a point that the panel supports. Furthermore, the panel acknowledges that the programme effectively provides information to students through the digital learning environment

(Blackboard until 2024-25, Brightspace as of 2025-2026) in an accessible and timely manner, including study planning and materials. Students are able to make well-informed decisions regarding electives that cover all ILOs. Students emphasized that they prefer to receive information about electives at two separate moments – one for period 2 and one for period 3 – since it is a lot to take in at once. They would also appreciate to receive more information on possible career paths and how to prepare for these (e.g., in the form of a personalized career orientation trajectory). The panel agrees that this would help students select appropriate electives, as there is currently no formal system in place to verify their choices.

Teaching staff

Teaching personnel for ADS are appointed from the department of Computer Science and other faculties of Utrecht University, as the GSNS has no dedicated teaching personnel. Thus, the programme is delivered by a diverse team of teachers, who are experts in their respective fields and represent a broad variety of domains. These include full professors, associate professors, (junior) assistant professors and PhD candidates. Many staff members have an international background; 8 (47%) of the 17 teachers involved in the taught component are international. Several ADS teachers are actively engaged in research falling under the Applied Data Science focus area. To ensure the coherence of the programme, ADS has implemented a regular teachers' conference to share knowledge; for instance, a topic for a next conference will be the overlap between courses. In addition, the team has started a programme-wide exercise to harmonize the interpretation of assessment rubrics. For each course, a course coordinator is responsible for the design and execution. All coordinators are in possession of a PhD.

In line with UU requirements, all staff members with teaching duties hold a Basic Teaching Qualification (BKO) or are in the process of obtaining one. Teachers who are involved in education management and curriculum development are encouraged to obtain a Senior Teaching Qualification (SKO); 5 staff members hold a SKO and an additional 4 are in a SKO trajectory. In the annual Assessment and Development cycle, both research and education criteria are of particular relevance, as the connection between education and research practice is fundamental to the UU education model. The Centre for Academic Teaching provides opportunities for the professional development of the teaching staff. In addition, the teachers' conference is used for developing the team's skills, for example, with a workshop on teamwork and how to evaluate this.

The panel has established that the committed staff have the broad expertise and teaching qualifications needed for this programme. They seem focused on continual improvement of the programme and are very open towards students' feedback. The panel also values the efforts to enhance the coherence of the programme and appreciates that a teachers' conference to unify standards has been established.

Considerations

The panel considers the curriculum to be well-structured, with a balanced academic content. It values the diverse selection of electives, which offer students the flexibility to explore various fields, although the fast-paced programme somewhat limits these opportunities. The varied teaching methods and the colloquia on Fridays are also highly appreciated. The panel agrees with the students' suggestions to make the colloquia more hybrid and encourages the programme to use these sessions effectively to foster community building.

The panel supports the programmes' initiative to restructure the compulsory course towards a more interdisciplinary approach. It recommends further embedding interdisciplinarity as a core element throughout the curriculum, aligning with the programme's vision, as cross-faculty expertise is particularly valuable in ADS. This approach would also enhance the curriculum's coherence and long-term sustainability. In addition, providing high-performance computing facilities for teaching will benefit the programme.

According to the panel, the choice for an English name and language of instruction is well substantiated and in alignment with the international nature of the professional and academic field. The programme's international orientation is reflected in the international community of students and staff. The vibrant and inclusive learning community encourages students from various backgrounds to achieve their best. The variety within the student body and staff could be leveraged to strengthen the programme even further.

The panel determines that students are well-supported throughout the programme. It considers the programme to be feasible, and advises continued monitoring to maintain this. The panel is positive about the role of the study advisors as well as the mentoring programme, assisting students in navigating the programme. Nevertheless, the availability of more study advisors would help reduce their workload and would benefit the students. The admission criteria, the information provided to students, and the facilities available for students with functional impairments are all satisfactory. Students indicated that they prefer to receive information about electives at two separate moments for period 2 and period 3. They would also appreciate to receive more information on possible career paths and how to prepare for these. The panel concurs that this would support students in choosing suitable electives.

