

Science and Technology

Design Engineering and Mathematics

Artificial Intelligence (AI) In Robotics

PDE3802

Module Leader: Purav Shah

[1] [2025-26]

[Duration of the module 12 weeks]

Document Version

Online location of handbook

This handbook can also be accessed via My Learning at:
<https://mdx.mrooms.net/mod/resource/view.php?id=3304305>

Other formats available

This handbook is available in a large print format. If you would like a large print copy or have other requirements for the handbook, please contact the Disability Support Service disability@mdx.ac.uk

Disclaimer

The material in this handbook is as accurate as possible at the date of production. You will be notified of any minor changes promptly. If there are any major changes to the module you will be consulted prior to the changes being confirmed. Please check the version number on the front page of this handbook to ensure that you are using the most accurate information.

Other documents

Your module handbook should be read and used alongside your programme handbook and the information available to all students on My Learning and MDXapp including the Academic Regulations. Your programme handbook can be found on the My Learning programme page for your programme.

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1. Welcome

This module aims to provide students with knowledge and practical skills of Artificial Intelligence (AI) and Machine Learning (ML) techniques used in robotics. The module will cover different types of autonomous robots in a variety of fields and applications. Students will acquire knowledge and practical skills on robot sensory processing, particularly vision, and on the use of machine learning methods and algorithms, and how these are applied to real life autonomous robotic applications.

2. The module teaching team

Please see below details of the teaching team for this module.

Module Leader: Purav Shah		
	Room number:	TG 115
	Email:	P.Shah@mdx.ac.uk
	Telephone number:	0208 411 5317
	Office hours:	Click here to enter text.
Tutor: Tolga Girici		
	Room number:	-
	Email:	t.girici@mdx.ac.uk
	Telephone number:	0776 038 7428
	Office hours:	-

3. Communication with the teaching team

The module leader and other module tutors are likely to send urgent and/or individual messages about the module to you by email, so it is important that you read your university email regularly.

Any overall module and course feedback can also be given to the student voice leader for your programme which will be included in programme feedback sessions and can also provide feedback through relevant surveys.

4. Module overview

Aims

This module aims to provide students with knowledge and practical skills of Artificial Intelligence (AI) and Machine Learning (ML) techniques used in robotics. The module will cover different types of autonomous robots in a variety of fields and applications. Students will acquire knowledge and practical skills on robot sensory processing, particularly vision, and on the use of machine learning methods and algorithms, and how these are applied to real life autonomous robotic applications.

Learning Outcomes

Module- Knowledge	
LO1	Demonstrate technical knowledge of AI/ML techniques used in robotics.
LO2	Critically analyse robotics problems to determine the most suitable hardware and software solutions for autonomous robot applications.
LO3	Demonstrate in-depth knowledge of robotic sensing (particularly vision).

Module- Skills	
LO4	Design and implement AI/ML solutions to robotics problems, using appropriate tools and relevant sources.
LO5	Develop software modules for implementing advanced robotic capabilities, such as vision-based manipulation or human robot interaction.

Syllabus

- Autonomous robots
- Types of autonomy and architectural paradigms
- AI sensor processing (mining information from sensor data)
- Image processing and computer vision
- Machine learning for robotics
- Supervised, unsupervised and reinforcement learning
- Neural networks and deep learning

Learning and teaching strategy

Students are expected to engage in two 3-hour practical workshops per week, comprising a blend of interactive sessions, guided exercises, hands-on demonstrations and interactive discussions. These sessions will foster active exploration of fundamental concepts and advanced AI/ML techniques used in robotic systems.

By participating in practical workshops, collaborative learning activities and independent study, students will develop the knowledge, skills and practical experience necessary to design, develop and optimise robotic systems with AI/ML tools effectively. The learning and teaching strategy will empower students to apply theoretical concepts in practical scenarios and address real-world societal challenges linked to the Sustainable Development Goals (SDGs)

Attendance, participation and progress will be closely monitored during practical sessions to ensure alignment with learning outcomes. Full attendance is essential to provide students with ample opportunities to apply theoretical concepts in practical scenarios and demonstrate their proficiency of autonomous robots in a variety of fields and application.

