SYLLABUS
Academic year 2025-2026

Dean,
Prof. Vasile-Ion Manta, PhD.

1. Program data

1.1 Higher education institution	Technical University "Gheorghe Asachi" Iasi
1.2 Faculty	Automatic and Computer Engineering
1.3 Department	Computers
1.4 Field of studies	Computers and information technology
1.5 The cycle of studies[1]	Masters
1.6 Study program	Artificial Intelligence

2. Discipline data

2.1 Name of the subject/Code			Visual Intelligence Applications / AI.209				
2.2 Holder of course activities			-				
2.3 Owner of Application Activities			Lect. Paul-Corneliu Herghelegiu, PhD., Lect. Otilia Zvorișteanu, PhD.				
2.4 Year of studies[2]	2	2.5 The semester[3]	1	2.6 Type of assessment[4]	colloquium	2.7 Type of discipline[5]	DID

3. Estimated total time of daily activities(hours per semester)

3.1 Number of hours per week	2	of which 3.2 course		3.3rd sem.		3.3b laboratory		3.3c project	2
3.4 Total hours from the education plan[6]	28	of which 3.5 course		3.6th sem.		3.6b laboratory		3.6c project	28

Distribution of the time fund[7]	No. hours
Study by textbook, course support, bibliography and notes	30
Additional documentation in the library, on specialist electronic platforms and in the field	20
Preparation of seminars/labs/projects, assignments, reports and portfolios	20
tutorial[8]	
EXAMINATION[9]	2
Other activities:	

3.7 Total hours of individual study[10]	72
3.8 Total hours per semester[11]	100
3.9 Number of Credits	4

4. Prerequisites(where applicable)

4.1 curriculum[12]	
4.2 skills	

5. Conditions(where applicable)

5.1 conducting the course[13]	• Blackboard, video projector
5.2 conducting the seminar / laboratory / project[14]	• Laboratory room with computers and internet access

[1] *Bachelor / Master*
[2] *1-4 for bachelor's, 1-2 for master's*
[3] *1-8 for Bachelors, 1-3 for Masters*
[4] *Exam, colloquium or VP A/R – from the curriculum*
[5] *DF - fundamental discipline, DID - discipline in the field, DS - specialized discipline or DC - complementary discipline - from the education plan*
[6] *It is equal to 14 weeksx number of hours from point 3.1 (similar for 3.5, 3.6abc)*
[7] *The lines below refer to the individual study; the total is completed at point 3.7.*
[8] *Between 7 and 14 hours*
[9] *Between 2 and 6 hours*
[10] *The sum of the values on the previous lines, which refer to the individual study.*
[11] *The sum of the number of hours of direct teaching activity (3.4) and the number of hours of individual study (3.7); must be equal to the number of credits allocated to the discipline (point 3.9)x 25 hours per credit.*
[12] *Mention the subjects that must be passed previously or equivalent*
[13] *Blackboard, video projector, flipchart, specific teaching materials, etc.*
[14] *Computing technique, software packages, experimental stands, etc.*

	• Visual Studio Programming Environment (Academic License), Python, Google Colaboratory, GitHub (Academic License), GitHub Classroom, Overleaf

6. The specific skills accumulated[15]

		Number of credits allocated to the discipline[16]:	**4**	Distribution of credits by skills[17]
Professional skills	CP1	Demonstrate an understanding of advanced theoretical frameworks and models in artificial intelligence, including machine learning algorithms, neural networks, and deep learning architectures.		0.8
	CP2	Employ advanced artificial intelligence algorithms and decision-making frameworks to analyze and resolve practical challenges and effectively manage uncertainties inherent in real-world artificial intelligence applications.		1.0
	CP3	Critically analyze and interpret the results of artificial intelligence models, employing domain-specific evaluation metrics and considering interpretability and explainability in decision-making processes.		1.0
	CP4	Apply ethical principles and considerations in the development and deployment of artificial intelligence systems, considering societal impact, fairness, and accountability.		0.5
competences CROSS	CT1	Applying, in the context of compliance with the legislation, intellectual property rights (including technological transfer), the product certification methodology, the principles, norms and values of the code of professional ethics within the framework of one's own rigorous, efficient and responsible work strategy.		0.1
	CT2	Application of communication techniques and effective group work; developing empathic interpersonal communication skills and assuming leadership roles/functions in a multi-specialized team.		0.3
	CT3	Creating opportunities for continuous training and the effective utilization of learning resources and techniques for personal development.		0.3

7. The objectives of the discipline(resulting from the grid of specific skills accumulated)

7.1 The general objective of the discipline	• Learn fundamental notions, methods and techniques of 2D image enhancement, filtering, processing, segmentation and understanding
7.2 Specific objectives	• Implementation of image processing applications: filtering, noise removal, image enhancement • Implementation of applications that deal with current topics in the field of Computer Vision/Deep Learning; • Development of image processing applications in the frequency domain; • Development of the ability to use some established libraries in the field of computer vision - OpenCV and deep learning TensorFlow, Pytorch, Keras

8. Contents

8.1 Course[18]	teaching methods[19]	Remarks
8.2a Seminar	teaching methods[20]	Remarks
8.2b Laboratory	teaching methods[21]	Remarks
8.2c Project	teaching methods[22]	Remarks
Mode of project implementation ● The laboratory activity related to the subject Visual Intelligence Applications consists in developing a project, in a team, on a topic specific to the subject. The		

[15] *Competencies from the G1 and G1bis Grids of the study program, adapted to the specifics of the discipline, for which credits are allocated (www.rncis.ro or the faculty website)*

[16] *From the education plan*

[17] *The credits allocated to the discipline are distributed on professional and transversal skills according to the specifics of the discipline*