The international teaching staff are experts in their diverse fields. They represent a broad variety of domains, covering the academic scope of the programme, and provide a strong connection between teaching and research activities. Moreover, they are committed and responsive to students. The panel also values the efforts to enhance the programme's coherence, including a regular teachers' conference to unify standards.

Conclusion

The panel concludes that the programme meets standard 2.

Standard 3. Student assessment

The programme has an adequate system of student assessment in place.

Findings

System of assessment

The programme's assessment system is based on the GSNS Assessment Plan, which includes assessment criteria for the entire school and specific assessment plans for each master's programme. In the ADS assessment plan, all programme components are connected explicitly with the overall learning outcomes. The panel observes that all assessments are aligned with the ILOs: for each course, there is a description of its assessment methods and how they align with the course-level and programme-level learning outcomes.

The panel notes with satisfaction that courses have multiple assessment moments, with the final grade calculated as a weighted sum of the component assessments, and that a variety of assessment methods are employed. Assessment includes examinations, as well as assignments that may involve presentations, reports, scientific literature surveys, programming and experimentation, data analysis, and brainstorming. The panel appreciates that, based on students' feedback, the weekly assignments in the compulsory course have been replaced with bi-weekly assignments, lowering the assessment workload for both students and staff. It also highlights a positive balance between individual and group work in every course and notes that students do not encounter any issues with freeriders.

Each course, as well as thesis projects, are assessed based on a rubric which connects assessment criteria to levels of attainment. These assessment criteria are known to students in advance. Most courses have

examinations or other assessments at different stages throughout the period. The panel was informed that course coordinators are the primary examiners; in many courses, a second examiner is involved. According to the self-evaluation report, one of the challenges of the programme is to maintain coherence in assessment methods and the interpretation of assessment rubrics due to the involvement of assessors from different faculties, especially for thesis projects. In response to earlier student feedback, ADS has introduced a comprehensive effort to standardize the interpretation of assessment rubrics across the involved faculties, an initiative that the panel commends.

Based on the interviews, the panel observes that the programme is actively considering how to address GenAI in education and assessment, including its potential impact on the ILOs. A working group on AI has been established at the GSNS level to develop guidelines. Currently, the Board of Examiners is prioritizing prevention measures, such as promoting more assessments in controlled environments, to minimize the risk of AI misuse. The panel appreciates these efforts.

Final assessment

The concluding component of the programme is a 14 EC thesis project. The thesis projects are conducted in interdisciplinary groups of two or three students, based on their indicated project preferences and a matching algorithm that the thesis supervisor uses. They encompass both internal and external research projects. Internal projects are primarily research-focused, sometimes involving collaborations with external partners, and allow students to integrate into existing research groups aligned with supervisors' ongoing work. External projects provide students with practical experience in real-world environments, working on data-driven problems with immediate organizational impact. All external projects are supervised by UU academic staff, with day-to-day supervision by members of the external organization involved. In an effort to harmonize supervision, all supervisors and students are provided with a thesis handbook explaining the procedures involved, as well as the thesis assessment rubric. Further information on the process is provided to students by the thesis coordinator and a website.

The process for soliciting and approving projects involves a structured call for proposals: internal projects are coordinated through the programme council and reviewed by the thesis coordinator and programme committee, while external projects are openly advertised via social media, alumni, and previous partners, with proposals submitted through an online questionnaire. The programme emphasizes standardization and iterative refinement of project proposals, maintaining a robust network of external partners who regularly contribute to thesis projects. After the review process, students can indicate their project preferences based on a thesis project book summarizing all approved projects and their assigned supervisors.

The panel notes that thesis assessment is based on a rubric aligned with the ILOs. Thesis projects are evaluated based on the process (30%), the quality of the thesis report (60%), and presentations (10%) delivered during an annual student conference attended by all ADS students and examiners. The process component includes integrity, responsibility, and a critical and reflective attitude. The panel appreciates that thesis assessment is done on an individual basis: students are expected to write an independent report presenting individual research. All three components currently require students to achieve a minimum passing grade to pass the assessment. The thesis is assessed independently by two examiners, usually the main supervisor and an independent second reader, while external supervisors are invited to give feedback on the assessment, particularly related to process criteria. During the site visit, the panel was informed that within the GSNS, there is a deliberate policy to complete one assessment form per thesis, providing a clear overview of the evaluation. If examiners disagree on the grade, the matter is escalated to the Board of Examiners; however, such disagreements are rare.