Comprehensive support materials and online activities will supplement learning and contribute to assessment activities, providing students with additional resources for independent study and reinforcement of concepts.

Assessment Scheme

Type	Hours
Independent Study	228
Scheduled Teaching	72

Research Ethics –

- The teaching, learning, assessment and research activities undertaken in this module have been considered and are not likely to require ethical approval.
- However, please seek advice if undertaking the module entails carrying out any research activities involving human participants, human data, animals/animal products, precious artefacts, materials or data systems.
- If you submit work that includes data gathered from or about people, this may be treated as academic misconduct and could lead to fail grade being awarded.
- Further information about ethics can be found at the following link: <http://mdx.mrooms.net/enrol/index.php?id=12277> (Log in required)

5. Learning resources

This module has a variety of learning resources available for you to use to support your learning. These include module notes, worked examples, solutions to exercises,

feedback, podcasts, and key reading materials. These can be accessed online via the module page. Please visit the module page regularly to make use of these.

6. Expectations of studying this module

The module team are here to help and support you achieve your goals. One of the key elements to successfully completing this module is engaging with all the learning opportunities we offer as well and working with your peers to support one another.

This module is designed as a combination of contact sessions, directed study and independent study. This means you must participate in all the allocated sessions, and you must complete all set prework and activities outside them. Students are expected to take an active part in all learning sessions whether these are online or on campus, lectures, lab sessions, practical classes, seminars and workshops.

To make the most of this module please complete the following every week

- Complete all prework in preparation for learning sessions. This may be watching videos, reading through set material or chapters and completing activities.
- Please make notes of points you need to clarify and discuss these in learning sessions with module tutors.
- Read through the notes making a note of any points you need to discuss with your tutor.
- Complete the set activities before the next session, making a note of any points you need to discuss with your tutor.
- Go to the module My Learning page, attempt the quizzes, make use of extra material, view the podcasts, and access the activity solutions. Make a note of anything you wish to discuss with your tutor.
- Complete further reading from the core text online.

The module team is committed to support you and your fellow students whilst you undertake this module. For you to get the most out of sessions you need to come prepared and ready to contribute. Please ensure that any work set by the team has been completed before workshops. After each class, please review what has been covered and make a note of anything you would like clarification on.

Attendance and Engagement

Engaging with online and on-campus in-person learning and activities is integral to your success. Middlesex University supports you to achieve your full potential through a number of strategies, all of which provide a supportive learning environment online, remotely, face-to-face, or blended. Further information on attendance and engaging

with your programme will be available at your Induction and general information is available at the weblink below.

<https://mymdx.mdx.ac.uk/campusm/home#pgitem/419149/t>

Professional behaviour and online conduct

The programme of study you are undertaking is underpinned by developing professional behaviour and attitude. You are expected to behave in a professional, supportive manner to your peers and teachers. You must come to sessions prepared and ready to contribute where appropriate. Please remember that your University ID should be carried with you always whilst on campus and you must be able to identify yourself if asked to do so. Please conduct your email communication with fellow students, tutors and all relevant staff in a formal and courteous manner.

Academic Integrity and Misconduct

Academic Integrity is a set of principles and values to show that you work in a professional, honest and ethical way. You should be aware of the University's academic integrity and misconduct policies and procedures. Taking unfair advantage over other students in assessment is considered a serious offence by the University. Action will be taken against any student who contravenes the regulations through negligence, foolishness or deliberate intent. Academic misconduct takes several forms, in particular:

- **Plagiarism** – using extensive unacknowledged quotations from, or direct copying of, another person's work and presenting it for assessment as if it were your own effort. This includes the use of third-party essay writing services.
- **Collusion** – working together with other students (without the tutor's permission), and presenting similar or identical work for assessment.
- **Infringement of Exam Room Rules** – Communication with another candidate, taking notes to your table in the exam room and/or referring to notes during the examination.
- **Self-Plagiarism** – including any material which is identical or substantially similar to material that has already been submitted by you for another assessment in the University or elsewhere.
- **Unauthorised use of Artificial Intelligence** – using artificial intelligence without referencing as such in your submission. Appropriate use of Artificial Intelligence (AI) is detailed in the assessment requirements grid in section 7.5

Student Success Essentials

Course includes useful information about how to approach your assessments and complete them with honesty. The course also describes what plagiarism (cheating) is

and how to avoid it so you don't face any disciplinary action. For successfully completing this course, you will be awarded a certificate that will verify the knowledge you have gained. Certificates can be shared and promoted via LinkedIn and other digital channels. You will have to log into to MyMDX and then MyLearning to access the course.

<https://mdx.mrooms.net/course/view.php?id=17199>

Full details on academic integrity and misconduct and the support available can be found at <https://mymdx.mdx.ac.uk/campusm/home#pgitem/419149/t> The Academic Integrity and Misconduct policy is available in our Public Policy Statements (under Academic Quality) at: Our policies | Middlesex University London (mdx.ac.uk)

Referencing & Plagiarism: Suspected of plagiarism?:

<http://libguides.mdx.ac.uk/c.php?g=322119&p=2155601>

Referencing and avoiding plagiarism:

<https://mymdx.mdx.ac.uk/campusm/home#pgitem/419258>

The Middlesex University Students' Union (MDXSU) Advice Service offers free and independent support in making an appeal, complaint or responding to any allegations of academic or non-academic misconduct.

<https://www.mdxsu.com/advice>

Extenuating circumstances:

There may be difficult circumstances in your life that affect your ability to meet an assessment deadline or affect your performance in an assessment. These are known as extenuating circumstances or 'ECs'. Extenuating circumstances are exceptional, seriously adverse and outside of your control. Please see link for further information and guidelines:

<https://unihub.mdx.ac.uk/your-study/assessment-and-regulations/extenuating-circumstances>

7. Assessment

Formative assessment: Formative assessments help show that you are learning and understanding the material covered in this module and allow us to monitor your progress towards achieving the learning outcomes. Although formative assessments do not directly contribute to the overall module mark, they do provide an important opportunity to receive feedback on your learning.

Summative assessment: Summative assessment is used to check the level of learning for the module. It is summative because it is based on accumulated learning during the course. It is the summative assessment that determines the grade that you are awarded for the module.

The table below specifies the associated deadlines:

Task: Autonomous system design report and Computer vision task (Due: Mid-semester)				
Weighting	Specification e.g. word count / duration / no. of pages	LO mapped to	Anonymously marked	Ethics approval required
60%	Report (max 3000 words) Code and demo video (max 3 minutes)	1,2,3,4	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes – individual student <input type="checkbox"/> Yes – group approval <input type="checkbox"/> Yes – whole module
Task: Autonomous system design and Computer vision task (Due: Mid-semester)				
Weighting	Specification e.g. word count / duration / no. of pages	LO mapped to	Anonymously marked	Ethics approval required
40%	Code and a 10 minute presentation	1,2,4,5	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes – individual student <input type="checkbox"/> Yes – group approval <input type="checkbox"/> Yes – whole module

In order to pass the module, the student will be required to achieve either:

- ☒ an overall aggregate of grade 16 with a minimum of grade 17 in each assessment component

Before you submit your work for final grading, please ensure that you have accurately referenced the work. It is your responsibility to check the spelling and grammar, as all written assessments will assess technical proficiency in the English. This means accurate and effective spelling, punctuation and grammar. Details of how it will be assessed will be provided in the marking criteria for each assessment and the University overall approach can be found within the Grade Criteria Guide in the University Regulations <https://www.mdx.ac.uk/about-us/policies> (scroll to university regulations) Reasonable adjustments will be made for those students who have a

declared disability/specific learning condition which would affect performance in this area.

