Assessment plan for the curriculum of the Master's degree programme in Artificial Intelligence, 2024-2025

Programme director: Prof. Dr. J.P. Borst

Date advice Board of Examiners: June 7th, 2024

Date approval Faculty Board:

1. Vision on assessment

1. to stimulate students to develop strong academic skills in addition to mastery of content, assessment will include the diversity of skills relevant to a professional in AI, which each have a substantial contribution to the final grade
2. to prepare students for their future careers, authentic assessment, geared towards future work, will be implemented where possible
3. to stimulate students' ability for critical reflection, assessment will include components for self and peer evaluation
4. to design teaching and assessment according to a learning pathway, course coordinators will jointly implement assessment strategies for subsequent courses within a learning pathway

2. Assessment guidelines

1. all courses need a minimum of two summative assessment activities
2. final tests or assessments that contribute substantially to the final grade are reviewed by a second examiner
3. for summative assessment counting 25% or less to the final grade, informal formative assessment activities can be used. For summative assessment counting more than 25% towards the final grade a formal formative assessment activity needs to be in place.
   informal formative assessment = ad hoc Q and A or feedback during lectures and tutorials.
   formal formative assessment = a mock exam similar to the actual exam or feedback that is based on the actual grading tool in case of an assignment
4. how students can use supporting materials and supporting (AI) tools is explicitly stated for all graded assignments
5. in all courses where the use of supporting materials or supporting tools is prohibited, a supervised assessment item is included
6. for group work, part of the grade is dedicated to criteria related to collaboration and organization within groups
7. for all self and peer assessment a valid grading rubric needs to be provided to students

3. Learning outcomes of the degree programme

Learning Outcome *At the end of the programme, the graduate …*	
1	demonstrates knowledge, understanding and the ability to evaluate, analyse and interpret relevant data, all on a level that builds on and surpasses the level of the bachelor Artificial Intelligence, in at least five of the research areas below. In one research area of Artificial Intelligence the master has specialised knowledge at an advanced level. a. The symbolic approach to Artificial Intelligence b. The numerical, non-symbolic approach to Artificial Intelligence c. Computational theories of perception and cognition d. Agent systems e. Linguistics and language technology f. Autonomous systems and robotics g. Machine learning and pattern recognition
2	demonstrates knowledge and understanding, on a level that builds on and surpasses the level of the bachelor Artificial Intelligence, in the empirical sciences (Psychology, Biology and Physics) and has experience applying and analysing results thereof.
3	demonstrates relevant knowledge and the ability to apply methods and techniques from mathematics and logic used in Artificial Intelligence.
4	demonstrates relevant knowledge and the ability to use algorithms, data structures and important programming languages used in Artificial Intelligence.
5	has the ability to, on an international academic level, analyse problems, critically and constructively review both one's own and other scientific results, even if incomplete, and communicate about this both individually as in a group, both oral and in written form, also in a broader societal context, to both specialists and non-specialists.
6	has the ability to critically reflect on his/her own working method and knowledge and to recognize the need for continued learning on a high degree of autonomy, and is able to understand the scientific developments within the field of Artificial Intelligence.

4. Overview of assessment methods, test moments for course units, and examiners

This table shows all the course units for each year of the programme and assessment methods.
The abbreviations for the relevant assessment methods used in below table are the following:

- *Written Exam (WE)*
- *Multiple Choice (MC)*
- *Oral Exam (OR)*
- *Report (R)*
- *Presentation (P)*
- *Practical Work (PR)*
- *Assignment (AST)*