The panel is impressed with the systematic and collaborative efforts of ADS to develop the thesis assessment rubric in response to differences in grading, using the teachers' conference to review and calibrate the evaluation of different theses. The programme has developed a set of detailed guidelines related to the thesis assessment rubric, which will form part of the thesis manual sent to ADS thesis supervisors. The panel observes that the rubric guidelines provide comprehensive descriptions, concurring with the Board of Examiners that this will help harmonize the grading process and should result in a more uniform evaluation.

The panel reviewed a selection of 15 theses, including the corresponding assessment forms. It generally agrees with the grades awarded to the theses, although it noted some discrepancies in the grading of theses. It found the grade motivation on thesis forms to be very minimal in some cases. In general, the panel finds it unclear how the individual sections, as well as the evaluations of the individual assessors, contribute to the final thesis grade, which are generally quite high, with many students scoring between 7.5 and 9. It also found some small inconsistencies between verbal descriptions and numerical grades (for example, 'good' can be a 6, 7, or 8). In one case, it noted that a student passed the thesis assessment while having an insufficient grade for the discussion section of the thesis. The panel suggests checking whether students can have an insufficient grade for a thesis component and still pass, and if so, ensuring that this situation cannot occur. It is of the opinion that including a discussion/reflection section in the thesis report should be a minimal requirement. Furthermore, the panel observes that the methods of delivering feedback on theses vary, resulting in reduced transparency for students.

Based on its findings, the panel recommends standardizing passing grade criteria. Furthermore, it advises to provide more extensive feedback, especially for higher grades; for examiners to complete assessment forms independently; and to standardize the feedback process (e.g., via email, Blackboard, or the rubric). The panel additionally suggests placing greater emphasis on presentations within the thesis assessment, in line with the ongoing development towards more controlled assessment in the light of the developments in generative AI. The panel also encourages the programme to work with thesis supervisors from different research groups/backgrounds.

Board of Examiners

The GSNS Board of Examiners is responsible for the quality of all exams and master's degrees conferred by the graduate school. It is composed of the chair, secretary and individual members representing each master's programme. The ADS representative in the Board of Examiners chairs the 'kamer' for the programme and is also a guest at the ADS Programme Council meetings. Among the tasks of the Board of Examiners are: monitoring examination quality; approval of new courses in consultation with the programme director and programme leader; approval of thesis projects and examiners for individual theses; and communicating with the Programme Council and EAC on the outcomes of course assessments and evaluations by students.

A particular attention point of the Board of Examiners has involved grading groupwork, making the involved examiners aware that individual contributions from students should be objectively traceable in the computation of the final grades. Another key attention point has been the approval of thesis projects and examiners for individual theses. The Board of Examiners has designed a streamlined process for extending second examiner approval, and has performed a major overhaul of the entire management of thesis projects, together with the thesis coordination team. This has resulted in a separate website that describes, in detail, the entire thesis workflow. According to the programme, this new approach is highly praised by both students and thesis supervisors. Based on its independent checking of selected thesis reports to validate the assessments made by examiners, the Board of Examiners concludes that ADS theses are in general of the intended quality level. The panel was informed that while the Board of Examiners periodically reviews thesis

project assessments, they are working towards an annual intervision-based exercise, in which a sample of theses is assessed by independent evaluators and then checked against the grades awarded by the examiners.

The panel discussed the inconsistencies it observed in thesis grading with the Board of Examiners. The Board of Examiners agreed that such inconsistencies should be avoided in the future. To address this, they plan to use a more representative sampling of theses, including at least one thesis from each faculty involved in ADS. Overall, the Board finds the current grade distribution to be balanced. It further stated that the rule requiring all three thesis components to achieve a minimum passing grade will be modified.