Reassessment for this module normally will be available on the module's webpage in due course.

Further information is available at

<https://unihub.mdx.ac.uk/study/assessment>

7.2 Feedback on your assignments

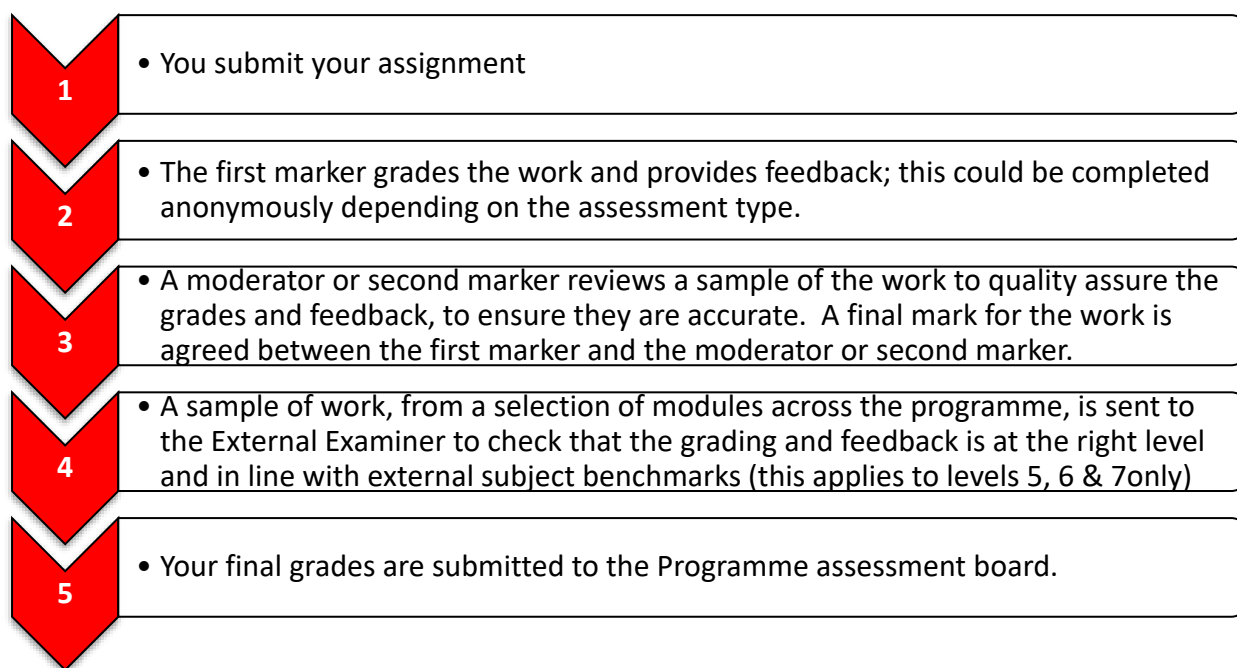
You will be provided with feedback on all assessments that is helpful and informative, consistent with aiding the learning and development process. The nature of the feedback shall be determined at programme level but may take a variety of forms including: written comments; individual and group tutorial feedback; peer feedback; or other forms of effective and efficient feedback. If you have submitted a formative or draft assessment, you will receive feedback but no grade. The comments should inform you about how well you have done or tell you about the areas for improvement. All assignments should be submitted online unless specified in assessment briefs.

Feedback on summative assessments will normally be provided within 15 WORKING DAYS of the published submission date.

7.3 How is your assignment mark agreed?

External Examiners (external academic experts) review what we deliver at a programme level. The University reviews a sample of your work to quality assure the grades and feedback you received from the person who marked your work. Our External Examiners will sample a selection of modules from a programme, with more focus of outcomes between modules within a programme.

The following diagram provides an overview of the marking process for your module assessment. Further information on the role of external examiners can be found at. <https://www.mdx.ac.uk/about-us/policies/academic-quality/handbook> (section 4)



Results Confirmation

First Semester: Provisional Grades: At the end of your first semester, you can see your module grades in the Grades and Progress tile within MyMDX. These grades are provisional and not yet confirmed.

