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Deliverable D1.1 EMAI4EU Master's in Emotion AI: Market Analysis and Curriculum Design

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Abstract

This document summarizes the results of the activities of WP1 of the EMAI4EU project. It presents the labour market needs analysis related to Emotion AI, carried out by the consortium, and describes the final curriculum of the Emotion AI Master's programme, which has been refined and improved based on the results of the analysis. The document provides a comprehensive description and a detailed analysis of the market studies, as well as it provides a general description of the curriculum prepared by the consortium. The curriculum is divided into two main parts: the first (entry) year of education is dedicated to the teaching of basic computer science and mathematics, and the second (exit) year is dedicated to the specialisations offered by the partner universities. The annexes of the document present the market analysis questionnaire, detailed results and the list of courses at each partner university.

Versioning and contribution history

Version	Date	Authors	Notes
0.1	15/11/2024	Jean Martinet (UCA)	First version.
0.1	20/11/2024	Kinga Bettina Faragó, László Gulyás (ELTE)	First version updates, draft structure.
0.2	22/11/2024	Françoise Baude (UCA)	Added possible page numbers target, so to reach a total, of let us say approx. 30 pages ALL included; so, core text without the executive summary, annexes and bibliography of 15 pages would be a reasonable target
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0.4	10/12/2024	Jean Martinet (UCA)	Added Annex 1 and Annex 2
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Project Abstract

Emotion Artificial Intelligence specialists for Europe (EMAI4EU) aims to train the next generation of specialists and innovators in Emotion Artificial Intelligence in Europe. EMAI4EU will achieve this goal by designing and delivering a double-degree master's programme (ISCED Level 7, 120 ECTS) in Artificial Intelligence with a specialisation in Emotion Artificial Intelligence and a minor in Innovation and Entrepreneurship.

The master's programme has been designed and created by 8 higher education institutions from 5 different countries, together with 4 innovative SMEs, a leading research centre in AI and EIT Digital, a pan-European organisation with experience in delivering education programmes in advanced digital skills across Europe. EMAI4EU master's programme will foster strong interactions and mobility between academia and business, strengthen knowledge triangle integration, promote entrepreneurship, foster inclusiveness, and boost the growth of the existing EIT Digital ecosystem, one of the largest digital ecosystems in Europe.

In addition to the specialised master's programme, EMAI4EU partners will develop and deploy self-standing learning modules on topics related to Artificial Intelligence and Emotion Artificial Intelligence. These modules will result in a set of certifications in advanced digital skills released by participating higher education institutions and EIT Digital. In line with the goals of the Digital Compass and New European Innovation Agenda, EMAI4EU will train more than 1000 participants across four years and contribute to reducing the gap in advanced digital skills in Europe and increasing Europe's competitiveness in a key digital technology domain such as Artificial Intelligence.

Finally, it is important to highlight the added value of this project: several isolated courses on Emotion AI can be identified in some European universities, but a master's programme in AI with a specialisation in Emotion AI has not been available on the EU market.

Executive Summary

This document summarizes the results of the activities of WP1 of the EMAI4EU project. It presents the labour market needs analysis related to Emotion AI, carried out by the consortium, and it describes the final curriculum of the Emotion AI Master's programme, which has been refined and improved based on the results of the analysis.

Emotional AI is about processing of data related to emotions in order **to recognise or influence the emotions of a person**. The affective computing branch of AI is **an interdisciplinary field of science**, having contributions from computer science to

psychology, linguistics, cognitive science. One of its motivations is **to give machines emotional intelligence,** including simulation of empathy. **The machine should interpret the emotional states of humans and adapt its behaviour to them**, giving an appropriate response to those emotions.

The consortium carried out a questionnaire-based market study in order to develop a joint understanding of the current landscape of Emotion AI and its applications in various industries, extending to the understanding of the current status of the uptake of AI. The questionnaire had 5 main parts: 1) General Information 2) AI awareness and usage 3) Future emotional AI outlook 4) Needs and priorities for Business 5) Training. Among the 100+ answers collected from market players, **51.4% came from companies with over 250 employees**, while one third of the answers (29.7%) were from individuals or companies of less than 20 employees. **37.8%** of the answers originated **from the Information technology and Communication sector** and **18.9%** were received **from C-Level executives**.

The analysis of the answers showed that **AI usage is already largely spread over the community (75.7%)**. **Text generation (89,3%) comes on top** of the list of application followed by search engine (41.7%), data analysis (32.1%), image generation (25%) and Video tools (9.5%). Surprisingly, **Copilot is only used by a very small portion (3.6%) of respondents**.

When it comes to **risk perception of AI**, the community is **divided almost equally** among respondents who rather believe that **AI represent a risk** (most believe that this risk is rather on the human side than on the system side), those who **consider AI safe**, and those (the largest group with 28.8% of responses) who are **undecided**. Importantly, **there is a broad consciousness on the environmental impact (~75%).**

The majority of respondents sees Emotion AI's increasing importance in the years to come, **even though 55.9%** of the people interviewed had **never heard about** emotion AI **before** taking the survey. We also observe that about **36%** of respondents **believe that emotional AI will have significance in their company in the future**, **while** about **44% do not** see this growing significance in their company. **According to 46% of the respondents emotional AI is an asset for society**. 31% considers it as a technological bubble, while ~23% are neutral.

In business operations, **respondents expect Emotion AI to contribute to enhanced user experience benefits (55%)** and **increased personalised interactions (53.2%), as well as improved customer satisfaction (45.9%)**. Further expectations include **mental health**

support (39.6%), **better decision making (36%)**, **enhanced productivity (33.3%)**, **reduced stress level (27.9%) and enhanced empathy (24.3%).**

Regarding the skills required for an Emotional AI expert the answers outline the need for some fundamentals of computing science such as **Data analysis (47.7%), Natural Language Processing (47.7%), Machine Learning (45%), Security and privacy (41.4%)**, as well as **Advanced user interfaces (27.9%), Uncertainty in AI (26.1%)**. Further skills that have been identified as necessary include **Emotion recognition (72.1%), Human psychology (67.6%), Ethical decision making (49.5%), and communication skills (45%).**

Only 8.1% of the respondents have already been trained in Emotion AI, **but 61% of them expressed their interest.** This points towards a significant demand for formal trainings in Emotion AI.

EMAI4EU Master's programme's curriculum design has been informed by the results of **the market survey** and building upon **existing expertise of the partner universities**. The programme combines expertise **in both human-centred design and in artificial intelligence**, developing innovative skills and comprehensive knowledge needed to design and develop emotionally intelligent AI systems.

The curriculum, developed in collaboration with partner universities (ELTE, POLIMI, UNITN, UR, UCA, EURECOM, UPM, UTU), provides **AI specialists with a general, comprehensive knowledge base** that can be used in a variety of professions: **Human-Centred AI Designer**, **Emotion AI Consultant, AI Developer, AI Research and Development Manager**, as well as knowledge that borders on psychology and cognitive science to help lay the foundations for human-centred, responsive systems. The EMAI4EU Master's programme also provides legal and ethical knowledge to support training. **The universities' specialisations cover a wide range of areas such as healthcare, robotic applications and interdisciplinary opportunities**.

The Emotion AI for EU Master programme is part of EIT Digital's Master School. It includes a **major in Emotion Artificial Intelligence**, combined with **a minor in Innovation and Entrepreneurship**. The entire programme is held **in English** and all partner universities are assumed to use ECTS units. The students are graded according to the national grading systems at the involved universities. The legal frameworks and specific local programmes used for local implementations for the EMAI4EU master's programme's partner universities are also included in this report.

The EMAI4EU master's programme has **the following structure**:

- Students study **one year at an 'entry' university and one year at an 'exit' university**.
- **The first year is similar at all entry points**, with a focus on basic courses that lay the foundation for the Emotion AI programme (modules: AI and CS Core, and Emotion AI Core). In addition, students are introduced to business and management during this first year as part of the Innovation and Entrepreneurship minor.
- **The second year offers a specialisation** (module: Emotion AI Specializations) and a graduation project (module: MSc Thesis).
- The graduation project includes an internship at a company or a research institute and cumulates with a Master thesis having a strong innovation and entrepreneurship dimension.
- During the second semester, a design project is combined with business development exercises to demonstrate how technology can be transformed into a successful business with optional elective courses. Students are taught how to prepare and present a convincing business plan.
- In between the first year and the second year, students participate in the EIT Digital **2-week Summer School programme** that addresses business opportunities within a socially relevant theme.
- Graduates receive **degrees from the two universities and a certificate** on their entrepreneurial studies awarded **by the European Institute of Innovation and Technology (EIT)**.

Following partner universities offer an entry year:

Eötvös Loránd University (ELTE)
Polytechnic University of Milan (POLIMI)
University of Trento (UNITN)
University of Rennes (UR)
Université Côte d'Azur (UCA)
Universidad Politécnica de Madrid (UPM)
University of Turku (UTU)

Following universities offer an exit year (with the listed specialisations):

Eötvös Loránd University (ELTE)	Humane Aspects of Applied Emotional AI

EURECOM	Emotional AI embodied in Multimodal Agents
University of Trento (UNITN)	Emotional AI in Robotic Applications
Université Côte d'Azur (UCA):	Holistic interdisciplinary aspects
Universidad Politécnica de Madrid (UPM)	Practical Emotional AI: healthcare
University of Turku (UTU):	Emotional AI in healthcare and medicine

Emotion Artificial Intelligence programme is **open to applicants** with either a **Bachelor of Science degree** or **who are in their final year of study in**: **Computer Science / Computer Engineering, Information Systems, Mathematics, Electrical Engineering**. Applicants with a **background in psychology, cognitive sciences and other relevant disciplines**, and with reasonable knowledge of the fundamentals of computing and information sciences and technologies may also be considered.

1. Market analysis

The objective of the market analysis is to help understanding the current landscape of Emotion AI and its applications in various industries. This section starts with an historical context of three decades of affective computing and examines risks and opportunities of this AI innovation. To gain deeper insights into market needs and trends, a meticulously designed questionnaire was employed to gather targeted feedback from stakeholders. The subsequent analysis of results highlights key insights and trends, offering some perspective on market demands. Furthermore, the questionnaire not only provided valuable data for aligning educational curricula with industry needs, but it also created incentives inside and outside the EMAI4EU consortium. Finally, this market analysis serves as an initial tool for enlightening curriculum development, ensuring that educational programs remain relevant and future-focused in the rapidly evolving field of Emotion AI.

1.1 History on Emotion AI and three decades of affective computing

On August 1st, 2024, because of a long journey in the AI History came into force the Artificial Intelligence Act, a European regulation establishing a common regulatory and legal framework for AI within the European Union. This act establishes the notion of risks and governance to ban AI applications that could manipulate human behaviour, facial recognition or social scoring or touch to the fundamental rights of persons. The list of high-risks applications can be expanded over time without the need to modify the AI Act in itself.

The affective computing branch of AI, an interdisciplinary field of science (from computer science to psychology, linguistics, cognitive science) can be traced back as to early inquiries into emotions, however the more modern branch of computer science originated with Rosalind Picard's 1995 paper [1] on affective computing published by MIT Press, which lays the foundation around emotion AI. One of the motivations for the research is to give machines emotional intelligence, including simulation of empathy. The machine should interpret the emotional states of humans and adapt its behaviour to them, giving an appropriate response to those emotions.

Two decades later, September 28, 2016, the Partnership on AI (PAI) was publicly announced with founding members such as Amazon, Facebook, Google, DeepMind, Microsoft, IBM. It is a nonprofit coalition committed to the responsible use of AI. In 2017 Apple joined while in October 2018 Baidu was the first Chinese firm to join the Partnership.

In August 2021, the Partnership on AI submitted a response to the National Institute of Standards and Technology (NIST). The response provided examples of PAI's work related to AI risk management, such as the Safety Critical AI report on responsible publication of AI research, the ABOUT ML project on documentation and transparency in machine learning lifecycles, and the AI Incident Database.

In February 2023, the PAI launched a novel framework aimed at guiding the ethical development and use of synthetic media – this initiative was backed by partners such as Adobe, OpenAI, TikTok to cite a few.

Partnership on AI has a multiple pronged approach to achieve impact. Their initiatives are separated into five different programmes: AI and media integrity; AI, work, and the economy; justice, transparency, and accountability; inclusive research and design; and security for AI. These programmes aim to produce value through specific outputs, methodological tools, and articles.

When it comes to Emotional AI, the purpose is developed to tackle many things such as:

- Sense signals and process data related to emotions.
- Find patterns and correlations between emotion and heart rate, respiration, patterns of speech, direction of gaze, body language, location, pupil dilation, frequency of messages sent and quickness of response.
- Recognise outward expressions associated with emotions, like a smile.
- Recognise the emotion intends to convey or accidently conveys.

- Replicate an outside observer's perception and predictions about someone else's emotional state, using everything the observers knows, including context.
- Recognise or influence the emotions of a person (both short term states, like happiness or sadness, and longer states, like depression or anxiety).
- Recognise or influence other affective states including interest, engagement, or alertness.
- Measure levels of arousal and negativity/positivity rather than describing a specific emotion.
- Simulate emotion or expressions of emotions (social robots).