Based on the documentation and the interviews during the site visit, the panel concludes that the Board of Examiners adequately safeguards the quality of assessment in the programme. It controls assessment quality in various ways, ensuring a thorough focus on the key areas related to the programme. Nonetheless, the panel encourages the Board of Examiners to adopt a more proactive approach in monitoring the thesis process and recommends increasing the sample size of theses examined in the future, suggesting more than five theses per year.

Considerations

The panel concludes that the assessment system of the programme is transparent and well-designed. Adequate procedures, such as the four-eyes principle and clear rubrics, are in place to ensure the quality of assessment. Amongst others, the panel appreciates the diverse and appropriate assessment methods used, the positive balance between individual and group work in the programme, as well as the comprehensive efforts to standardize the interpretation of assessment rubrics across the involved faculties. It is also positive about the interdisciplinary teams in the thesis assessment, while the final assessment is conducted on an individual basis. The Board of Examiners adequately safeguards the quality of assessments within the programme.

To further enhance the quality of assessment the panel recommends standardizing passing grade criteria. Additionally, the panel suggests providing more extensive feedback; ensuring that every thesis contains a reflection; using separate assessment forms for the two thesis examiners; standardizing the feedback process; and placing greater emphasis on presentations within the thesis assessment. The panel encourages the Board of Examiners to adopt a more proactive approach in monitoring the thesis process and recommends increasing the sample size of theses to be reviewed periodically.

Conclusion

The panel concludes that the programme meets standard 3.

Standard 4. Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

Theses

The 14 EC master's thesis is regarded as the programme's final work, in which students demonstrate that they achieved the ILOs at an individual level. In the theses, students use different existing techniques and methods to analyse the data and find answers. In preparation for the site visit, the panel examined 15 theses. In the selection, a proper distribution across grades was ensured, as well as coverage of all faculties involved

in ADS. In the opinion of the panel, the level of the examined theses is appropriate for an academic master's programme. In general, the theses demonstrate the achievement of the ILOs and are of expected quality. The panel found them to be highly structured, although at times they lacked a clear motivation of the research question, an ethical reflection, and/or an explanation for why specific methods were used, which the panel considers important academic components. The wide range of topics, techniques and methods reflects the broad nature of the programme. To further enhance the interdisciplinary strength of the programme, the panel advises the programme to organize thesis supervision in a more interdisciplinary and diverse manner, and sees opportunities to formulate research questions more broadly and across faculty boundaries, in order to better reflect a range of perspectives and disciplines.

To ensure that all theses contain main elements such as a reflection, the panel recommends integrating a clear structure and designated place for the thesis project within the programme's vision and curriculum, ensuring that students are optimally prepared for their thesis project. Furthermore, it recommends verifying that the ILOs are consistently covered in the programme, considering students typically follow very diverse trajectories (electives). This verification process could be automated to reduce the need for manual checks for each individual student.

Alumni

The majority of ADS graduates find direct employment following their studies. 85% find jobs connected with their field of study, and 70% feel that the programme gave them a good basis for the labour market. They have a variety of (technical and translator) roles, for example, as data scientists. Around 5% of the graduates continue to pursue PhD research, and some join another master's programme to seek further specialization.

The professional representatives assured the panel that ADS alumni are well-equipped and able to apply their learned skills and knowledge effectively. They highlighted that the programme has evolved over the years to meet changing industry needs. The panel determines that students are adequately prepared to secure suitable employment or pursue further education.

The panel appreciates that the programme is currently seeking ways to provide opportunities for more students to have access to potential employers, complementing the existing colloquia, as students could be better prepared by setting more realistic expectations about their job responsibilities. The panel encourages the programme to continue its efforts in keeping track of alumni, which will help gain a clearer understanding of the connection between alumni's profiles/backgrounds and their employment outcomes.