Second Semester: Final Grades and Progression: After your second semester, the Programme Assessment Board will confirm your grades. Then, your final module results, progression status, or finalist classification will be posted in the Grades and Progress tile within MyMDX.

Need Help or More Info?

- **University Guide:** Find detailed information in the University Guide in the Grades and Progress tile within MyMDX.
- **Support Team:** Ask your Progression and Support Team Officer for advice.
- **Regulations:** Check the University regulations for more details.

7.4 Anonymous Marking Assessment Policy

We have worked with the Middlesex University Students' Union (MDXSU) to create an anonymous marking policy, in response to student feedback. Anonymous marking ensures that your identity (your name, student number and other personal/identifiable information) is not made available to academics when they are marking your work. This means that you can have confidence that your assessments will be marked fairly and consistently. However, there are some forms of assessment for which anonymity cannot be guaranteed and these are recognised in the policy. The Anonymous Marking Assessment Policy is available at:

https://www.mdx.ac.uk/_data/assets/pdf_file/0037/563599/anonymous-marking-assessment-policy.pdf

We now look at each component of summative assessment for this module in detail. Each of the following tables provides an overview of the requirements. The support provided for each component along with the feedback arrangements, is also detailed below:

7.5.1 Assessment 1 (report, code and video)

Report, Code and Video	
Module code	PDE3802
Module title	AI in Robotics
Submission date, time	6 pm on the 8th Nov. 2024 via the module's learning page https://mdx.mrooms.net/mod/assign/view.php?id=3304312
Feedback type & date	Written feedback by 29th Nov.
Word count	3000 words.
Assignment type	Report and Software code (not counted in word/page count as Appendix) Link to a max. 3-minute video.
Assignment structure, format and details	<p>Part A — System Design Report (30%): Task: Write a <3000 word report (11pt MS word format) that designs an autonomous robotic system for finding and organizing office items (e.g., chair, bin, mug, bottle, book, keyboard, mouse, stapler, notebook, phone) in a typical indoor office. Assume the activity is not time-critical (no strict time limit per action once a turn/command is established). Your report must specify: 1) Mission & Tasks: A concise description of what the robot must accomplish and a task list (e.g., patrol → detect target category → decide action → navigate to item → report/organize). 2) Required Skills (with interfaces): What the robot needs to be able to do (perception, localization, planning, optional manipulation/HRI). For each skill, describe inputs/outputs and success criteria. 3) Hardware Components (with alternatives): Sensors (RGB camera, depth camera/OAK-D, 2D LiDAR, IMU, AprilTags) and actuators/computing (Raspberry Pi/NUC). Provide alternatives for each component and justify choices (accuracy, cost, compute, integration complexity). 4) Software Architecture: A block diagram showing the main modules (e.g., detect depth-to-3D, mapping, navigation), data flows, and (if known) ROS 2 topics/actions/frames you'd use in the second half of the module. 5) Dataset & Model Plan: What classes you will recognize, how you will collect/label data, how you will evaluate (accuracy, F1, confusion matrix, or mAP if you consider detection later). 6) Risk & Safety: E-stop, speed cap, minimum obstacle distance, fallback when detection/localization fails. 7) Budget / BOM: A realistic bill of materials with indicative prices and a target budget 8) References & Contributions: Cite relevant sources; include a short contribution section for each group member (if it is a team work). 9) Video (required): Submit a link to a ~3-minute video outlining your system concept (slides + narration are acceptable). Use consistent fonts, titling, margins throughout the report.</p> <p>Part B — Office-Goods Classification Code (30%): Task: Write software that recognizes an office item class from a single image or live camera frame (one item at a time). The program must accept input from file(s) or from a standard camera and output the predicted class (and confidence, if available). You may implement specific computer-vision libraries.</p>