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
Mandatory Course Units									
1	1a	Responsible AI	WMAI029-05	5	WE, AST	Yes	CA, EW	H.B. Verheij	L.C. Verbrugge
1	1a	Design of Multi-Agent Systems	WMAI004-05	5	R	Yes	CA	H.A. de Weerd	H.B. Verheij
1	1b	Advanced Machine Learning	WMAI030-05	5	MC, PR, R	No	CA, EW	H. Jaeger	M. Sabatelli
1	1b	Deep Learning	WMAI017-05	5	WE, AST, R, P	Yes	CA, EW	M.A. Valdenegro Toro	M. Sabatelli
1	2a	Methodology in Artificial Intelligence	WMAI026-05	5	P, R, AST	Yes	CA, ET	M.A. Valdenegro Toro	J.S. Dibangoye
1	2b	Natural Language Processing with Deep Learning	WMAI031-05	5	WE, R, PR, AST	No	CA, EW	*TBD*	T.M. Tashu
2	1a-2b	Final Research Project AI	WMAI901-45	45	R, P	No	NA	Project supervisors **	Project supervisors **
Course Units in Specialisation(s) and Pre-approved Electives (organized by Own or Computational Cognitive Science Degree Programme)									
1, 2	1a	Pattern Recognition (for AI) [a, c]	WMAI021-05	5	WE, PC, R, AST, PR	Yes	CA, EW	M.A. Dhali	S.H. Mohades Kasaei
2	1a	Multi-agent Reinforcement Learning [a]	WMAI033-05	5	WE, MC, AST, PR	Yes	CA, EW	J.S. Dibangoye	R.F. Cunha
1, 2	1a	Arguing Agents [b]	WMAI001-05	5	MC	No	EW	H.B. Verheij	L.C. Verbrugge
1, 2	1a	Robotics for AI [c]	WMAI011-05	5	R, PR	Yes	CA	R. Carloni	S.H. Mohades Kasaei
2	1a	Human-Centred Artificial Intelligence [d]	WMCC023-05	5	R, P, AST	No	CA	F. Cnossen	C.L. Sibert

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
1, 2	1a	Computational Cognitive Neuroscience	WMCC010-05	5	R, AST	Yes	CA	M.K. van Vugt	N.A. Taatgen
1, 2	1a	Psycholinguistics and Cognition	WMCC020-05	5	AST, OR	Yes	CA, ET	S.D. Tokac	*TBD*
1, 2	1a	User Modelling	WMCC021-05	5	R, PR	Yes	ET	C.L. Sibert	J.P. Borst
1	1b	Logical Aspects of Multi-agent Systems [b]	WMAI020-05	5	AST, PR, P	Yes	CA	L.C. Verbrugge	J.D. Top
1	1b	Cognitive Robotics [c]	WMAI003-05	5	R, P, PR, AST	Yes	CA, ET	S.H. Mohades Kasaei	R. Carloni
1	1b	Advanced Hybrid Intelligence [d]	WMAI036-05	5	R, P	Yes	CA	H.A. de Weerd	*TBD*
1, 2	1b	Advanced Machine Learning	WMAI030-05	5	MC, R, PR	No	CA, EW	H. Jaeger	M. Sabatelli
1, 2	1b	Unsupervised Deep Learning	WMAI038-05	5	WE, P, PR	No	CA, EW	M. Zullich	M.A. Valdenegro Toro
1, 2	1b	Advanced Statistical Modelling	WMCC005-05	5	WE, AST	Yes	CA, EW	J.C. van Rij-Tange	J.P. Borst
1, 2	1b	Cognitive Modelling	WMCC019-05	5	AST, R	Yes	CA, ET	N.A. Taatgen	W. Kruijne
1	2a	Trustworthy and Explainable AI [a, d]	WMAI032-05	5	WE, P, PR	No	CA, EW	M. Zullich	M.A. Valdenegro Toro
1	2a	Computational Social Choice [b]	WMAI016-05	5	R, AST	Yes	CA, ET	D. Grossi	L.C. Verbrugge
1	2a	Computational Game Theory [b]	WMAI035-05	5	R, AST	Yes	CA, ET	D. Grossi	H.A. de Weerd
1	2a	Control Methods for Robotics [c]	WMAI037-05	5	*TBD*	*TBD*	*TBD*	R. Carloni	*TBD*
1, 2	2a	Neuroprosthetics	WMAI028-05	5	AST	Yes	CA	A.I. Sburlea	R. Carloni
1	2a	Non-Invasive Brain-Computer Interfaces [d]	WMCC016-05	5	WE, AST, P	Yes	CA, EW	A.I. Sburlea	M.A. Valdenegro-Toro
1, 2	2a	Cognitive Engineering	WMCC001-05	5	R, P, AST	Yes	CA	F. Cnossen	C.L. Sibert
1, 2	2a	Applied Cognitive Modelling	WMCC024-05	5	R, PR	No	CA, ET	N.A. Taatgen	J.P. Borst
1, 2	2a	Computational Simulations of Language	WMCC009-05	5	AST	No	CA	S.M. Jones	J.C. van Rij-Tange
1, 2	2b	Deep Reinforcement Learning [a]	WMAI024-05	5	WE, R, PR, P	Yes	CA, EW	M. Sabatelli	J.S. Dibangoye
1, 2	2b	Deep Learning Practical [a]	WMAI034-05	5	R, P, PR	Yes	CA	M.A. Dhali	M.A. Valdenegro Toro
1, 2	2b	Collective Intelligence [b]	WMAI023-05	5	WE, AST	Yes	CA, EW	Z.L. Christoff	L.C. Verbrugge
1, 2	2b	Human-Robot Interaction for Social Robots [c, d]	WMAI027-05	5	R, P, AST	Yes	CA	P.A. Vogt	S.H. Mohades Kasaei
1, 2	2b	Cognitive Neural Networks	WMCC022-05	5	*TBD*	*TBD*	*TBD*	M.M. Cook	J.P. Borst
1, 2	2b	Neuro-ergonomics	WMCC011-05	5	R, P	Yes	CA	E.G. Akyurek	*TBD*
1, 2	2b	User-Centred Design	WMCC025-05	5	R, P, PR	Yes	CA, ET	M.B. Schippers	J.O. van Bijsterveld
1, 2	2b	Models of Human-Syntax Processing	WMCC014-05	5	AST, P, R	Yes	CA, ET	S.M. Jones	J.C. van Rij-Tange

