



NVAO  THE NETHERLANDS

PEER REVIEW NEW PROGRAMME

BACHELOR

DATA SCIENCE & ARTIFICIAL

INTELLIGENCE

Leiden University

SUMMARY REPORT

1st July 2021



1 Peer Review

The quality of a new programme is assessed by means of peer review. A panel of independent peers including a student reviews the plans during a site visit to the institution. A discussion amongst peer experts forms the basis for the panel's final judgement and the advisory report. The focus is on the curriculum, the teaching and learning environment, and student assessment.

The Accreditation Organisation of the Netherlands and Flanders (NVAO) takes a formal decision on the quality of the new programme based on the outcome of the peer review. This decision can be positive, conditionally positive or negative. Following a positive NVAO decision with or without conditions the institution can proceed to offer the new programme. Upon completion of the programme graduates are entitled to receive a legally accredited degree.

This summary report contains the main outcomes of the peer review. A full report with more details including the panel's findings and analysis is also available. NVAO bases an accreditation decision on the full report.

Both the full and summary reports of peer reviews are published on NVAO's website www.nvao.net. There you can also find more information on NVAO and peer reviews of new programmes.

Because of COVID-19 temporary measures apply for this peer review.

2 Panel

Peer experts

1. Prof. Dr. Willem-Jan Van den Heuvel (*chair*), Professor Information Systems at *Universiteit van Tilburg/Jheronimus Academy of Data Science (JADS)*;
2. Prof. dr. ir. Stan van Hoesel, Professor of Operations Research at *University Maastricht*;
3. Prof. dr. Lejla Batina, Professor Digital Security and Programme Director Instituut Informatica en Informatiekunde at *Radboud Universiteit*;
4. Ruward Karper, (*student*), Student Joint Master Data Science & Entrepreneurship, *Universiteit van Tilburg & Technische Universiteit Eindhoven*.

Assisting staff

- Riekje de Jong, secretary;
- Frank Wamelink, NVAO policy advisor and process coordinator.

Site visit (online)

Leiden Institute of Advanced Computer Science (LIACS), May 18th 2021

3 Outcome

The NVAO approved panel reaches a positive conclusion regarding the quality of the bachelor programme Data Science and Artificial Intelligence offered by Leiden University. The programme complies with all standards of the limited NVAO framework.

The overall objective of the bachelor DSAI is that students learn how to get insight from data and how to build “intelligent” machines capable of performing tasks that typically require human intelligence in order to provide useful applications for society.

The panel is very positive about the vision and the aims of the new bachelor programme DSAI and the intended qualification profile of the graduate.

The programme defines a set of complete and concise intended learning outcomes. It is demonstrated that the intended learning outcomes meet bachelor level and expectations of the (professional) field by matching them with international reference frameworks. These goals are well thought out and further developed in discussion with envisioned teachers and the Advisory Board.

The panel recommends clarifying the emphasis on the theoretical approach of problem solving in its communication to students and the field. Although issues of security, privacy, ethics, legal aspects and soft skills are present in various courses, the panel recommends that these issues are strengthened in the curriculum and highlighted in the Intended learning outcomes.

The programme fits with the wider vision on teaching and learning of Leiden University and the existing research environment.

The programme is a thorough elaboration of the intended learning outcomes. The learning lines and the didactics of the courses contribute to the achievement of the goals of the programme by the graduate. The overall objectives of the programme are translated into six learning trajectories: computational thinking, mathematical skills, basic AI, intelligent systems, cognition and research skills. Guidance of students is properly in place on several levels and student engagement is part of the culture. The staff is well qualified and committed to the new programme. Interactions between the contributing disciplines and groups are fruitful, thus illustrating the interdisciplinary attitude of the staff.

The panel affirms English as language of teaching. The panel considers the intake level and the mandatory matching procedure of Dutch students as adequate.

The assessment policy is both formally at the level of the program, and more operationally in the courses well developed. A mixture of assessments is used. The assessment policy also promotes a steady study behaviour. The quality assurance of assessments is detailed and a strong point of the programme. Developing assessment matrices could be of added value in the quality assurance of course assessments. The assessment of the thesis is well developed and substantive.

LIACS will be fully responsible for the development and delivery of this new programme. This is a solid base of implementing the new DSAI programme. Necessary agreements about teaching are already in place with participating institutes. The panel concludes that



envisioned lecturers are already collaborating in the design of the new programme that will start in September 2022.

All in all, the panel assesses the quality of the programme as positive.



4 Commendations

The programme is commended for the following features of good practice.

1. Integration and depth: The programme is centred on solving problems by the combination of Data Science and Artificial Intelligence with an emphasis on thorough understanding of formal methods and techniques.
2. Relevant expertise LIACS: The programme fits the existing educational activities and connects well with LIACS research with an accent on methodology rather than on industrial or public/consumer applications.
3. Graduates well qualified for master: Both the intended learning outcomes of the programme, that are elaborated in the learning tracks and the choice of minors, prepare appropriately for a faculty master or a master offered by the consortium of Leiden University, TU-Delft, and Erasmus University.
4. Decisive coordination: The full support and solid base of LIACS as host of the new programme that is taking responsibility of coordination, management and quality assurance

5 Recommendations

For further improvement to the programme, the panel recommends a number of follow-up actions.