	<p><i>or use machine learning/deep learning. You may use OpenCV and common Python libraries (NumPy, scikit-learn, PyTorch/TensorFlow, or YOLO-cls). Sometimes implementing a small function yourself is faster than integrating a heavy external dependency—use good judgement.</i></p> <p><i>Use 6–10 classes relevant to the “office organizer” theme. Aim for sufficient number of images per class where possible. Provide all images used for training/validation/testing (a download link if size is large). Include a dataset card. Present a README file that explains how to install, how to run (examples), expected outputs, and troubleshooting. Use Git (GitLab/GitHub). Commit regularly and using meaningful messages. Tag the release you submit. Report accuracy and macro-F1 on a held-out test set, plus a confusion matrix. Include a brief error analysis.</i></p>				
Appropriate use of AI	<p><i>While you may access a variety of services offered by third parties, including content created by other individuals or Artificial Intelligence (AI), passing such work as your own is not allowed for submitted assessments. See “Academic Integrity and Misconduct” section for further details</i></p>				
Assessed learning outcome (s)	1,2,3,4				
Assessment weighting %	60%				
Key reading and learning resources	See module page..				
Criteria	1-4 First 70%+	5-8 Upper Second 60%-69%	9-12 Lower Second 50%-59%	13-16 Third 40%-49%	17-20 Refer Less than 40%
Code Quality & Functionality	Code is clean, well-commented, and functions smoothly on all platforms as required. Handles different inputs (camera and file) effectively. All features, including UI, are intuitive and efficient.	Code is functional and mostly clean, with minor areas for improvement. Handles input and performs well but may have some inefficiencies or small bugs.	Code works but may be messy or poorly structured in places. Handles input, but issues may arise with efficiency or user experience.	Code is basic with limited functionality. Some required features are missing or not fully working. Input handling may be inefficient.	Code is incomplete, messy, or non-functional. Critical features are missing, and input handling does not work as required.

Testing & Evaluation	Extensive and rigorous testing has been conducted, with clear evidence of robustness. Test images (training and validation) are well organized and diverse. Test results are clearly documented and critically evaluated.	Good testing with most edge cases considered. Test images are provided and mostly diverse. Test results are well-documented and evaluated, but could be more thorough.	Sufficient testing with some key test images used. Some test results are documented, but there is room for more critical evaluation.	Limited testing with minimal test images provided. Test results are basic or incomplete, with little evaluation of performance	No meaningful testing conducted or documented. Test images are missing, or results are unclear or absent.
Report Quality	Report is clear, detailed, and well-organized. All group members' contributions are clearly outlined. Uses diagrams/figures effectively. Includes a thorough critical analysis of the approach, limitations, and references are cited appropriately.	Report is well written and organized, but some sections lack depth or clarity. Group contributions are mostly clear. Analysis is solid but could be more critical. References are appropriately cited.	Report is satisfactory but may lack depth or clarity in some sections. Group contributions are listed. Some analysis is present but lacks critical evaluation. Basic report with some unclear or incomplete sections. Contributions of group members may not be clear. Minimal analysis or evaluation. Some missing references.	Basic report with some unclear or incomplete sections. Contributions of group members may not be clear. Minimal analysis or evaluation. Some missing references.	Report is unclear, incomplete, or disorganized. Lacks meaningful analysis. Group contributions are missing, and references are poorly cited or absent.
Video Presentation (not assessed)	Video is clear, concise (within 3 minutes), and well-organized.	Video is good but may lack some clarity or detail. Key elements of the	Video is satisfactory but may miss key parts of the system or lack clarity.	Video is basic with limited demonstration of the system. Some key	No video provided or video is incomplete and does not

	Demonstrates key elements of the system, including implementation, testing, and outcomes.	system are demonstrated but not all aspects are fully covered.	Demonstrates the system, but with room for improvement.	aspects are missing or unclear.	demonstrate key elements of the system.
Technical proficiency in the English language* Clearly presented with limited spelling and grammatical errors.	Very well expressed and understanding of content with limited spelling or grammatical errors.	Very well expressed; good understanding of content with some spelling and/ or grammatical errors.	Well expressed; understanding of content with many spelling and/ or grammatical errors.	Simple expression of information; little understanding of content; many spelling and grammatical errors.	Inaccurate expression of information: lacks understanding of content; many spelling and grammatical errors.