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
Pre-approved Electives (organized by <u>Other</u> Degree Programme) *									
1, 2	1a-1b	Introduction Science and Policy	WMSE002-10	10	*	*	*	*	*
1, 2	1a	Introduction to Data Science	WMCS002-05	5	*	*	*	*	*
1, 2	1a, 2a	Skills in Science Communication	WMEC006-05	5	*	*	*	*	*
1, 2	1a	Scientific Visualization	WMCS018-05	5	*	*	*	*	*
1, 2	1a	Perception for Visual Computing	WMCS029-05	5	*	*	*	*	*
1, 2	1a	Social Network Analysis	WMCS028-05	5	*	*	*	*	*
1, 2	1a	Introduction Science and Business	WMSE001-10	10	*	*	*	*	*
1, 2	1a	Robotics for IEM	WMIE005-05	5	*	*	*	*	*
1, 2	1a	Auditory and Visual Perception	WMBC002-05	5	*	*	*	*	*
1, 2	1a	Advanced Topics in Security and Privacy	WMCS001-05	5	*	*	*	*	*
1, 2	1a	Semantic Web Technology	LIX002M05	10	*	*	*	*	*
1, 2	1b	Neural Networks and Computational Intelligence	WMCS010-05	5	*	*	*	*	*
1, 2	1b	Advanced Computer Graphics	WMCS006-05	5	*	*	*	*	*
1, 2	1b	Ethical Hacking	WMCS030-05	5	*	*	*	*	*
1, 2	1b	Modal Logic and Proof Theory	WMCS027-05	5	*	*	*	*	*
1, 2	1b	Computational Semantics	LIX021M05	5	*	*	*	*	*
1, 2	2a	Computer Vision	WMCS015-05	5	*	*	*	*	*
1, 2	2a	Fundamentals of Distributed Systems	WMCS022-05	5	*	*	*	*	*
1, 2	2b	Neuromorphic Circuit Design	WMPH044-05	5	*	*	*	*	*
1, 2	2b	Language Technology Project	LIX025M05	5	*	*	*	*	*