Considerations

The panel concludes that the level of the theses is appropriate for an academic master's programme and that students achieve the intended learning outcomes. To further strengthen the programme, it recommends integrating a clear structure and place for the thesis project within the programme's vision, to ensure that students are prepared to achieve the ILOs throughout their studies, as well as verifying that the ILOs are consistently covered, considering students typically follow very diverse trajectories.

The programme effectively prepares students for the labour market in diverse sectors, as well as for pursuing postgraduate studies at the PhD level. Alumni find professional positions that match the programme's content and level. They are generally content with the programme and are well prepared to perform successfully in the academic and professional field in the Netherlands and abroad.

Conclusion

The panel concludes that the programme meets standard 4.

General conclusion

The panel judges that the master's programme Applied Data Science meets standard 1 (Intended learning outcomes), standard 2 (Teaching-learning environment), standard 3 (Student assessment) and standard 4 (Achieved learning outcomes). The panel's assessment of the programmes is therefore positive.

Recommendations

1. Make the interdisciplinary aspects more explicit in the ILOs, and interpret responsible data science more broadly to encompass potential social, ethical, and legal implications.
2. Further embed interdisciplinarity as a core focus throughout the curriculum, aligning with the programme's vision, thereby enhancing the curriculum's coherence and long-term sustainability.
3. Standardize passing grade criteria for the master's thesis.
4. Integrate a clear structure and designated place for the thesis project within the programme's vision and curriculum, ensuring that students are optimally prepared for their thesis project, and verify that the ILOs are consistently covered, taking into account the diverse student trajectories.
5. As Board of Examiners, adopt a more proactive approach in monitoring the thesis process by increasing the sample size of annually selected theses.

Appendix 1. Intended learning outcomes

Knowledge and understanding

- K1. Can use their knowledge of Applied Data Science to contribute to the development and/or application of scientific concepts and methods.
- K2. Is able to understand important recent developments in Applied Data Science, and of indicating their implications for society and the research field.
- K3. Is able to interpret and use literature in the field of Applied Data Science.
- K4. Has insight into the role that ethical and legal issues play in the field of Applied Data Science.

Applying knowledge and understanding

- A1. Is able to translate a problem from the area of Applied Data Science to an approach relevant to a product or service.
- A2. Is able to independently design and execute a research plan with the required care and ethical responsibility (such as fairness, explainability, value-sensitive design, and general regulations, and others) and to process, interpret and evaluate the empirical data and outcomes thus obtained in the appropriate manner.

Making judgements

- M1. Is able to interpret and evaluate the results of another person's empirical or theoretical research.
- M2. Is able to indicate the relevance of research for the solution of questions and problems in the field of applied data science, from a societal point of view.

Communication skills

- C1. Is capable of clearly communicating the results of research, in writing as well as orally, to an audience of specialists and laymen, also in an international context.
- C2. Is capable of functioning effectively in a multidisciplinary team.

Learning skills

- L1. Has acquired an effective and results-driven way of working that allows them to function independently in a competitive labour market.
- L2. Has insight into employment opportunities and on the skills needed to make a successful start in the job market.

Appendix 2. Programme curriculum

General structure

The curriculum consists of a 46 EC course part and a 14 EC thesis part.

Course part (46 EC)

The course part of this programme consists of:

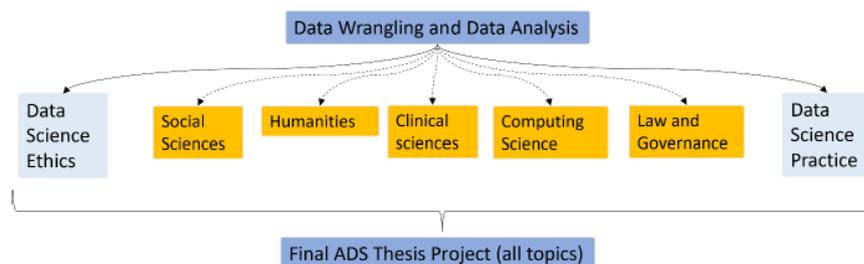
- 1 compulsory course (14 EC)
- 4 elective courses (30 EC)
- compulsory colloquium series (2 EC)