The following table details the support you will be receiving for this assessment and the feedback opportunities you will have.

Support and draft feedback sessions for Assessment 1	
Coursework briefing Week 3 in class.	
Draft feedback opportunities Time will be devoted to providing feedback.	
Additional support <i>Drop-in sessions</i>	

7.5.2 Assessment 2 (code and Presentation)

Code, Presentation and Demonstration					
Module code	<i>PDE 3802</i>				
Module title	<i>AI in Robotics</i>				
Submission date, time	<i>6 pm on the 13th Dec. 2024 via the module's learning page https://mdx.mrooms.net/mod/assign/view.php?id=3304314</i>				
Feedback type & date	<i>Written feedback by 10th Jan.</i>				
Word count	<i>10 min presentation and Demo</i>				
Assignment type	<i>Code and presentation</i>				
Assignment structure and format	<i>Perform real-time (or near-real-time) classification of 6–10 office classes (e.g., chair, bin, mug, bottle, book, keyboard, mouse, stapler, notebook, phone) from the Pi camera feed using Raspberry Pi. All inference runs on the Pi (no cloud). Training may be done on the Pi or off-device (laptop/workstation) and then deployed. Target functional requirement are 1) Live classification with >5 FPS on RPi4 at 224-320 pixels of input, 2) Two modes of operation such as Live camera view and evaluation of a file input. 3) Distance and pose estimation. You may reuse and/or fine-tune the model you trained in Assessment 1, or train a fresh model. You have to deliver a presentation, make a demonstration and also deliver your code repository with a clear README file with install instructions, launch commands, parameter table, and troubleshooting.</i>				
Appropriate use of AI	<i>While you may access a variety of services offered by third parties, including content created by other individuals or Artificial Intelligence (AI), passing such work as your own is not allowed for submitted assessments. See “Academic Integrity and Misconduct” section for further details</i>				
Assessed learning outcome (s)	<i>A brief outline of the module learning outcomes that are being assessed.</i>				
Module weighting %	<i>Insert a figure of the module weighting of the assignment.</i>				
Key reading and learning resources	<i>See module page.</i>				
Criteria	1-4 First	5-8 Upper Second	9-12 Lower Second	13-16 Third	17-20 Refer
	70%+	60%-69%	50%-59%	40%-49%	Less than 40%

Implementation of Vision-Based Interaction	Implements a highly effective solution for object interaction using the robot's sensors and actuators. The system is accurate, efficient, and handles various tasks with precision.	Good implementation of object interaction. The system works well but may have minor inefficiencies or limitations in handling tasks or object variation.	Satisfactory implementation of basic object interaction tasks, but the system lacks refinement in accuracy or task variety.	Basic or partial implementation with limited interaction capabilities. The system may work but lacks efficiency or robustness.	Incomplete or non functional implementation. Object interaction is not achieved, or the system fails to operate as required.
Code Quality & Functionality	Code is well structured, efficient, and well commented. All functionalities work as expected. Code runs smoothly on the required platform.	Good code quality with minor issues in structure or efficiency. The program works, but some minor bugs or inefficiencies may be present.	Adequate code, but structure or clarity may be lacking. The program works but may have notable inefficiencies or issues with stability.	Code is poorly structured or inefficient. The program may run but is buggy or unstable, with missing key functionalities.	Code is incomplete, poorly written, or non functional. The program does not run or consistently fails.
Presentation & Demonstration	Presentation is highly professional, clear, and well organized. Demonstration effectively showcases the	Good presentation and demonstration, with some minor areas for improvement in clarity or structure. The system is	Satisfactory presentation and demonstration, though some sections lack clarity or depth. The demonstration may be limited in	Presentation is basic or unclear, with limited or ineffective demonstration of the system. Group contributions may be unclear.	Poor or no presentation. The demonstration is incomplete or fails to show the system's capabilities. Group

	solution, approach, and the system's capabilities. All group members' contributions are clear.	demonstrated effectively overall.	showing the system's full capabilities.		contributions are not listed.
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The following table details the support you will be receiving for this assignment and the feedback opportunities you will have.