We are entering in fast innovation cycle pervasive to the complete society, with applications covering a broad range of human activities, from detecting, treating or assisting with disease or disability, to agriculture, social robots, education and audience engagement, gaming, movies and entertainment, advertising and retail, hiring and employment, chatbots, call centres, home/auto voice assistants, wearable and stress relief, automotive and industrial safety, threat detection/intervention and law enforcement, communities, politics and social networks.

We started this long journey on Emotional AI by the most recent innovation in law in Europe to highlight the need to minimise risks while maximising social benefits. This will require thinking big and strategically to anticipate unacceptable risks while discovering incredibly new types of opportunities to bring in the years to come to the entire society.

While human history is paved by great inventions over a long period of time, we are entering in a fast forward move into shorter innovations cycles as described by Kondratieff waves of innovations [2], in this era of Big Data and powerful algorithms increasing capabilities, Emotional AI education will in a fast way bring new benefits to the entire society in the years to come.

As well as fitting into economic schemes, another important aspect of a new innovation is society's reaction to it in general. The Gartner Hype Cycle [3,4] illustrates the value of a new technology trend or innovation and helps understanding a product's lifecycle. A proper knowledge of innovation lifecycles is the first step to tackling new opportunities and challenges. According to the theory an innovation has five main stages in its lifecycle, which are: innovation trigger, peak of inflated expectations, through of disillusionment, slope of enlightenment, plateau of productivity as they are named after the visual shape of the curve. In this section we refer to these phases.

Based on the Gartner Hype Cycle for AI report from July 2023 [3] and considering emotion AI-related technological tools we highlight relevant innovations that are already part of everyday life or just about to find their acceptance and proper common usage, however, have impact on market and research directions. Visualization can be seen in Figure 1.

Looking closely at the 5–10-year horizon of reaching the productivity plateau, we find that the field of Autonomous Vehicles is behind the disillusionment, but Intelligent Robots, Responsible AI, Neuromorphic Computing are around the peak, so the processing phase of the lack of high hopes is still ahead of them in the lifecycle of these topics and technologies.

Composite AI is essential in multimodal information processing which is an efficient method to incorporate emotions to human-centred services or applications. It seems to be a fast-emerging topic since it is predicted to reach the plateau in 2-5 years, however still not reached the peak. The field of Intelligent Applications is beyond the peak of inflated expectations and the slope of disillusionment, but about to be in the productivity area in 2-5 years.

A final topic to mention is that we found Neuro-symbolic AI and Artificial General Intelligence the most relevant long-term triggers, that are still in the phase of reaching the peak of inflated expectation and to arrive to the phase of the plateau of productivity in more than 10 years.

For a broader perspective it is also worth looking at Gartner's Hype Cycle for Emerging Technologies from 2024 [4]. It is clear from the curve (see Figure 2), that automation, AI-supported innovations and applied AI methods are presented in a spectacular amount and in general most of the items are around the peak of hype and about to reach productivity in 2-10 years.

Finally, we complete this brief overview by discussing current trends in startups and their relation to the development of emotional AI. This recently published review article [5] presents comprehensive details on entrepreneurship in the digital age, considering success factors, market analysis, financial challenges, technological impacts, handling of costumer data and emerging technologies.

In addition to several factors that are outside the scope of this document, the authors highlight the need for entrepreneurs to meet the market demands of AI use, navigate complex regulations, and manage consumer data ethically and provide transparent AI solutions. Technological literacy and a comprehensive knowledge of emerging innovations are essential to building a successful startup.

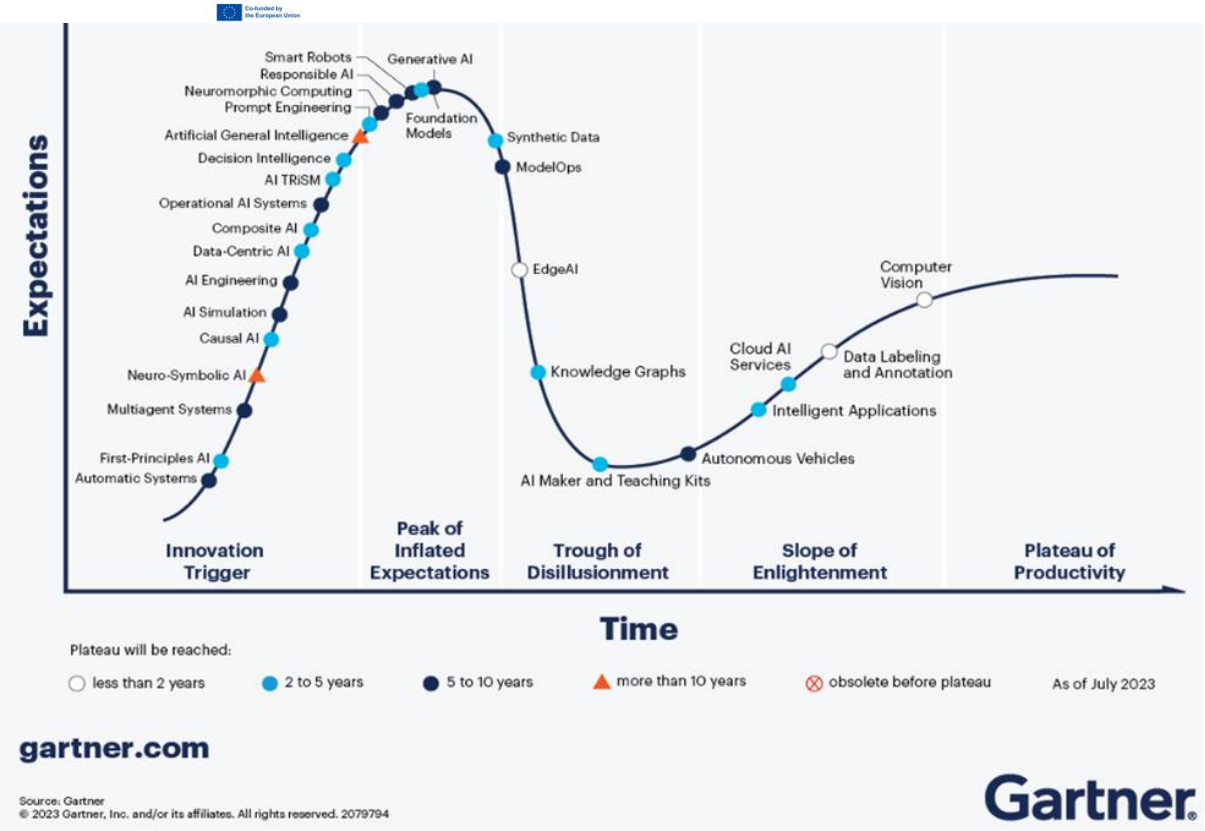

Figure 1. Hype Cycle for Artificial Intelligence, 2023, visualization presented by Gartner [3]

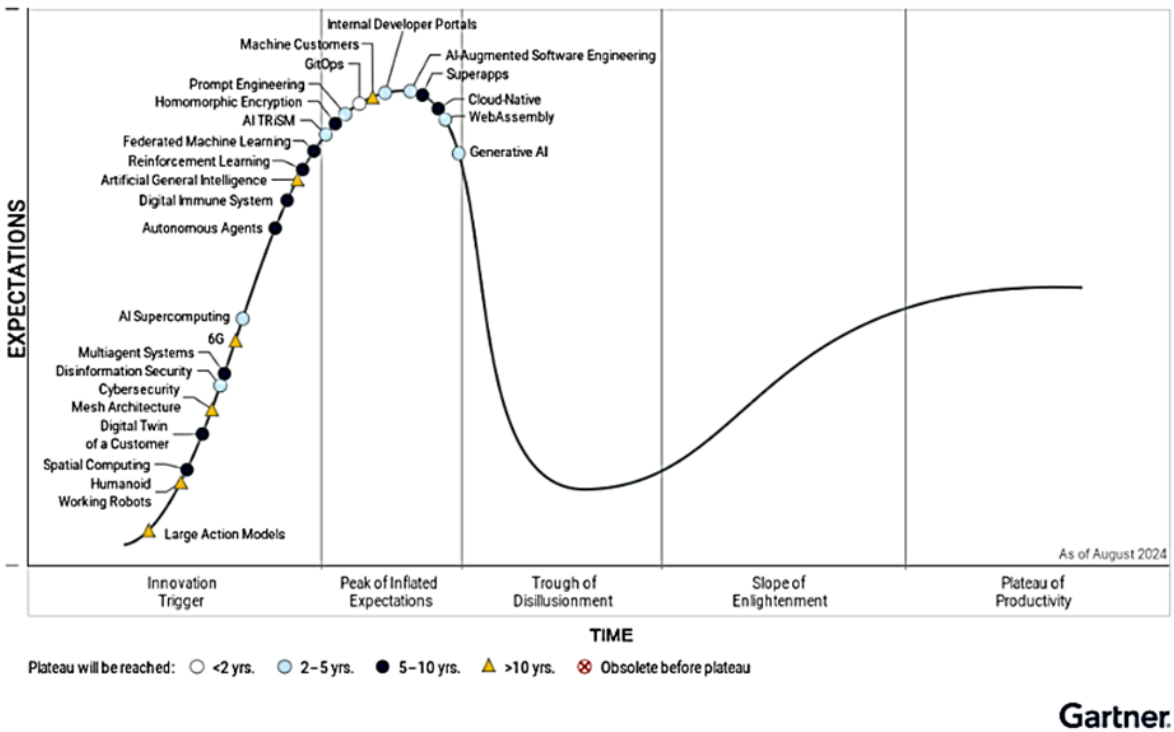

Figure 2. Hype Cycle for Emerging Technologies, 2024, visualization presented by Gartner [4]

1.2 Questionnaire design

The draft and format of the Questionnaire is the result of the cooperation between different stakeholders of the EMAI4EU Consortium. The most active members in the beginning were UCA with the contribution from the Economy Faculty (EUR ELMI) and our industrial partner Ludotic. The partner UTU also deeply contributed from the early stage of the questionnaire elaboration. Indeed, the design has been carried out in collaboration with partners in charge of T1.1 and T2.1, with the purpose of exploiting a single questionnaire to serve the market analysis both for establishing the Master curriculum and the list of self-standing modules.

After a few brainstorming sessions, we reached during March 2024 timeframe to 2 versions that we merged into a single version for beta test around mid-March. Later, we released the final version to our many contacts inside the Sophia Antipolis cluster first before opening it to all the members of the Consortium by the end of March. At the end of April, we had collected close to 30 answers. Having Ludotic onboard in the Consortium, we got access to the Telecom Valley network (Telecom Valley is a cluster of players of the French Riviera digital economy, with nearly 120 members) that has allowed to reach many key players in the field of AI from the big multinationals such as IBM, Amadeus, Orange up to the start-ups involved in the field of emotion AI. We agreed to choose a GoogleForm based on Ludotic recommendation and to build a questionnaire made of 5 main parts and few scales so that the survey could be completed in 10 to 20 minutes max by the participants. The 5 parts addressed by the Survey are 1) General Information 2) AI awareness and usage 3) Future emotional AI outlook 4) Needs and priorities for Business 5) Training.

By the end of April, we started to accelerate through the mobilisation of Consortium members to extend the answers from the Sophia Antipolis cluster to our European reach. Those multiple efforts have led to our target to reach a panel of more than 100 answers to yield enough raw data for our results analysis and insights by end of June 2024.

1.3 Results analysis and insights

We have collected 113 answers from the questionnaire out of which 111 can be used for the results analysis and to elaborate the insights. The questionnaire results are exhaustively displayed in Annex 2: Market Analysis Questionnaire Results.

In the first part of the questionnaire, we see that regarding the sector of activity of respondents, over a third of the answers (37.8%) originate from the Information technology and Communication sector, which is the main sector sampled. As for the size of companies, more than half of the answers (51.4%) originate from companies with over 250 employees while one third of the answers (29.7%) come from individuals or companies of less than 20 employees. Therefore, medium enterprises are slightly under-represented. Regarding the role of respondents in the companies, one fourth of the answers are from Software engineers (24.3%), which added to the Software developers (15.3%) brings the total close to 40% of the answers. C-Level/ Top Management counted for 18.9% of the total answers. The remaining parts belong to various types of roles from project managers (4.5%), human resources (6,3%) and diverse types of positions, including management and general administration, operations management, ergonomists, researchers, software developers in apprenticeship, etc.

In the second part of the questionnaire, we learn that AI usage is already largely spread over the community (75.7%). As seen in Figure Figure 3, text generation (89,3%) comes on top of the list followed by search engine (41.7%), data analysis (32.1%), image generation (25%) and Video tools (9.5%). Surprisingly, Copilot is only used by a very small portion (3.6%) of respondents.