[a] Course is part of specialisation: Machine Learning
[b] Course is part of specialisation: Multi-Agent Systems
[c] Course is part of specialisation: Robotics
[d] Course is part of specialisation: Hybrid Intelligence

* Pre-approved Electives organized by Other Degree Programme. For more information see the Assessment Plan of the Degree Programme organizing the course unit.
** The following examiners are allowed to supervise Final Research projects in the Artificial Intelligence Master's Programme:

- drs. J.O. van Bijsterveld
- prof. dr. J.P. Borst
- J.D. Cardenas Cartagena, MSc.
- prof. dr. R. Carloni

- dr. Z.L. Christoff
- dr. F. Cnossen
- prof. dr. M.M. Cook
- R.F. Cunha, MSc.
- dr. M.A. Dhali
- prof. dr. J. Dibangoye
- prof. dr. D. Grossi
- prof. dr. H. Jaeger
- dr. S.M. Jones
- I.P. de Jong, MSc
- dr. S.K. Mehlhorn
- dr. S.H. Mohades Kasaei
- dr. S.M. van Netten
- dr. J.C. van Rij – Tange
- dr. M. Sabatelli
- dr. A.I. Sburlea
- dr. M.B. Schippers
- dr. J. Schoeffer
- prof. dr. L.R.B. Schomaker
- dr. C.L. Sibert
- prof. dr. N.A. Taatgen
- dr. T.M. Tashu
- dr. S.D. Tokaç
- J.D. Top, MSc.
- dr. M.A. Valdenegro Toro
- prof. dr. L.C. Verbrugge
- prof. dr. H.B. Verheij
- dr. P.A. Vogt
- dr. L.M. Vortmann
- dr. M.K. van Vugt
- dr. H.A. de Weerd
- dr. B.J. Wolf
- dr. M. Zullich

5. Relationship between course units and details of the learning outcomes

Please note in the table below the course units per block in the programme. Indicate which learning outcomes are assessed in which courses by adding an X in the relevant cell. ***An X means that the learning outcome is explicitly assessed (not merely addressed) in the course.***

			Learning outcomes of the degree programme					
			1	**2**	**3**	**4**	**5**	**6**
Period	**Course**	**Course code**	**Year 1 - compulsory courses**					
1a	Responsible AI	WMAI029-05	X				X	
1a	Design of Multi-Agent Systems	WMAI004-05	a, c, d, e		X	X		
1b	Advanced Machine Learning	WMAI030-05	b, g		X	X	X	X
1b	Deep Learning	WMAI017-05	b, g		X	X	X	X
2a	Methodology in Artificial Intelligence	WMAI026-05	X	X	X	X	X	
2b	Natural Language Processing with Deep Learning	WMAI031-05	e			X		X
Period	**Course**	**Course code**	**Year 2 - compulsory courses**					
1a-2b	Final Research Project AI	WMAI901-45	*	*	*	*	X	X
Period	**Course**	**Course code**	**Course Units in Specialisation(s) and Pre-approved Electives (organized by Own or Computational Cognitive Science Degree Programme)**					
1a	Pattern Recognition (for AI) [a, c]	WMAI021-05	b, g		X	X		
1a	Multi-agent Reinforcement Learning [a]	WMAI033-05	a, b, d, f, g		X	X		
1a	Arguing Agents [b]	WMAI001-05	a, c, d, e		X	X		
1a	Robotics for AI [c]	WMAI011-05	b, f, g		X	X		X
1a	Human-Centred Artificial Intelligence [d]	WMCC023-05	c	X			X	X
1b	Logical Aspects of Multi-agent Systems [b]	WMAI020-05	a, d		X	X	X	
1b	Cognitive Robotics [c]	WMAI003-05	b, f, g		X	X		X
1b	Advanced Hybrid Intelligence [d]	WMAI036-05	c, d	X	X		X	
1b	Advanced Statistical Modelling	WMCC005-05		X	X			
1b	Cognitive Modelling	WMCC019-05	c	X				
1b	Unsupervised Deep Learning	WMAI038-05	b, g			X		
1b	Advanced Machine Learning	WMAI030-05	b, g		X	X	X	X
2a	Trustworthy and Explainable AI [a, d]	WMAI032-05	g				X	
2a	Computational Social Choice [b]	WMAI016-05	a, d		X	X	X	
2a	Computational Game Theory [b]	WMAI035-05	d		X		X	X
2a	Control Methods for Robotics [c]	WMAI037-05		X		X		
2a	Non-Invasive Brain-Computer Interfaces [d]	WMCC016-05	g		X			