Support and draft feedback sessions for Assessment 2					
Coursework briefing Week 3 in class.					
Draft feedback opportunities Time will be devoted to providing feedback.					
Additional support <i>Drop-in sessions</i>					

8. Learning Planner

Please add details of week by week schedule, activities etc

Week Beginning	Week	Lecture	Workshop	Assessment and Feedback
22 nd Sept	1	Introduction, Autonomous Robots and Robotic systems architecture	Anaconda installation, Python, Linux , Gitlab	Assessment 1 (A1) brief
29 th Sept	2	Natural Vision, Artificial Vision	CV warm-up: OpenCV I/O, color spaces, resizing, basic filters	A1 discussion
6 th Oct	3	OpenCV: edges, morphology, histograms; camera models, calibration theory.	Lab on image processing using cv2 library, Cam. Calibration	A1 outline (tasks/skills/sensors) ; A1 dataset plan (classes, sources)
13 th Oct	4	ML for Vision: train/val/test, precision/recall/F1, confusion matrix; augmentation	Binary classification , Keras, MNIST, HOG+SVM	A1 classification metrics
20 th Oct	5	CNNs: convolution, stride/padding, receptive fields; transfer learning (TL); overfitting, YOLO	TL: ResNet etc. YOLO dataset and practice	A1 Progress
27 th Oct	6	ROS 2 Essentials: nodes/topics/services/actions ; colcon; params/launch; TF intro; RViz/rosbag	Wrap-up & finalize code; README, CLI; record short demo	A1 DUE (end of week) — Submit A1 report + A1 code, 3-min concept video link.
3 rd Nov	7	Depth & Frames: RGB-D/LiDAR basics; depth→3D projection	Pose estimation, Linux&ROS-2 practice	A2 brief
10 th Nov	8	YOLO and ROS2, URDF, Gazebo	Run YOLO on robot/edge PC; RViz overlay; log fps/latency	A2 Progress
17 th Nov	9	Kinematics , Odometry	Gazebo practice	A2 Progress
24 th Nov	10	Sensor Fusion, Accelerometer, IMU	Gazebo practice	
1 st Dec	11	Work on A2	Work on A2	Work on A2
8 th Dec	12	A2 presentation and demos		

9. University 20-point Scale

20-point scale	General scale	General scale (full ranges)	Percentage used for aggregation purposes only (for areas marking directly to the 20 point scale on modules with multiple assessment components)
1	80% - 100%	79.50% - 100%	90%
2	76% - 79%	75.50% - 79.49%	77.5%
3	73% - 75%	72.50% - 75.49%	74%
4	70% - 72%	69.50% - 72.49%	71%
5	67% - 69%	66.50% - 69.49%	68%
6	65% - 66%	64.50% - 66.49%	65.5%
7	62% - 64%	61.50% - 64.49%	63%
8	60% - 61%	59.50% - 61.49%	60.5%
9	57% - 59%	56.50% - 59.49%	58%
10	55% - 56%	54.50% - 56.49%	55.5%
11	52% - 54%	51.50% - 54.49%	53%
12	50% - 51%	49.50% - 51.49%	50.5%
13	47% - 49%	46.50% - 49.49%	48%
14	45% - 46%	44.50% - 46.49%	45.5%
15	42% - 44%	41.50% - 44.49%	43%
16	40% - 41%	39.50% - 41.49%	40.5%
17	35% - 39%	34.50% - 39.49%	37%
18	30% - 34%	29.50% - 34.49%	32%
19	0% - 29%	0.01% - 29.49%	15%
20	Non-participation	0%	0% (non-submission of a component)