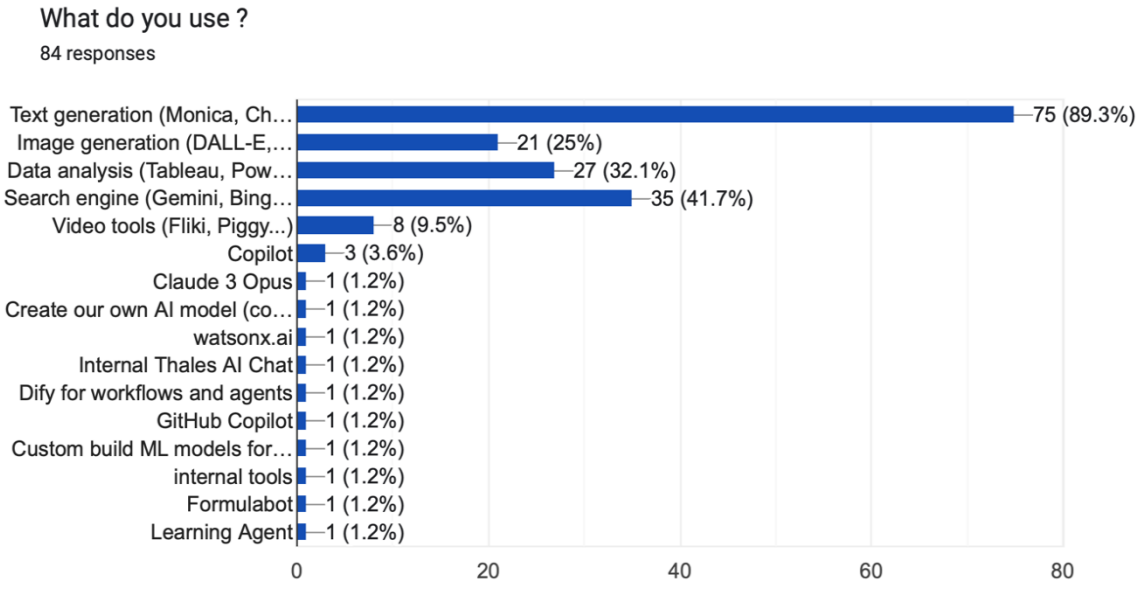

Figure 3 AI tasks and tools used in work tasks (as displayed in Annex 2)

When it comes to risk perception of AI, one third of the respondents rather believe that AI represent a risk (most believe that this risk is rather on the human side than on the system side), while another third rather lean towards the opposite opinion; the last third (largest group with 28.8% responses) are undecided and do not know. Besides, there is a broad

consciousness on the environmental impact as well (close to 75%). Finally, AI seem to be currently used in the companies of about half the respondents.

So, as an insight of this part, companies have already adopted AI to a very important level, beyond the usages there is a limited consciousness about the risks and wider awareness of the environmental impact.

When it comes to emotion AI in the third part, while 55.9% of the people interviewed had never heard about emotion AI before taking the survey, a majority sees its increasing importance in the years to come. We also observe that about 36% of respondents believe that emotional AI will have significance in their company in the future, while about 44% do not see this growing significance in their company.

In the fourth part related to the benefits foreseen from using emotion AI in the business operations, over half the interviewees see enhanced user experience benefits (55%) and increased personalised interactions (53.2%), improved customer satisfaction (45.9%) while people see big interests for mental health support (39.6%), better decision making (36%), enhanced productivity (33.3%), reduced stress level (27.9%) and enhanced empathy (24.3%) – see Figure Figure 4.

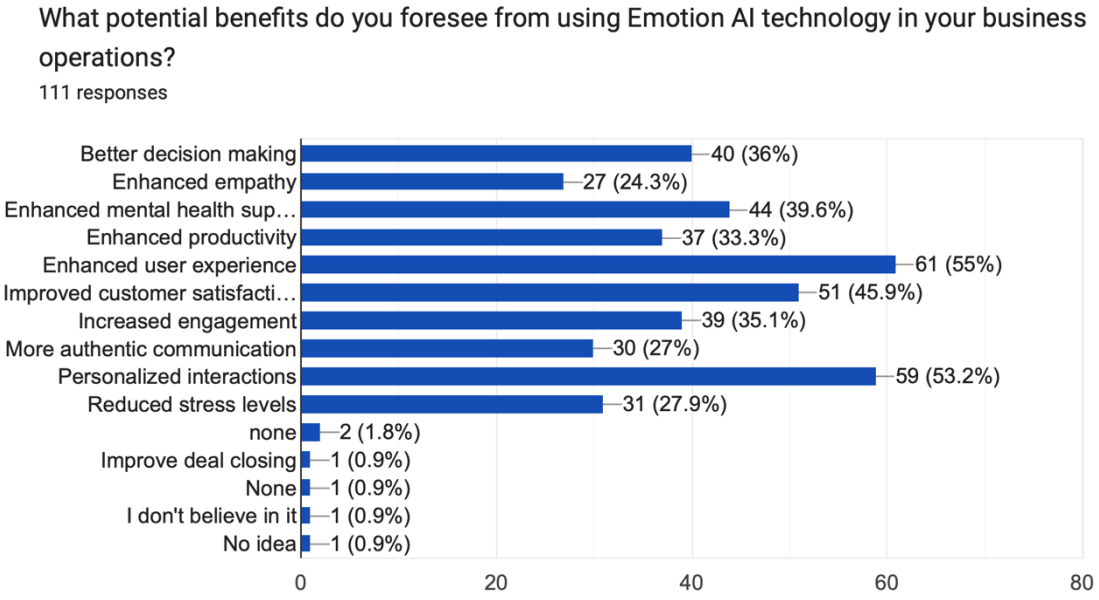

Figure 4 The potential benefits of emotion AI in business operations (as displayed in Annex 2)

Most of the answers regarding the skills required for an Emotional AI expert outlines the needs for some fundamentals of computing science such as Data analysis (47.7%), Natural

Language Processing (47.7%), Machine Learning (45%), Security and privacy (41.4%), Advanced user interfaces (27.9%), Uncertainty in AI (26.1%), however, many see the growing importance to acquire skills in Emotion recognition (72.1%), Human psychology (67.6%), Ethical decision making (49.5%), and communication skills (45%).

Regarding the question of risk perception for "emotion AI", it is interesting to observe the difference with the previous question about the perceived risk of "AI". While the answers are roughly evenly distributed among *no risk*, *do not know*, and *risk* with about one third of respondents each group in the previous question, for "emotion AI", the distribution is rather 27.9% for *no risk*, 18.9% for *do not know*, and 53.1% for *risk*. The respondents are therefore more decided about a risk for emotion AI than for AI in general. A large ratio of respondents (about 46%) acknowledges the idea that emotional AI is an asset for society, while only about 31% see emotion AI as a technological bubble; about 23% are neutral about it.

Finally, when it comes to training in the fifth part, we learn from the responses that companies generally support certifications and continuous learning. However, in the field of emotion AI, only 8.1% of the respondents already got trained on this topic, while 91.9% have never attended any training in this field, and interestingly, 80% (resp. 61%) have expressed their interest for being trained in IA (resp. emotion AI), therefore there is a wide need of training to be covered while moving forward. Last, about one third of respondents stated that their companies would be willing to host an AI / emotion AI intern, which confirms that future EMAI4EU students are likely to easily find an intern position as part of their curriculum.

To conclude this section, we synthetise the main insights from the questionnaire, that are summarised below:

- The questionnaire results helped to understand the need to include in the curriculum, beyond core technical AI modules, several transversal topics (such as Emotion Recognition, Human Psychology, Ethics, Communication, Empathy, and others)
- The benefits identified are mainly related to enhanced user experience to personalised interactions, improved customer satisfaction, enhanced mental health, better decision making, increased engagement, enhanced productivity, reduced stress levels, more authentic communication and enhanced empathy.
- While AI is already largely adopted in professional environments, there is a wide need of training in emotional AI.

1.4 Incentives created by the questionnaire

The design of the questionnaire has the following positive side effects. The choice of questions has started brainstorming in the consortium about the curriculum contents.

The main brainstorming topics focused on the awareness and usage of artificial intelligence, which is also an important future challenge for academic education in general. Besides, finding the proper position and additional value of emotional AI was a well-discussed area among the partners. In simple terms, the common task was to define the necessary competences for an emotional AI specialist and to provide the associated education for each skill.

Preparing the market analysis questionnaire for exploring the potential risks of AI-supported systems from a business perspective was challenging.

Internally to the consortium, the questionnaire has created an engaging effect from the multiple stakeholders from the consortium and in time the complete consortium engaged in the process, stimulating a brainstorming effect, a learning effect, a networking effect and an advertising effect.

Externally to the consortium the results were quite similar. To a certain extent this has stimulated the brainstorming with the people approached and created a network effect.

1.5 The impact of market analysis on curriculum development

The market analysis informed the development of the curriculum of the Emotion AI Master's programme. It was made sure that the most important skills expected by the market from emotion AI experts are covered and that relevant specialisations are offered that lead to professionals that are capable of fulfilling the professional roles expected by the market.

Figure 5 shows the breakdown of the most important skills, according to the market survey respondents. Emotion recognition is the top skill, which lies at the heart of the programme's emotion AI specialisation and thus is covered. Looking at this competence within the structure of the programme, it is linked to the content of the second module (Emotion Ai Core module) and the specialisations (Module 3) of the universities offering each exit year.

This is followed by Data analysis and Machine Learning – core AI skills that are covered by the curriculum's AI & CS Core module (namely Module 1). Natural Language Processing is part of both advanced AI and an important topic of emotion AI, so the consortium agreed to give this topic a strong emphasis. It is incorporated into Module 2 (namely Emotion AI Core). Software development is covered as part of the generic computer science background of the programme (also supported by the entry requirements) and it is part of the AI & CS Core module.

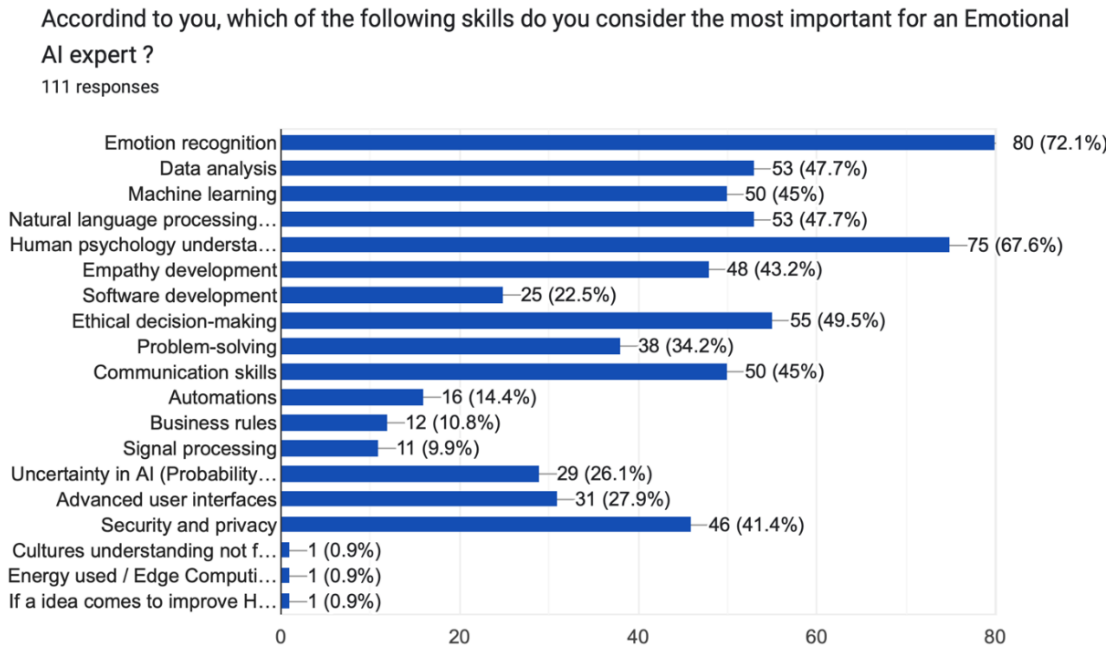

Figure 5. Most important skills for an Emotional AI expert – according to respondents.

The basics of Human psychology understanding, Empathy development and Advanced user interfaces are addressed either by the Emotion AI Core module (as Module 2) or as part of the offered specialisations (Module 3). The ethical dimension of Emotion AI was included in the curriculum as a response to the survey, into the AI and CS Core module.

Finally, Problem Solving, Communications skills and the understanding of Business rules are addressed by the Innovation and Entrepreneurship minor of the programme, which is identified as Module 5. An overview of the programme structure and students' competencies is given in Figure 5 and Table 2.

1.6. Alternative Emotion AI curricula

The landscape of Emotion AI curricula is rather limited in 2024. As part of market analysis, we researched existing courses or curricula online to build a global view of what other education programmes oriented towards Emotion AI potential students could find in

Europe and outside Europe. The online search typically included combinations of "emotion AI", "emotional AI", "affective computing", "course", "curriculum", "degree", etc. In summary, while several academic research groups investigate Emotion AI and applications, on the education side, we found only scarce individual courses with the historical name "Affective Computing", and more importantly, we could not find any other integrated curriculum oriented towards Emotion AI. We give below examples of individual courses (most are face-to-face, some are online):

- A course on Affective Computing from Queen Mary University of London (UK).
- A course on Affective Computing from the University of Cambridge (UK).
- A course on Affective Computing from the University of Milan (Italy).