1. Highlight the DSAI profile with its focus on theoretical foundations more clearly in the intended learning outcomes and in communication to students and the professional field.
2. Embed societal issues like cyber-security and privacy, ethics and legal aspects more broadly in the curriculum. Also soft skills like communication and cooperation can be strengthened in the programme.
3. Put structural effort in the (current ad-hoc) mentoring of young staff combining research and teaching and putting effort in the design of the new DSAI bachelor programme. Make this a structural part of the professionalisation of new staff.
4. Use assessment matrices to assure the right level of assessment and the alignment of course objectives and course assessments.



6 What comes next?

NVAO grants initial accreditation to a new programme on the basis of a panel's full report. The decision is valid for a maximum of six years. For a conditional accreditation other regulations apply. Upon accreditation the new programme will follow the NVAO review procedures for existing programmes. NVAO publishes the accreditation decision together with the full report and this summary report.¹

Each institution has a system of quality assurance in place ensuring continuous follow-up actions and periodic peer-review activities. Peer reviews help the institution to improve the quality of its programmes. The progress made since the last review is therefore taken into consideration when preparing for the next review. The follow-up activities are also part of the following peer-review report. For more information, visit the institution's website.²

¹ <https://www.nvaio.net/nl/besluiten>

² <https://www.universiteitleiden.nl>



7 Summary in Dutch

Het panel oordeelt positief over de kwaliteit van Data Science and Artificial Intelligence van de Universiteit Leiden. Dit is de uitkomst van de kwaliteitstoets uitgevoerd door een panel van *peers* op verzoek van de Nederlands-Vlaamse Accreditatieorganisatie (NVAO). Voor deze beoordeling heeft het panel gesprekken gevoerd met de opleiding op 18 mei 2021.

Studenten leren in de Bachelor opleiding Data Science and Artificial intelligence (DSAI) om hun verkregen inzicht in data te gebruiken voor het ontwikkelen van “intelligente” machines die taken uitvoeren die een menselijke intelligentie vereisen om bruikbare maatschappelijke toepassingsmogelijkheden te bieden. De soort oplossingen die studenten Data Science en Artificial Intelligence ontwikkelen zijn van methodische en technische aard. Studenten maken daarbij ook gebruik van kennis uit de (cognitieve)psychologie en neurowetenschappen, statistiek, taalwetenschappen en filosofie.

De doelen van de opleiding passen bij de internationale kwalificatie kaders van het wetenschappelijk veld. Afgestudeerde bachelor studenten kunnen doorstormen naar een universitaire masteropleiding en naar een passende functie in het werkveld. Het programma is uitgewerkt in zes leerlijnen: wiskundig redeneren (computational thinking), wiskundige vaardigheden, basiskennis AI, intelligente systemen, cognitie en onderzoekvaardigheden. Het programma sluit aan op de visie over onderwijs en leren van de Leidse universiteit die de nadruk legt op het doen van onderzoek, kritisch denken en een goede balans tussen theorie en praktijk. Het onderwijs is goed ingebed in een wetenschappelijke onderzoekomgeving. Het onderwijs in de cursussen draagt bij aan het bereiken van de einddoelen van het programma door de studenten. Studenten krijgen begeleiding op alle niveaus van de opleiding. Het panel ondersteunt het besluit om de opleiding Engelstalig aan te bieden en kan zich vinden in het gekozen niveau van de vooropleiding. Ook de aandacht voor de motivatie van studenten in de intake procedure (mandatory matching) is belangrijk.

Het toetsbeleid van de opleiding is goed uitgewerkt en stimuleert een goede studiehouding van studenten. Cursussen maken gebruik van verschillende toetsvormen. Het afstudeerproject heeft een goede omvang en de beoordeling ervan is goed uitgewerkt.

De interdisciplinaire groep docenten die samen werken aan de ontwikkeling van de opleiding is goed gekwalificeerd. Hun betrokkenheid op studenten maakt deel uit van de onderwijscultuur.

Sterke punten zijn volgens het panel:

1. Het programma is gericht op het oplossen van problemen door kennis van Data Science en Artificial Intelligence te combineren met een grondig begrip van formele methoden en technieken.
2. Het DSAI programma past goed bij het bestaande onderwijs en sluit goed aan bij het wetenschappelijk onderzoek waarbij het accent ligt op methodologie en niet zozeer op industriële- of publieke- of consumenten toepassingen.

Aanbevelingen van het panel zijn:

1. Breng het DSAI profiel met z'n focus op theoretische grondslagen duidelijker naar voren in de leerdoelen en in de communicatie naar studenten en werkveld.

2. Neem maatschappelijke vraagstukken zoals cyber-security, privacy, ethische en juridische aspecten breder op in het onderwijsprogramma en geef meer aandacht aan soft skills zoals communicatie en samenwerking.

Meer informatie over de NVAO-werkwijze en de toetsing van nieuwe opleidingen is te vinden op www.nvao.net. Voor informatie over de Universiteit Leiden verwijzen we naar de website van de instelling.³

Als gevolg van de beperkende omstandigheden door COVID-19 geldt voor deze kwaliteitstoets een tijdelijke procedure.