			Learning outcomes of the degree programme					
			1	**2**	**3**	**4**	**5**	**6**
2a	Neuroprosthetics	WMAI028-05	f, g	X		X		
2a	Cognitive Engineering	WMCC001-05	c	X			X	
2a	Applied Cognitive Modelling	WMCC024-05	c	X			X	
2a	Computational Simulations of Language	WMCC009-05	e					
2b	Deep Reinforcement Learning [a]	WMAI024-05	b, g		X	X	X	X
2b	Deep Learning Practical [a]	WMAI034-05	a, b, c, e, g		X	X	X	X
2b	Collective Intelligence [b]	WMAI023-05	a, d		X	X	X	
2b	Human-Robot Interaction for Social Robots [c, d]	WMAI027-05	e, f	X			X	
2b	Cognitive Neural Networks	WMCC022-05	b	X		X		
2b	Neuro-ergonomics	WMCC011-05	e				X	
2b	User-Centred Design	WMCC025-05	c	X			X	
2b	Models of Human-Syntax Processing	WMCC014-05	e					
Period	**Course**	**Course code**	**Pre-approved Electives (organized by Other Degree Programme)**					
1a	Computational Cognitive Neuroscience	WMCC010-05	c	X			X	
1a	Psycholinguistics and Cognition	WMCC020-05	e					
1a	User Modelling	WMCC021-05	c	X			X	
1a-1b	Introduction Science and Policy	WMSE002-10					X	
1a	Introduction to Data Science	WMCS002-05	b, g		X	X		
1a, 2a	Skills in Science Communication	WMEC006-05					X	
1a	Scientific Visualization	WMCS018-05			X	X		
1a	Perception for Visual Computing	WMCS029-05	c	X		X	X	
1a	Social Network Analysis	WMCS028-05	d	X				
1a	Introduction Science and Business	WMSE001-10					X	
1a	Robotics for IEM	WMIE005-05	b, f	X	X			
1a	Auditory and Visual Perception	WMBC002-05	c, e				X	
1a	Advanced Topics in Security and Privacy	WMCS001-05				X	X	
1a	Semantic Web Technology	LIX002M05	a, e		X			
1b	Neural Networks and Computational Intelligence	WMCS010-05	b, g		X	X		
1b	Advanced Computer Graphics	WMCS006-05			X			
1b	Ethical Hacking	WMCS030-05					X	X
1b	Modal Logic and Proof Theory	WMCS027-05			X			
1b	Computational Semantics	LIX021M05	e			X		

			Learning outcomes of the degree programme					
			1	**2**	**3**	**4**	**5**	**6**
2a	Computer Vision	WMCS015-05	c		X			
2a	Fundamentals of Distributed Systems	WMCS022-05				X		
2b	Neuromorphic Circuit Design	WMPH044-05	b			X		
2b	Language Technology Project	LIX025M05	e				X	

[a] Course is part of specialisation: Machine Learning
[b] Course is part of specialisation: Multi-Agent Systems
[c] Course is part of specialisation: Robotics
[d] Course is part of specialisation: Hybrid Intelligence

* The learning outcomes in projects can differ depending on the type of project.