Outside Europe, we can cite:

- An open course on Affective Computing from MIT (USA)
- A course on Affective Computing from the University of Waterloo (Canada).
- A course on Affective Computing from IIT Delhi and IIT Ropar (India), also available online through the Indian e-learning platform NPTL (National Programme on Technology Enhanced Learning).

Note that the same online research online with similar keywords early 2025 returns the EMAI4EU MSc as the single curriculum available in the first results, which highlights that EMAI4EU is currently the most visible education programme.

2. Curriculum design

The programme builds upon existing expertise and courses of the partner universities.

2.1 Programme objectives

As Artificial Intelligence (AI) continues to transform industries and revolutionise the way we live and work, the next frontier in AI development is about understanding human emotions and behaviour and harnessing this knowledge to create more intuitive and empathetic systems that can improve standards of living. The intersection of AI and emotions is a rapidly growing field that requires expertise in both human-centred design and artificial intelligence.

The Emotional AI master's programme combines these two areas of expertise to provide the innovative skills and comprehensive knowledge needed to design and develop emotionally intelligent AI systems. By understanding AI fundamentals and the nature of

human emotions and behaviour, graduates will be able to create AI systems that are more intuitive, empathetic, and user-friendly, and that can enhance human well-being and quality of life.

2.2 Structure and Learning Objectives

The EMAI4EU master's programme consists of a comprehensive two-year education combining a technical major (90 ECTS) and a standardised I&E minor (30 ECTS). A total of 120 ECTS are required for successful completion. Table 2 shows an informative summary about the programme's total ECTS. The technical major consists of compulsory courses, electives, specialisation courses and the Master's thesis. The compulsory I&E module focuses on business and management skills, covering methodologies and design of business ideas and the transfer of current technologies into businesses. The entire Master's programme is held in English and all partner universities are assumed to use ECTS units.

The EMAI4EU master's programme has the following main points:

- Students study one year at an 'entry' university and one year at an 'exit' university.
- The first year is similar at all entry points, with a focus on basic courses that lay the foundation for the chosen technical programme. Students are introduced to business and management during this first year. During the second semester, a design project is combined with business development exercises to demonstrate how technology can be transformed into a successful business with optional elective courses. Students are taught how to prepare and present a convincing business plan.
- In between the first year and the second year, students participate in the EIT Digital 2-week Summer School programme that addresses business opportunities within a socially relevant theme.
- The second year offers a specialisation and a graduation project. The graduation project includes an internship at a company or a research institute and cumulates with a Master thesis having a strong innovation and entrepreneurship dimension.
- Graduates receive degrees from the two universities and a certificate on their entrepreneurial studies awarded by the European Institute of Innovation and Technology.

Table 1 contains the partner university names and corresponding responsibility of the programme. Figure 5 shows university locations.

Name of University	Country	ENTRY Year	EXIT Year
Eötvös Loránd University (ELTE)	Hungary	✔	✔
Polytechnic University of Milan (POLIMI)	Italy	✔	
University of Trento (UNITN)	Italy	✔	✔
University of Rennes (UR)	France	✔	
Université Côte d'Azur (UCA)	France	✔	✔
EURECOM	France		✔
Universidad Politécnica de Madrid (UPM)	Spain	✔	✔
University of Turku (UTU)	Finland	✔	✔

Table 1. Summary table of entry and exit years provided by partner universities.

The 2-years Master's programme has a modularized structure, which means the first (entry) year covers Modules 1 (AI and CS Core) and 2 (Emotion AI Core) and the second (exit) year contains Modules 3 (Emotion AI Specializations) and 4 (MSc Thesis). Additionally, Module 5 as the standardized I&E minor has courses both for first and second year. Summary of the modularized structure is shown in Table 2. Regarding ECTS data a module can either have a range or a fixed number of ECTS. This modest flexibility takes into account the course administration (ECTS/course) of each university, while ensuring the overall standardisation of the Master's programme.

To successfully complete the programme, students have to complete the technical major (60 ECTS plus 30 ECTS for the MSc thesis) and the I&E minor (30 ECTS), for a total of 120 ECTS.

Modules Description			
Module nr.	**Module name**	**Description**	**ECTS**
1	AI & CS Core	Mandatory courses in Artificial Intelligence and Computer Science, covering the fundamentals of programming and mathematics required for AI, as well as a strong base in Artificial Intelligence methods.	20-25 (*)
2	Emotion AI Core	Mandatory courses covering the Emotion Artificial Intelligence.	11-16 (*)
3	Emotion AI Specialisations	Advanced topics in Emotional Artificial Intelligence.	20-25 (*)

4	MSc Thesis	Mandatory consultations and creation of the MSc thesis work.	30
5	I&E	Business minor focused on Innovation and Entrepreneurship.	30
(*) Combined target for Modules 1-3 is 60 ECTS in total			

Table 2. Summary table of EMAI4EU modules. Modules 1 and 2 refer to the entry year, modules 3 and 4 to the exit year. Module 5 applies to both years. A short description and the corresponding ECTS are shown.

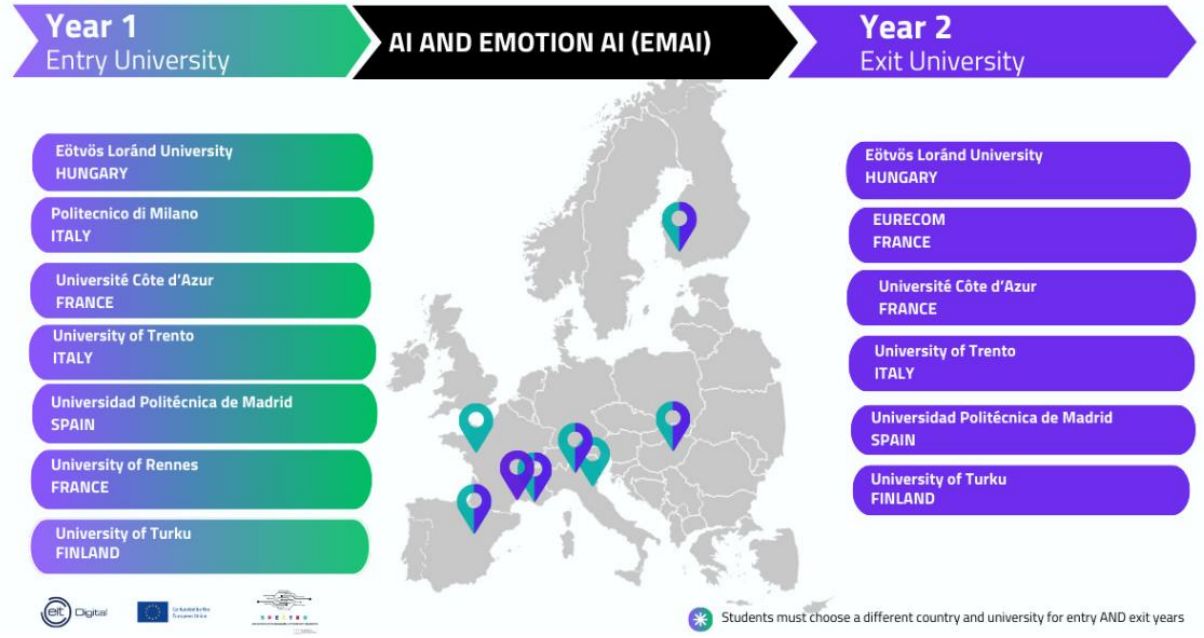

Figure 6. Map of the EMAI4EU Master's programme's partner universities in Europe, with their respective entry/exit years. Original source: https://masterschool.eitdigital.eu/emotion-ai

The EMAI4EU programme defined the following learning objectives as essential skills and/or attitudes that graduates should acquire in the major, technical module (which contains Modules 1-4):

- Excellent level of practical knowledge on data analysis, mathematical, statistical concepts, as well as programming principles and relationships necessary for innovative, research-level practice in the field of artificial intelligence, particularly the principles of machine learning, reinforcement learning, network modelling and data processing, statistics, uncertainty management, symbolic reasoning and semantics, cognition, and

human collaboration, which underpin lifelong learning and knowledge adaptation in changing industrial environments.

- Comprehensive knowledge on general human-machine interactions, specified to emotion-involved tasks. Accordingly, students should understand the possibilities offered by emotion artificial intelligence for implementing efficient and natural human-machine interaction systems, which ensure the widespread use of technology.
- Up-to-date theoretical knowledge on emotion AI. Focusing on the latest concepts, methods and theories related to emotion artificial intelligence, including techniques for programs to measure, understand, simulate, and react to human emotions.
- Technological literacy in the major application areas such as recognition, recommendation, generation, assistive, and other similar systems. Students should become familiar with the problems associated with these areas and the main directions of possible solutions, as well as the application limitations of the related techniques.
- Students acquire knowledge of the methods and possibilities for developing non-biased and secure artificial intelligence, understanding ethical concepts and the advantages and disadvantages of various methods, which enables the application of artificial intelligence even in safety-critical systems.
- Excellent level software development skills. Students should be familiar with the application of software development processes and technologies that aim for the reliable and efficient creation, deployment, optimisation, maintenance, and expansion of artificial intelligence methods in an industrial environment, thus covering the entire lifecycle of the software.
- Industrial perspective. Students should possess outstanding knowledge of the current concepts, methods, and theories of artificial intelligence, be aware of the impacts of various constraints (such as real-world conditions, large amounts of data, applications developed for specific human support) on modelling and training, which facilitate communication with different industrial stakeholders. In addition, students learn a cooperative attitude, reasoning, problem solving to ensure effective collaboration with industry in terms of incorporating emotions.

The standardized I&E minor – as Module 5 – has the following list of learning objectives as complementing the general and specialised professional competences to be acquired by students:

- Skills and/or attitudes to model, plan and develop new businesses, to deal with specificities of developing a new venture at early stage, and to deal with fast evolving scenarios and uncertainty (agile/lean processes).

- Skills and/or attitudes to create products, services, businesses with a customer/user-centric perspective (user centred methods), to assess the impact of Digital technologies (on value chains, markets, companies) and opportunities they create, to exploit value of a Digital technology on the market (maturity/feasibility, IPR, standardization, etc.), and to identify short and long term future consequences of plans and decision from an integrated scientific, ethical and intergenerational perspective (foresight and value).
- Skills and/or attitudes to communicate ideas, exercise decision-making and leadership, interact with business experts on a common language.

2.3 Modules

2.3.1 Technical Core Modules (common base for the first year)

Entry universities offer a modular curriculum consisting of (1) a core module on Artificial Intelligence and Computer Science and (2) a core module on Emotion Artificial Intelligence. The aim of Module 1 is to provide students with a comprehensive theoretical and practical knowledge of mathematics and computer science, machine learning, deep learning, data representation and processing, as well as ethical, privacy and security considerations.
To fully apply the acquired competencies, the aim is also to enable students to make purpose-oriented use of the latest deep learning frameworks and open-source neural network software functionalities.

Module 2 allows students to acquire a comprehensive knowledge and carry out relevant activities in the field of human cognition, which are deepened in selected chapters, such as understanding human cognitive and perceptual functions in order to lay the foundation for further analysis of human intentions, as well as cognitive control, social behaviour, language, memory, emotions and general perceptions.

The practical applications of Module 2 are covering the recognition, correct interpretation, expression and matching the intentions of the human partner and the embodied artificial intelligence. Different modalities as emotion-sensitive data sources and natural language processing are also incorporated in the curriculum.

2.3.2 Specialisation Modules (second year)

Specialisation: Humane Aspects of Applied Emotional AI (ELTE)

To explore and understand the broad dimension of new techniques and applications supported by Emotional AI, focusing on human intention and the expression of Emotional AI through different modalities, together with critical thinking and general ethical considerations.

The specialisation in Emotional Artificial Intelligence offered by ELTE focuses on the design and implementation of applied solutions and the understanding of existing technologies. This is a comprehensive theoretical and practical knowledge that starts from understanding the mental state and measurable cues of the human participant and ends in the optimal satisfaction of the task to be solved.

Throughout the process, students learn the general knowledge that will help them extensively not only to uncover the essence of the problem, but also to understand the context and environment in which it is posed. Courses will cover a wide range of topics in natural language processing, from the physical characteristics of human speech to the application of generative artificial intelligence.

Human speech is one of the fastest and most efficient information communication techniques in human-human interactions, and these benefits will be increasingly taken up by applications to serve human needs, both everyday (assistants, chat bots) and specialised (medical rehabilitation, security systems). Sufficiently efficient artificial intelligence systems that mimic human communication will become widespread. ELTE's specialisation prepares students to exploit this phenomenon in a practical way. In addition to the compulsory advanced NLP and deep learning courses, students can also take courses on machine learning technologies, 3D machine vision, and comprehensive technology solutions.