Course components

Faculty and departments	Course(s)
Science (Information and Computing Sciences)	<u>Compulsory course:</u> Data wrangling and data analysis (14 EC)
Social Sciences (incl. methodology and statistics)	<u>Elective courses:</u> Causal Inference Methods for Policy Evaluation Dynamics and causality in the social and behavioural sciences Human Network Analysis Data Ethics: Responsible data practices and value-sensitive design Personalisation for (public) media Text and media analytics Transformers: Applications in language and communication
Humanities (incl. computational linguistics)	
Geosciences	
UMCU (Clinical and medical sciences)	
Science (Information and Computing Sciences)	Spatial data analysis and simulation modeling Spatial statistics and machine learning
Law, Economics and Governance	Using data from routine care Epidemiology and medical datascience Visual analytics for big data
Cross-domain	Data science in public governance <u>Colloquium series:</u> Data science practice colloquium series Data science ethics colloquium series

Table 3 Courses offered in the ADS Program. Unless otherwise indicated, each course has an EC value of 7,5.

Schematic overview



Appendix 3. Programme of the site visit

Monday 30 June 2025

11.00	11.05	Arrival and welcome
11.05	11.30	Private panel meeting
11.30	12.15	Interview programme management
12.15	13.15	Lunch break
13.15	14.00	Interview students and alumni
14.00	14.15	Break
14.15	15.00	Interview teaching staff
15.00	15.30	Break
15.30	16.00	Interview Board of Examiners
16.00	16.15	Break
16.15	17.00	Interview academic and professional stakeholders (domain representatives & partners)
17.00	17.30	Panel wrap-up

Tuesday 1 July 2025

08.45	09.00	Panel arrival	
09.00	11.00	Thematic sessions	
	09.00	09.50	Session 1 (Coherence in the interdisciplinary programme – how to make the global picture evident to students and outsiders)
	09.50	10.05	Break
	10.05	10.55	Session 2 (Changing student profiles, and how to accommodate different levels of knowledge, especially for the foundational course)
11.00	12.00	Private panel meeting	
12.00	12.30	Final interview management and faculty	
12.30	13.00	Lunch break	
13.00	13.30	Private panel meeting	
13.30	13.45	Oral feedback	

Appendix 4. Materials

Prior to the site visit, the panel studied 15 theses of the master's programme Applied Data Science. Information on the theses is available from Academion upon request.

The panel also studied other materials, which included:

Self evaluation report

Self evaluation report M Applied Data Science 2025, including student chapter

Appendices

- ADS Learning Outcomes
- Form for Thesis Proposals
- Thesis assessment rubric
- Rubric guidelines
- Sample of published papers from student theses
- List of teaching staff involved in ADS, and their qualifications

Additional information

- Utrecht University Vision on Education
- Intake and study success rates:
 - o Intake graphs ADSM of the NL Bachelor graduates between 2020 and 2024
 - o Intake numbers by background degree
 - o Study success rates per cohort 2020-2023, per cohort at the level of the faculty BETA and in comparison with NL master's in the same cluster
- GSNS documents and regulations:
 - o Annual report Graduate School of Natural Sciences Education Committee 2022-2023
 - o Annual report Graduate School of Natural Sciences Education Committee 2023-2024
 - o Assessment Policy Plan Graduate School of Natural Sciences 2017
 - o Graduate School of Natural Sciences EER 2024-2025 in Dutch
 - o Graduate School of Natural Sciences EER Annexes 2024-2025 in English
 - o GSNS Provisions Process from September 2024 Onward
 - o Reglement Examencommissie Graduate School of Natural Sciences per 01-09-2024
 - o Study Advisors Procedures for Student Monitoring
- Selected course materials:
 - o INFOMDWR – Data Wrangling and Data Analysis (2024-2025)
 - o INFOMDCSBS – Dynamics and Causality in the Social and Behavioural Sciences (2024-2025)
 - o INFOMCIMPE – Causal Inference Methods for Policy Evaluation
- Selected examples of assignments/exams and their respective feedback (available during the visit)
- Selected ADS MSc theses