[18] *Chapter and paragraph headings*

[19] *Exposition, lecture, blackboard presentation of the studied issue, use of video projector, discussions with students (for each chapter, if applicable)*

[20] *Discussions, debates, presentation and/or analysis of papers, solving exercises and problems*

[21] *Practical demonstration, exercise, experiment*

[22] *Case study, demonstration, exercise, error analysis, etc.*

purpose of the discipline is to acquire practical skills of analysis, design, implementation, evaluation and presentation of solutions to current problems in the field. ● The project will be developed in teams of 2 students, during the laboratory and individual study hours allocated to the discipline. ● The topic chosen for the project can be proposed by the students and approved by the teaching staff following a discussion on the topic. **Laboratory activity:** **1. Intro:** discipline objectives, presentation of project subjects, team formation (2h) **2. Workspace setup & Project proposal:** create Github account, join Github Classroom, choose project theme (2h) **3. Literature review:** submission of project proposal, conduct literature review, explore existing solution and identify gaps related to the project theme (2h) **4-6. Prototype implementation:** design and implement project's solution, evaluate the proposed solution, prepare the documentation and the presentation for the midterm (6h) **7. Midterm:** oral presentation of the results obtained with the initial prototype, submission of intermediate report, MVP (2h) **8-12. Final prototype implementation:** adapt solution, implement new features, evaluate solution, submit code (10h) **13. Prepare final presentation:** prepare the oral presentation, write documentation (2h) **14. Final presentations:** each team will present the developed project (2h) **Hardware resources:** HTC Vive Pro Set V2, NAO humanoid robot, Jetson Nano 2GB Developer Kit, 3D laser scanner, Microsoft Hololens 2, IRIS camera, Biometric sensor - capture 1 fingerprint, Zed 2 & Mini stereo cameras, Biometric sensor - captures 10 fingerprints, etc. **Software Resources:** ● Google Collaboratory - https://colab.research.google.com ● OpenCV - https://opencv.org/ ● PyTorch - https://pytorch.org/ ● TensorFlow - https://www.tensorflow.org/ ● Keras - https://keras.io/ ● Github Classroom		

Applications bibliography (laboratory / project):

1. R.C. Gonzalez, Digital Image Processing- 3rd Edition, editura Prentice Hall, New Jersey, SUA, pag. 568-572, 2008
2. Nixon M.S., Aguado A.S., Feature Extraction and Image Processing for Computer Vision (3ed., AP, 2012)
3. Richard, H. and A. Zisserman. Multiple View Geometry in Computer Vision. Cambridge: Cambridge University Press, 2000
4. Dorin Comaniciu and Peter Meer, "Mean Shift: A robust approach toward feature space analysis". IEEE Transactions on Pattern Analysis and Machine Intelligence. 2002. pp. 603-619
5. Ingemar J. Cox, Sunita L. Hingorani, Satish B. Rao, Bruce M. Maggs, A Maximum Likelihood Stereo Algorithm, Computer Vision and Image Understanding, Volume 63, Issue 3, 1996, Pages 542-567, ISSN 1077-3142

9. Corroboration of the contents of the discipline with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program[23]

[23] *The connection with other disciplines, the usefulness of the discipline on the labor market*

Intelligent agents belong to the more general field of distributed artificial intelligence, which in turn lies at the border between artificial intelligence and distributed computing, the study of which is the main focus of the curriculum. Distributed artificial intelligence mainly consists of the study of distributed problem solving and the study of multiagent systems. Unlike classic programs, intended for a certain well-defined purpose, agents are especially suited to operate in complex, sometimes unpredictable environments. In a distributed environment, it is very difficult for a programmer to predict all possible situations that an agent may end up in during its execution. One solution is to add intelligent dynamic adaptive capabilities resulting from a learning process,

10. Evaluation

<table>
<tr><th>Type of activity</th><th>10.1 Evaluation criteria</th><th colspan="2">10.2 Evaluation methods</th><th>10.3 Weight of the final grade</th></tr>
<tr><td rowspan="4">10.4a Colloquium</td><td rowspan="4">Acquired theoretical and practical knowledge (quantity, correctness, accuracy)</td><td>Tests along the way[24]:</td><td></td><td rowspan="4">30% (minimum 5)</td></tr>
<tr><td>Homework:</td><td></td></tr>
<tr><td>Other activities[25]:</td><td></td></tr>
<tr><td>Final Rating:</td><td>100%</td></tr>
<tr><td>10.4b Seminar</td><td>Frequency/relevance of interventions or responses</td><td colspan="2">Record of interventions, portfolio of works (references, scientific summaries)</td><td></td></tr>
<tr><td>10.4c Laboratory</td><td>Knowledge of equipment, how to use specific tools; evaluation of tools or achievements, processing and interpretation of results</td><td colspan="2"></td><td rowspan="2">70% (minimum 5)</td></tr>
<tr><td>10.4d Project</td><td>The quality of the completed project, the correctness of the project documentation, the justification of the chosen solutions</td><td colspan="2">• Practical demonstrations
• Oral answers
• Assessment of progress during project hours through discussions with students, questions, and checks of practical results obtained</td></tr>
<tr><td colspan="5">10.5 Minimum Performance Standard[26]: grade 5 in the exam and practical papers (average between laboratory and project)</td></tr>
</table>

Date of completion,	Course owner's signature,	Signature of the application holder,
06 December 2024	Lect. Paul-Corneliu Herghelegiu, PhD.	Lect. Otilia Zvorișteanu, PhD.

Date of approval in the department,	Department manager,
7 December 2024	Assoc. Prof. Andrei Stan, PhD.

[24] *The number of tests and the weeks in which they will be held will be specified.*

[25] *Scientific circles, professional competitions, etc.*

[26] *The minimum performance standard from the skills grid of the study program is customized to the specifics of the discipline, if applicable.*