Specialisation: Emotional AI embodied in Multimodal Agents (EURECOM)

The specialization offered by EURECOM focuses on the design, development, and deployment of Emotional AI systems integrated into multimodal agents. These agents combine advanced technologies to perceive, process, and respond to human emotions using diverse input modalities such as visual (e.g. facial expressions), audio (e.g. voice intonations), and textual (e.g. sentiment). Students gain expertise in creating emotionally intelligent systems capable of enhancing human-computer interaction across various applications.

The specialization delves into multimedia analysis, covering topics such as face recognition, facial beauty assessment, and sound processing. Learners will master techniques in sentiment analysis, enabling agents to interpret and adapt to human emotions. The program emphasizes cutting-edge methodologies, including neuro-symbolic systems that combine symbolic reasoning with neural networks for more nuanced emotional understanding.

Students will explore the development of conversational assistants with emotional roles, such as empathetic virtual therapists or customer service agents capable of understanding and responding to user emotions. The program also focuses on real-world deployment challenges, teaching students to design robust systems that perform seamlessly across diverse environments while maintaining sensitivity to user context.

A strong emphasis is placed on addressing bias, fairness, and ethical aspects in Emotional AI. Students will critically evaluate the societal impact of these technologies, ensuring the systems they develop are inclusive, transparent, and aligned with ethical standards. The specialization fosters an understanding of how to balance technical innovation with responsible AI deployment, shaping emotionally aware agents that enhance human well-being.

Specialisation: Practical Emotional AI: healthcare (UPM)

The specialisation offered by UPM focuses on the design and implementation of applied solutions mainly in the health domain and the understanding of existing technologies.

Students will learn the theoretical background and software tools for developing applications that use AI and emotions for improving health care processes from diagnoses to active aging. Students will implement real-world applications that combine natural language processing, speech processing, multi-sensors information, images and other sources of information improving health care solutions based on the information gathered from users.

The program will allow to gain deep knowledge in image, natural language and speech processing, IoT (sensor based systems) and bigdata management and development of innovative applications that combine these technologies.

Specialisation: Holistic interdisciplinary aspects (UCA)

Emotion AI is a subset of artificial intelligence that measures, understands, simulates, and reacts to human emotions. The ability for a system to understand and react to people's emotional states and moods opens new opportunities.

The specialisation on Emotion AI for the exit year at UCA is oriented towards the perception of emotion for technical courses. Before reacting to human emotions, it is necessary to detect, measure, process, analyse, and understand them. Other aspects of the emotions will be tackled from Human Science perspective, including psychology, ethics, philosophy, society, communication, behaviours, etc.

The specialisation builds on a broad scope of courses from several university departments such as Polytech Nice Sophia engineering school (two departments: Mathematics and Computer Science), with the Master of Computer Science (Graduate School Digital Systems for Humans), and the Master of "Economic behaviours and decisions in the digital age" (Graduate School of Economics and Management), and the Master of "Communication and political languages" (Graduate School Arts and Humanities).

The strength and relevance of the Emotion AI specialisation at UCA come from the diversity of profiles of instructors involved that include Professors in ICT, Communication Science, and Economics and Humanities in both graduate and undergraduate programmes.

Specialisation: Emotional AI in Robotic Applications (UNITN)

Step into the future of technology with the groundbreaking program on Emotionally Intelligent AI and robotics offered by UNITN! This program will allow to immerse yourself in the design, development, and implementation of advanced robotic systems tailored for diverse real-world applications.

The program will allow to i) unleash your potential to redefine human-computer interaction by going beyond conventional paradigms. ii) dive yourself into the creation of interactive multisensory networked systems, collaborative robotic solutions that understand and respond with empathy, and innovative methods to craft Emotionally Intelligent systems across a variety of cutting-edge contexts.

This program will be your chance to become a trailblazer in the transformative world of AI-powered robotics, combining intelligence with human emotion to revolutionize industries. The program will let you acquire the expertise that will set you apart and position you at the forefront of tomorrow's technology landscape!

Specialisation: Emotional AI in healthcare and medicine (UTU)

The specialization on Emotion AI for the exit year at UTU blends Emotion AI with health technology and gamification, providing skills for developing Emotional AI based methods for wider and more efficient usage of health data. Health technology focuses on wellness and health applications, such as wearable health monitoring systems, sports performance tracking devices, personalized healthcare systems, AI-powered virtual health assistants, among many others. Gamification leverages incentive-driven game-like elements such as rewards, progress tracking and challenges for motivating the users of a system and to make it more engaging and enjoyable. Emotional AI can detect feelings such as frustration, excitement, stress, or joy, and adjust the gamified system accordingly. For example, if user

becomes too frustrated, AI may offer encouragement, simplify challenges, or provide positive reinforcement. Together, these technologies help you to develop systems with interactive and motivating healthcare experiences that encourage their users to invest more in their health.

Health technology courses cover acquisition and analysis of biosignals, their origins, how they are collected, what kind of sensor technology is required, and how they are analysed. You learn how medical sensor technology and information technology can be used in healthcare applications. You continue by learning the necessary skills to work in a medical device development project. You learn the architecture of a medical embedded system including the most common interfacing protocols, sensing modalities and peripherals.

In courses on gamification and serious games, you will the learn the basics of game design and programming, the practical side and stages of a game development process, game AI programming. Using game mechanics for making the experience more fun and engaging, creation of a gamified UI design, collaboration with corporate customers in gamification project, ethical concerns of gamification. Topics are also covered from the perspective of psychology, management and education.

2.3.3 Innovation and Entrepreneurship (I&E) Module

The Innovation and Entrepreneurship component of the Masters is integrated throughout the two-year programme. The curriculum of the I&E module had already been designed and implemented by the consortium earlier.

This section contains the relevant I&E courses with their corresponding ECTS ranges/credit points. Using range in some cases gives a moderate amount of freedom and flexibility to partner universities to use different ECTS numbers, but they must stay within the predefined range. Standardisation means that I&E minor subjects must cover exactly 30 ECTS over the two years.

Year one

- **I&E Basics (5-8 ECTS)**
  Introductory lectures on technology-based entrepreneurship, marketing and markets, organisation and project management, new product and process development, entrepreneurial finance, and human resource development.
- **Business Development Lab (7-10 ECTS)**

The Business Development Lab is mainly concentrated on project work throughout the main phases of business modelling and development. It builds on the Basic course and enables students to conduct a fully-fledged business development project. Entrepreneurs and experts are invited to share valuable experience and knowledge.

- **Elective I&E Course (5 ECTS)**
  Covers such advanced topics as business development, business finance, marketing, innovation management, intellectual property, and market research.
- **Summer School (4 ECTS)**
  A unique opportunity to get hands-on, real-world experience. This two-week programme takes a deep dive into using digital innovation and entrepreneurship to solve societal challenges and access business opportunities. This program creates opportunity to collaborate with faculty, staff and like-minded students from around the world while students can immerse themselves in real business issues. There will even be an opportunity to develop, evaluate and present a business idea!

Year two

- **I&E Study Course (6 ECTS)**

Supervised business analysis work that focuses on applying prior I&E knowledge and competencies in a real business context. This is a chance to tackle an actual business challenge using a robust, explorative business analysis methodology.

2.4 Conclusions

The market analysis and curriculum design presented hereabove are the main pillars of the Emotion Artificial Intelligence specialists for Europe (EMAI4EU) project, which has been created to train emotional AI specialists, unique in Europe. This programme is one of the most recent options in the EIT Digital Master School programmes, that provide high-quality curricular professional and entrepreneurial skills through a double-degree Master's education, with the participation of several prestigious universities in Europe.

In the current report, we have documented evidence that there is a demand in both the market and in university education for professionals who not only have a high level of AI knowledge and entrepreneurial skills, but also understand the ethical, legal and human impact of AI use.

We found that Emotional AI aspects have become part of many emerging and hyped innovations. A growing number of companies are becoming open to incorporating AI into

their everyday workflows, but a major deterrent for them is the issue of reliability and transparency of systems incorporating AI, which can range from data security to ethically trustworthy decision-making.

The curriculum, developed in collaboration with partner universities (ELTE, POLIMI, UNITN, UR, UCA, EURECOM, UPM, UTU), provides AI specialists with a general, comprehensive knowledge base that can be used in a variety of professions (Human-Centred AI Designer, Emotion AI Consultant, AI Developer, AI Research and Development Manager), as well as knowledge that borders on psychology and cognitive science to help lay the foundations for human-centred, responsive systems. The EMAI4EU Master's programme also provides legal and ethical knowledge to support training. The universities' specialisations cover a wide range of areas such as healthcare, robotic applications and interdisciplinary opportunities.

The EMAI4EU Master's programme is therefore based on market research, and the universities' specialisations provide a high level of diversity and high-quality training for the future professionals of the emotion AI.

2.5 Quality Assurance Remarks

The development of the programme was supervised very closely by the Quality Assurance Team, ensuring that any aspect related to the quality of the programme was considered and respected. Specifically, those aspects related to the "Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). (2015). Brussels, Belgium.", that any European university must follow when delivering a degree, and those of the EIT Quality Assurance and Learning Enhancement system (EIT QALE) that any degree of the EIT Master School must follow.

The supervision was made with a series of templates to be filled out by the programme designers, and a series of Quality Indicators, all related to the above aspects. The objective was to assure that there was evidence that the standards and guidelines were followed.

This quality assurance exercise was really appreciated by the participants, as it helped them to organize the programme in modules, as well as to align it with the detected market needs. The whole process is described in Deliverable 4.3

3. Educational Information

3.1 Specific admission requirements

Emotion Artificial Intelligence programme is open to applicants with either a Bachelor of Science degree or who are in their final year of study in:

- Computer Science / Computer Engineering
- Information Systems
- Mathematics
- Electrical Engineering

Applicants with a background in psychology, cognitive sciences and other relevant disciplines, and with reasonable knowledge of the fundamentals of computing and information sciences and technologies may also be considered.

3.2 Degrees

The general degrees and legal frameworks for the EMAI4EU master's programme's partner universities are as follows:

- Eötvös Loránd University (ELTE), Hungary: "Master Degree" or "Magister" (abbreviated as MSc) (Section 52. Act 5) and legal framework Act CCIV of 2011 on National Higher Education, National Assembly
- Polytechnic University of Milan (POLIMI), Italy: Laurea Magistrale (Master of Science Degree) in Computer Science and Engineering, class of degree LM-32 Computer Systems Engineering in the legal framework of Italian Ministerial Decree No. 270/04.
- EURECOM, France: Master of Science in Computer Science (Diplôme National de Master – mention Informatique). Accredited by French Ministry of Higher Education and Research (Ministère de l'Enseignement Supérieur et de la Recherche)
- Université Cote D'Azur (UCA), France: Master Degree in Computer Science EIT Digital track, and for the entry students (only): Engineering Degree in Computer Science Polytech Nice Sophia.
- University of Trento (UNITN), Italy: Master Degree in Artificial Intelligent Systems, class of degree LM-32 Computer Systems Engineering in the legal framework of Italian Ministerial Decree No. 270/04.

- Universidad Politécnica de Madrid (UPM), Spain: Master Universitario en Innovacion Digital / Master in Innovacion Digital, Resolución de 1 de diciembre de 2022, de la Universidad Politécnica de Madrid, por la que se publica la modificación del plan de estudios de Máster Universitario en Innovación Digital/Digital Innovation, Boletin Oficial del Estado 305, 21 de diciembre de 2022
- University of Rennes (UR), France: Computer Methods Applied to Business Management (MIAGE).
- University of Turku (UTU), Finland: Diplomi-insinööri, Diplomingenjör, Master of Science (Technology), Decree of the Council of State on University Degrees (1136/2009)

3.3 Local programmes

The specific local master programmes used for local implementation of the Emotion AI (EMAI) Master's programme are given below:

- Eötvös Loránd University, Hungary: M.Sc. in Computer Science, Artificial Intelligence specialization
- Polytechnic University of Milan, Italy: Laurea Magistrale (Master of Science) in Computer Science and Engineering.
- EURECOM, France: Master (Master of Science) in Computer Science – Data Science track
- Université Côte D'Azur, France: Two local programmes : Master in Computer Science (Graduate School and Research Digital Systems for Humans - DS4H) and Engineering programme (Polytech Nice Sophia engineering school) in Computer Science. Note that students will receive a Master's degree in computer science, and in addition entry student can also be awarded the engineering degree under some conditions. Our local implementation include some courses taken from the Master of Economics (Graduate School and Research of Economics and Management) and Master of Cognitive Science (Neuromod Institute).
- University of Trento, Italy: Laurea Magistrale (Master of Science) in Artificial Intelligent Systems.
- Univesidad Politécnica de Madrid, Spain: Master Universitario en Innovacion Digital / Master in Innovacion Digital
- University of Rennes, France: Computer Methods Applied to Business Management (MIAGE) international track EIT Data Science. The I&E minor is shared with all EIT digital students in all master tracks.
- University of Turku, Finland: Master's Degree Programme in Health Technology

3.4 Grading systems

Students enrolled at the EIT Digital Master School will be graded according to the national grading systems at the involved EIT Digital partner Universities:

- Finland uses the ECTS system. The grading scale is: 5 (Excellent), 4 (Very good), 3 (Good), 2 (Satisfactory), 1 (Sufficient) and 0 (Fail). Failed courses (0) are marked in the study register but they do not appear on the official transcript of records. Pass (P) and fail (F) are used in some specific courses.
- France uses the ECTS system. The grading scale is: 18 – 20 (Excellent), 16 – 17.5 (Very good), 14 – 15.5 (Good), 12 – 13.5 (Satisfactory), 10 – 11.5 (Correct) and 0 – 9.5 (Fail).
- Hungary uses an ECTS-equivalent system. The grading scale is: A (excellent) 5 (jeles), B (very good) 5 (jeles), C (good) 4 (jó), D (satisfactory) 3 (közepes), E (pass) 2 (elégséges), F (fail) 1 (elégtelen).
- Italy uses CFU, where 1 CFU equals 1 ECTS credit. The grading scale is from 18/30 (minimum grade to pass) to 30/30 (with distinction option available). All grades below 18/30 mean fail.
- Spain uses the standard Spanish grading scale, as well as ECTS credits. The Spanish grading system is based on a 10-point grading scale. The passing grade is 5. The grading scale is: 9-10 (Excellent), 8.9-7 (Very good), 6.9-6 (Good), 5.9-5 (Satisfactory), 4.9-0 (Fail).

The following table (Table 3) will be used to relate credits in the different systems:

ECTS	Finland	France	Hungary	Italy	Spain
A, best 10%	5	16-20	5	28-30	9-10
B, next 25%	4	14-15.9	5	26-27/30	8-8.9
C, next 30%	3	12-13.9	4	23-25/30	7-7.9
D, next 25%	2	11-11.9	3	20-22/30	6-6.9
E, next 10%	1	10-10.9	2	18-19/30	5-5.9
F, fail	0, fail	0-9.9	1	<18/30	

Table 3. Summary of EMAI4EU partner universities' grading system and scale.

3.5 Guidelines

This section provides general recommendations for solving common issues quickly and reliably. As the Emotion AI Master's is part of EIT Digital, the Master's School Office acts as the main guide. The following section contains information regarding study delays and study breaks.

Partner universities and EIT Digital in collaboration will handle students deviating from the "normal" study tempo for any number of reasons, on a case-by-case basis (delays or breaks due to family reasons, personal reasons, suspensions or such).

A general requirement for entering the second year is that the student has successfully completed 80% of the course work during the first year (some Exit universities may require a higher completion ratio). The formal checkpoint is at the end of the 2nd semester, and the progress of the students should be evaluated at the end of each semester. The responsibility to complete missing courses or modules from the 1st year lies with the student and the entry university. Students who are not able to enter the 2nd year thereby forfeit the chance to obtain a dual degree and an EIT Label certificate. A way to finish the Master's programme, without mobility demands fulfilled can be offered by the entry university. EIT Digital tuition fee waivers are terminated in this case and normal local tuition feed applies. Already used EIT Digital tuition fee waivers will not be revoked.

Minor delays due to the design of EIT Digital Master School programmes, as unsynchronized partner university semesters should not lead to extra costs for students. EIT Digital and the involved universities will share the responsibility in this case.

If a student, after the end of the 2nd year of study has not fulfilled all academic requirements of the entry and exit university, the student is not eligible for a dual degree. Students in this situation will have the opportunity for new enrolment according to local regulations of the exit university. Entry and exit universities should engage to assist the student during their retake session. If a student fulfils all requirements within 12 months from the nominal end of the second year, at their own expense, they can obtain a dual degree and an EIT Label certificate.

3.5.1 Guidelines for handling delays

The local guidelines of the partner which is responsible when a delay occurs and the general guidelines of the Master School Office shall be used to handle delays. In case of conflict, the corresponding guideline of the Master School Office shall be applied.

3.5.2 Guidelines for issuing Double Degrees

The local guidelines of both the Entry and the Exit University or Institution together with the general guidelines of the Master School Office are taken into account when issuing the Double Degree. Any potentially conflicting guidelines shall not be applied to the disadvantage of the degree candidate. In case of conflict the guidelines of the Master School Office concerning the specific matter shall be applied.

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Annex 1: Market Analysis Questionnaire

This annex depicts the questionnaire with an exhaustive list of questions, as it has been used in the study carried out between March 3rd and November 29th, 2024.

Emotion AI Education and Training Survey:

Understanding Stakeholder Needs and Expectations

As part of the EMAI4EU project, we would like to gather information and insights from a wide audience to better understand the needs and expectations regarding education and training in the field of Emotional Artificial Intelligence (Emotion AI).

The EMAI4EU project, funded by the Digital Europe Programme of the European Comission, aims to develop education and training in the field of Emotion AI (Emotional Artificial Intelligence). With a duration of 4 years, it involves a consortium of 13 partners from 8

European countries. Its objectives are to create a double degree master's program in Emotion AI, online learning modules, workshops, and awareness events, and to promote collaboration among stakeholders in the field.

* Indicates required question

Introduction text

All data collected will be used exclusively for research purposes. By participating in this questionnaire, you consent to the use of your responses for research analysis. The analysis of your answers is anonymous.

This questionnaire includes 5 parts and few scales. If you're not familiar with them, here's a brief explanation: scales help avoid common survey pitfalls, such as overly vague questions that participants struggle to answer. For example: 'Do you like chocolate?' on a scale of 1-7, ranging from '1 = I hate it' to '7 = I love it'. If someone answers 5, it means this person moderately likes chocolate.

1. Are you ready to start the questionnaire? (Average time: 10 min) *

Mark only one oval.

- Yes *Skip to question 2*
- No *Skip to question 32*

Skip to question 2


EM AI
4EU
Co-funded by
the European Union

Part 1. General information

2. Name of your company *

3. Sector of activity *

Mark only one oval.

- Education
- Energy and utilities
- Finance and insurance
- Food and beverage
- Healthcare and pharmaceuticals
- Information technology and communications
- Manufacturing industry
- Professional services
- Real Estate and construction
- Retail and E-commerce
- Tourism and hospitality Transportation and logistics Other:

4. Number of employees *

Mark only one oval.

- 1 - 20
- 21 - 99
- 100 - 249
- 250 +

5. What's your role within the company *

Mark only one oval.

- Account manager
- Accountant
- Administrative assistant
- C-Level/Top management
- Customer service representative
- Digital marketing specialist
- Financial analyst
- Graphic designer
- Human ressources
- Internal auditor
- Legal counsel
- Maintenance technician
- Management and general administration
- Marketing manager

Operations manager
Project manager
Sales coordinator
Salesperson
Software developer
Sofware engineer
Systeme administrator
Translator UX design/research
Other:

Part 2. AI awareness and usage

Definiton of Artificial Intelligence :

AI refers to the simulation of human intelligence in machines that are programmed to mimic human actions. It encompasses a wide range of technologies, including symbolic AI, machine learning and deep learning, which enable computers to perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. AI has diverse applications across various industries, from education, healthcare and finance to transportation and entertainment, revolutionizing the way we work, live, and interact with technology.

6. Do you use AI for your work tasks? *

Mark only one oval.

Yes *Skip to question 7*
No *Skip to question 8*

If yes,

7. What do you use? *

Check all that apply.

Text generation (Monica, ChatGPT...)
Image generation (DALL-E, MidJourney...)
Data analysis (Tableau, Power BI...)
Search engine (Gemini, Bing...) Video tools (Fliki, Piggy...)
Other:
Skip to question 9

If not,

8. What uses could you make of it?

Skip to question 9

9. For you, to what extent does AI represent a risk? *

Mark only one oval.

1 2 3 4 5 6 7

Low risk High risk

10. Is the risk more on the human side or the system side? *

Mark only one oval.

1 2 3 4 5 6 7

Human side System side

11. In your opinion, how could the integration of AI in business operations impact the environment?

Mark only one oval.

1 2 3 4 5 6 7

Low influence High influence

12. Is your company currently using any AI technology? *

Mark only one oval.

1 2 3 4 5 6 7

Not integrate Fully integrated

Part 3. Future emotional AI outlook

13. Have you heard of Emotion AI before taking this survey? *

Mark only one oval.

Yes No

Definition of Emotional AI :

Emotion AI is a subset of AI aiming to measure, understand, simulate, and react to human emotions. It's also known as Affective Computing, or Artificial Emotional Intelligence. The field dates back to at least 1995 when MIT Media lab professor Rosalind Picard published Affective Computing. Emotion AI enables everyday objects to detect, analyze, process, and respond to people's emotional states and moods, from happiness and love to fear and shame. Emotion AI technology can be used to create more personalized user experiences, such as a smart fridge that interprets how humans feel and suggests food to match human feelings.

14. Do you believe that Emotion AI technology will become increasingly important in your industry sector over the next few years?

Mark only one oval.

1 2 3 4 5 6 7

Disagree Agree

15. For you, what significance will this emotional AI have in your company? *

Mark only one oval.

1 2 3 4 5 6 7

Low priority High priority

16. Are there any areas where you think Emotion AI could have significant impact but is not currently being used?

Part 4. Needs and priorities for business

17. What potential benefits do you foresee from using Emotion AI technology in your business operations?

Check all that apply.

- Better decision making
- Enhanced empathy
- Enhanced mental health support
- Enhanced productivity
- Enhanced user experience
- Improved customer satisfaction
- Increased engagement
- More authentic communication
- Personalized interactions
- Reduced stress levels Other:

18. Would you like to have an emotional AI specialist in your company? *

Mark only one oval.

- Yes *Skip to question 19*
- No *Skip to question 20*

If yes,

19. How soon do you anticipate the importance of having it? *

Mark only one oval.

- Month
- Semester
- A year
- More than a year
- I don't know
- Other:

Skip to question 21 If not,

20. What is holding you back or preventing you? *

Skip to question 21

21. According to you, which of the following skills do you consider the most important for an Emotional AI expert?
Check all that apply.

- Emotion recognition
- Data analysis
- Machine learning
- Natural language processing (NLP)
- Human psychology understanding
- Empathy development
- Software development
- Ethical decision-making
- Problem-solving
- Communication skills
- Automations
- Business rules
- Signal processing
- Uncertainty in AI (Probability, Statistics)
- Advanced user interfaces
- Security and privacy
- Other:

22. For you, does Emotional AI represent a risk? *
Mark only one oval.

1 2 3 4 5 6 7

No risk High risk

23. Could you explain the risk that you perceive? (Optional)

24. Currently, do you perceive Emotion AI as a technological bubble or as a valuable asset to society?
Mark only one oval.

1 2 3 4 5 6 7

Technological bubble Valuable asset

Part 5. Training

25. Does your company support employees in pursuing additional certifications or continuous learning opportunities to AI?

Mark only one oval.

Yes

No

I don't know

26. Would you, personally, be interested in a training related to AI? *

Mark only one oval.

1 2 3 4 5 6 7

Not interested Interested

27. Have you ever attended a training on emotional AI? *

Mark only one oval.

Yes

No

28. Would you, personally, be interested in a more specific AI training on emotion traitment?

Mark only one oval.

1 2 3 4 5 6 7

Not interested Interested

29. In your opinion, what are the main certification providers (e.g., universities, private companies, training organizations)? Please feel free to provide specific names. (Optional)

30. Would your company be willing to host an intern pursuing a Master's degree in AI and emotional AI?

Mark only one oval.

Yes

No

I don't know

31. What would be your preferred methods for receiving emotion AI training? *

Check all that apply.

Self-Paced online courses

Online webinars

Interactive virtual classes

Blended learning (combination of in-person and online training)

In-person workshops

Other:

Conclusion

Thank you for your participation. Your responses are invaluable and provide important insights into opinions and perspectives on the topic of emotional artificial intelligence. Your contribution will help enrich our understanding and guide our future actions. We appreciate your involvement and interest in this research.

32. If there is another questionnaire on this subject or if you want to have the results of it, would you be interested? Feel free to provide your email address. This email address will only be used for the purpose of this study.

33. If you have additional comments or ideas to share with us, please feel free to send us a comment.
If you know someone who might be interested in this topic or this questionnaire, please feel free to share it.

Annex 2: Market Analysis Questionnaire Results

Part 1. General information

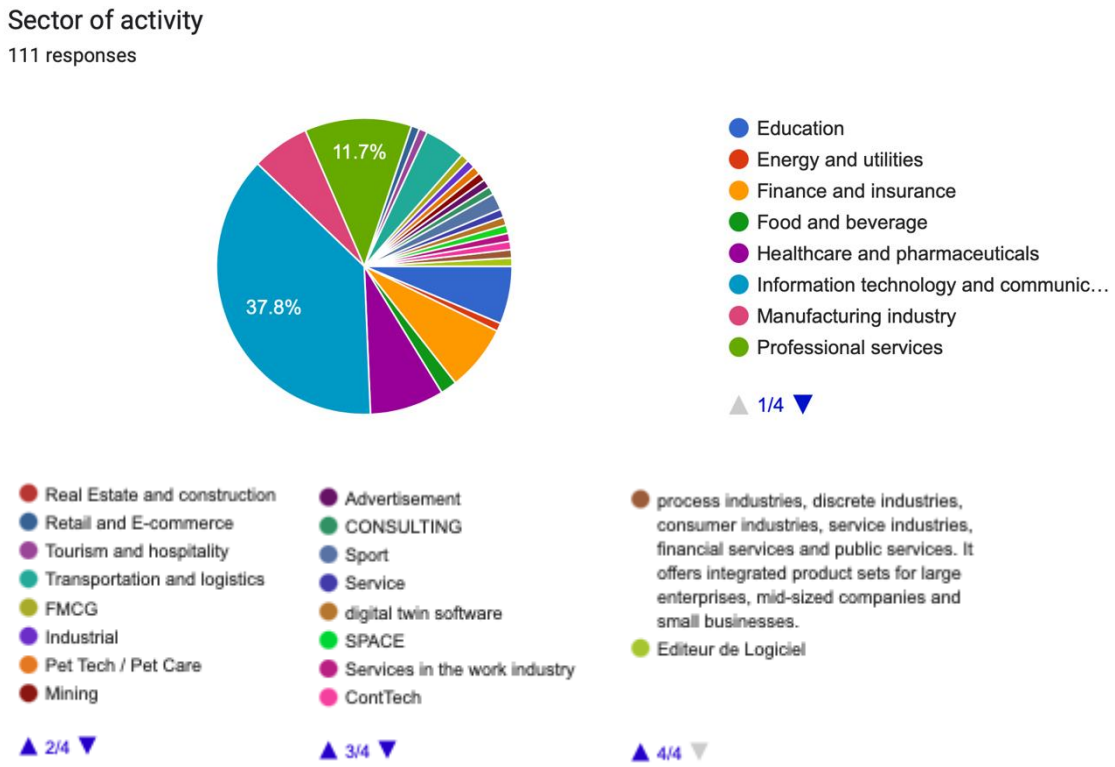

Figure A. Sector of activity.

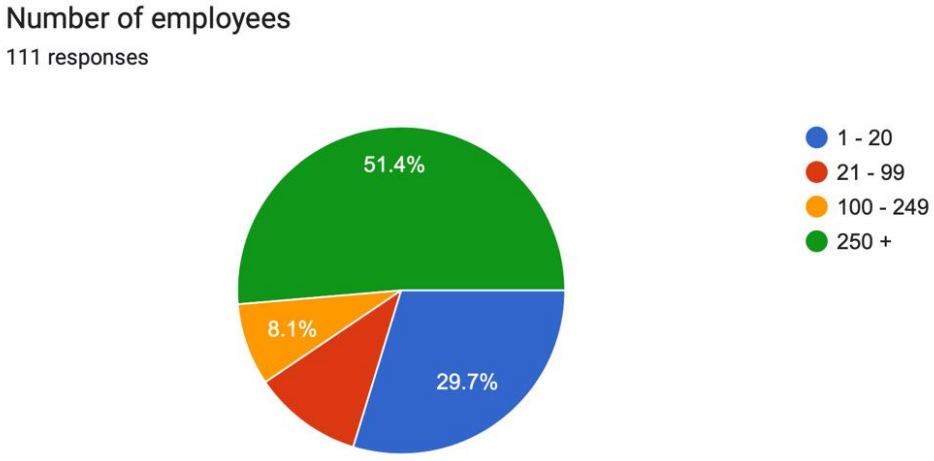

Figure B. Number of employees.

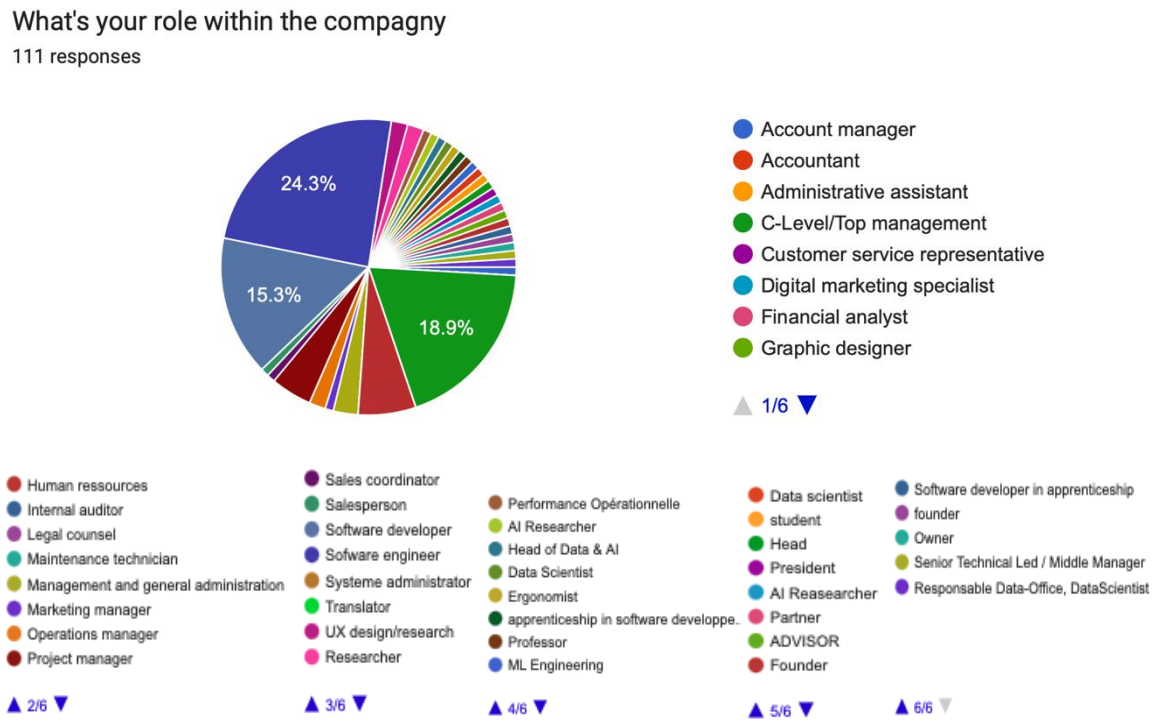

Figure C7 Role of respondents in the company

Part 2. AI awareness and usage

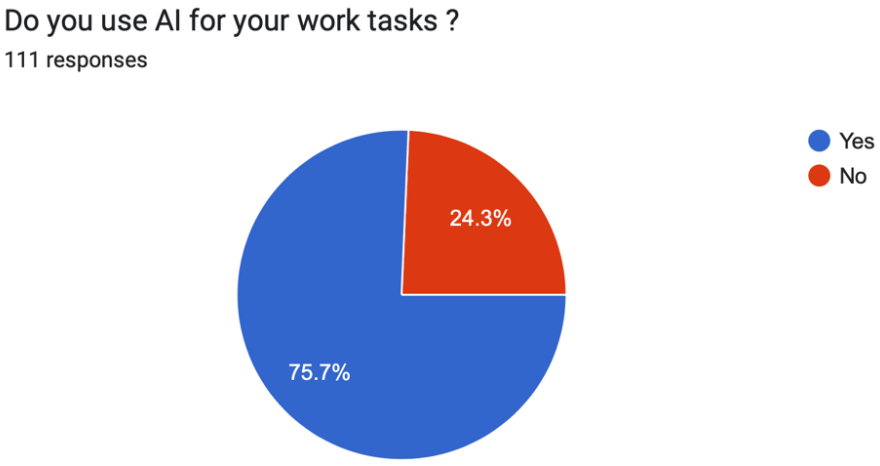

Figure D8 Use of AI in work tasks.

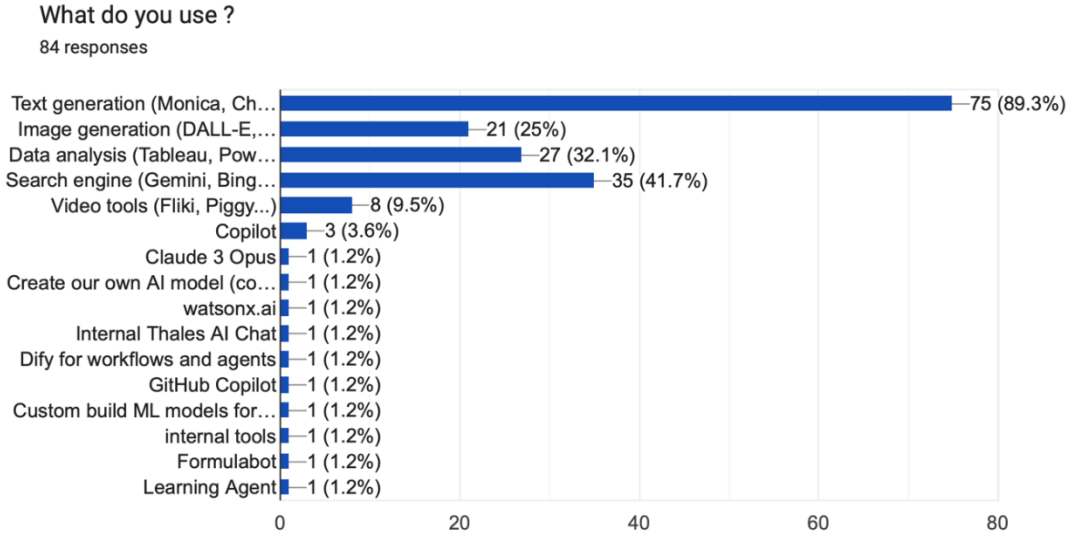

Figure E. AI tasks and tools used in work tasks

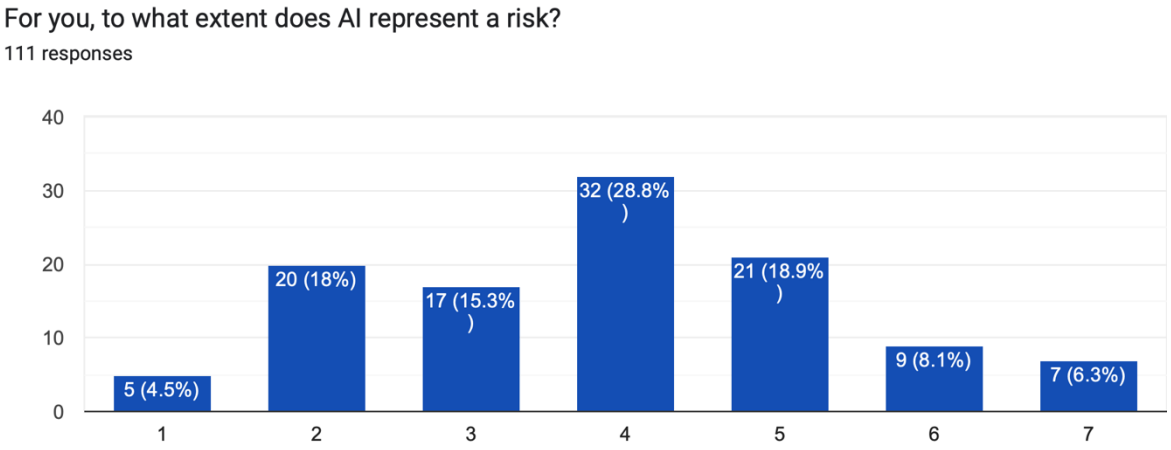

Figure F9. Does AI represent a risk?

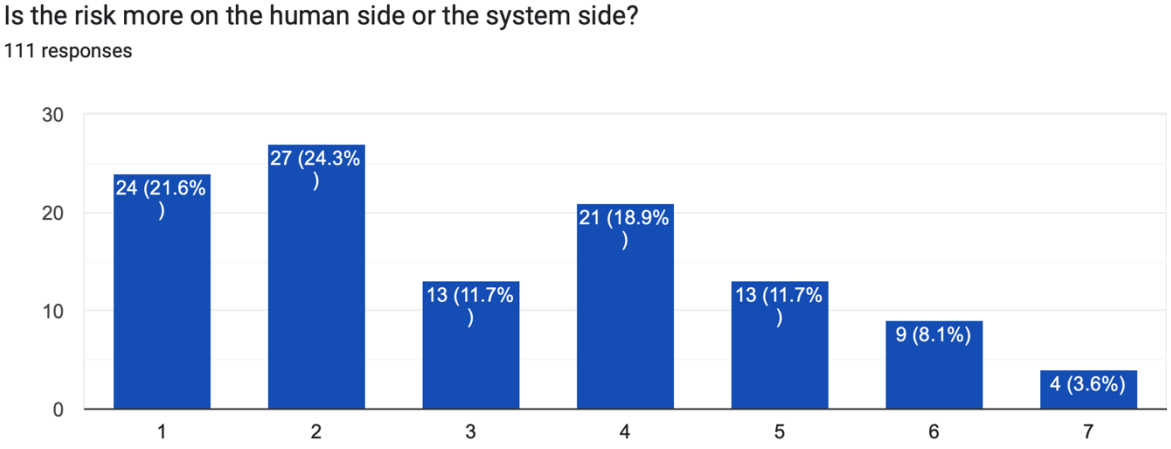

Figure G10. Is the risk on the human or system side?

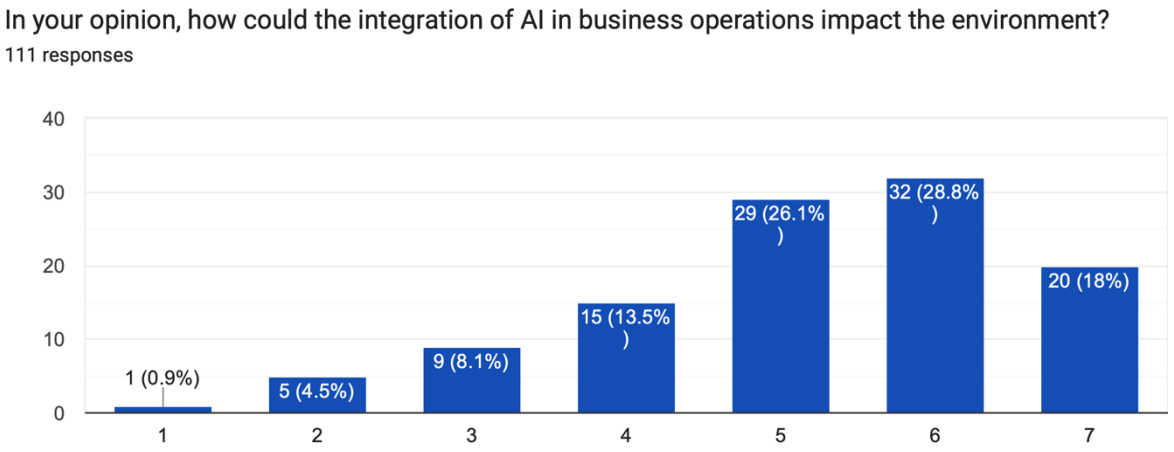

Figure H. Impact on the environment

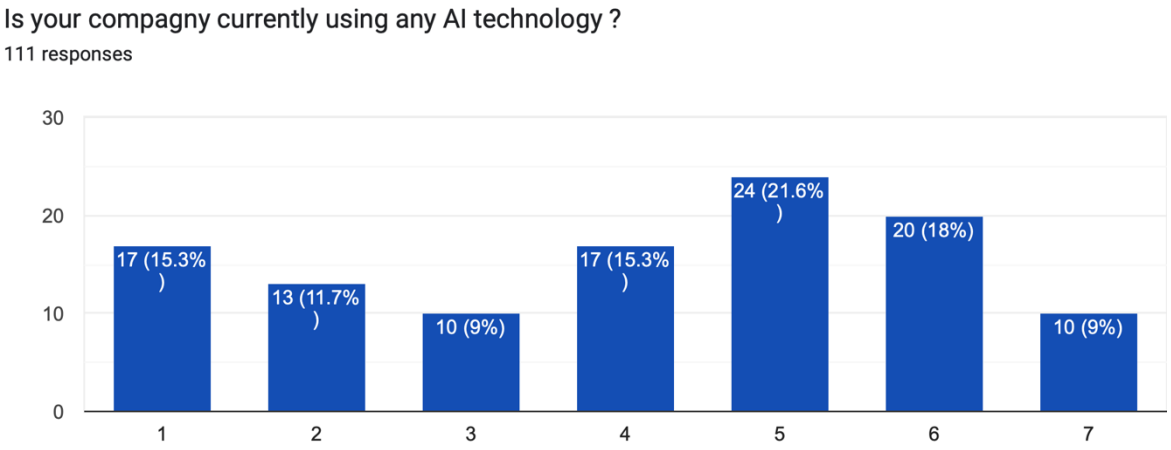

Figure I. Is your company currently using AI?

Part 3. Future emotional AI outlook

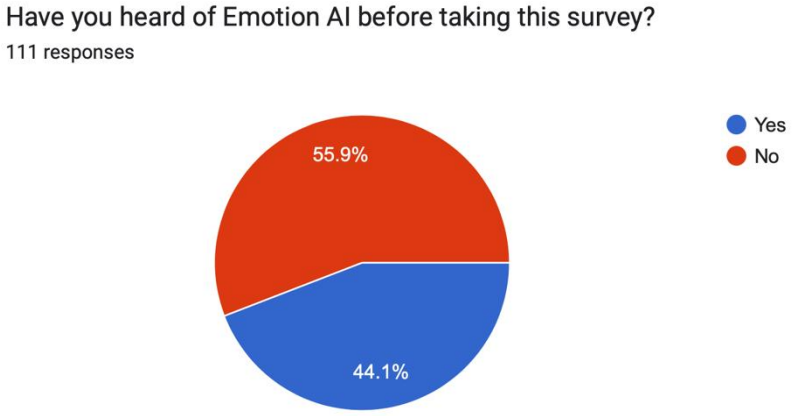

Figure J. Have your heard of emotion AI before?

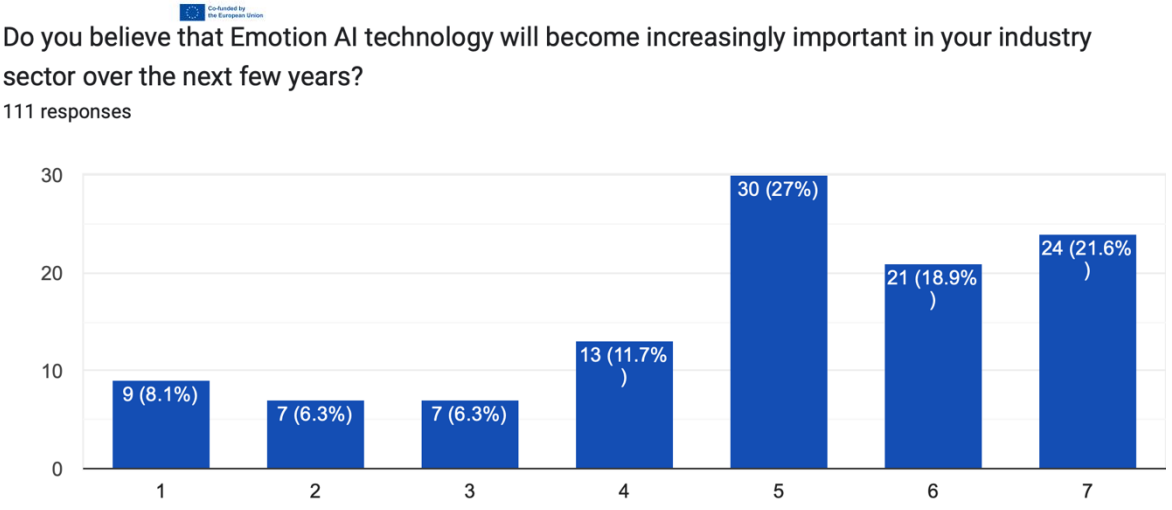

Figure K. Do you believe that Emotion AI technology will become increasingly important in your industry sector over the next few years?

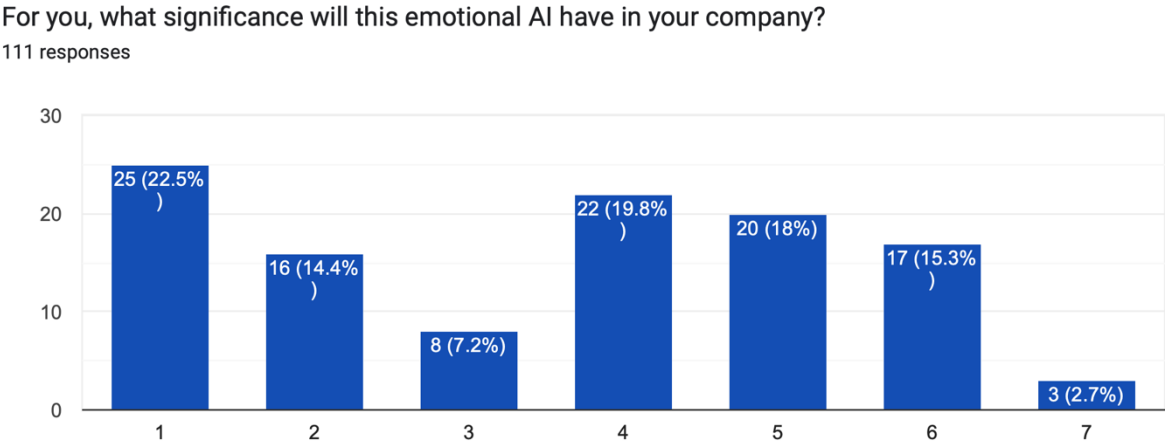

Figure L. What significance will this emotional AI have in your company?

Part 4. Needs and priorities for business

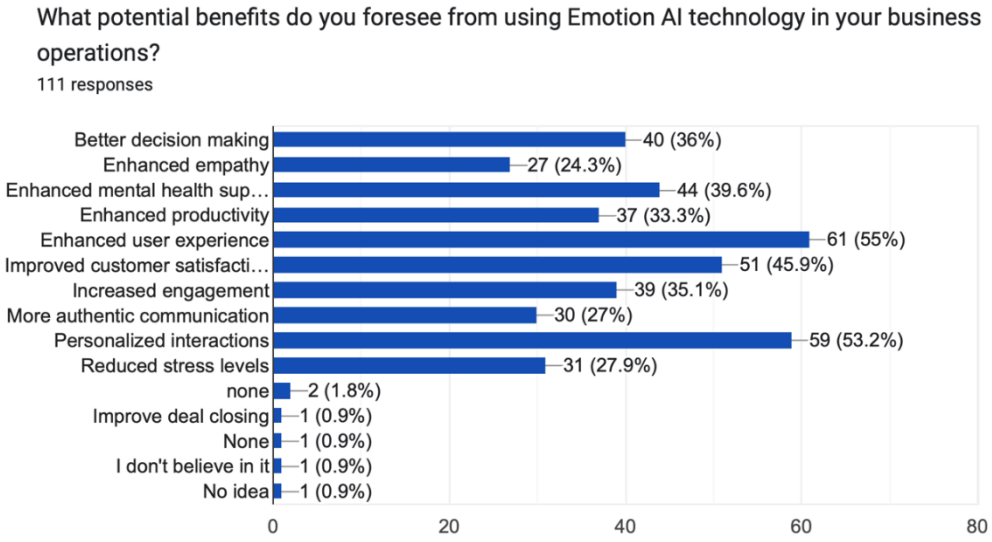

Figure M. Potential benefits of emotion AI in business operations

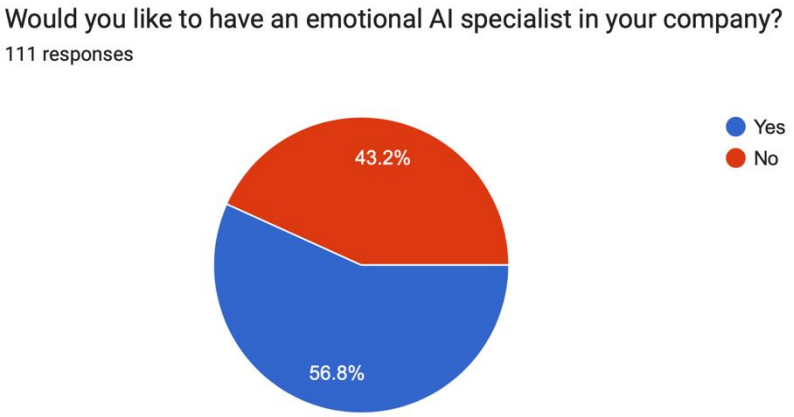

Figure N. Would you like to have an emotion AI specialist in your company?

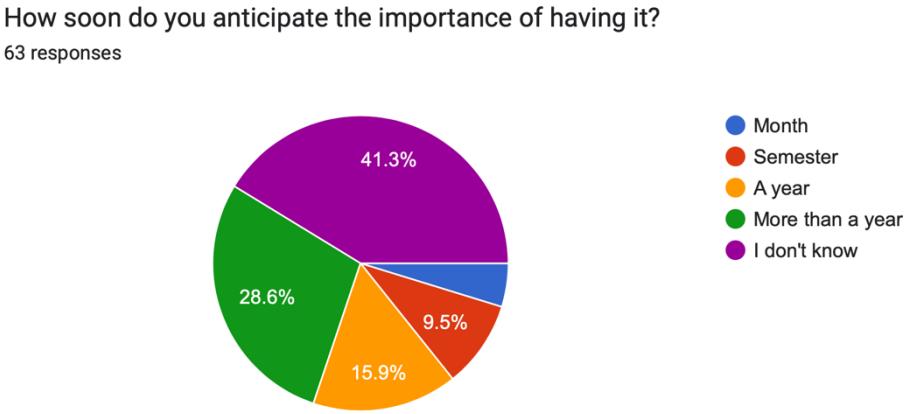

Figure O. How soon do you anticipate the importance of having it?

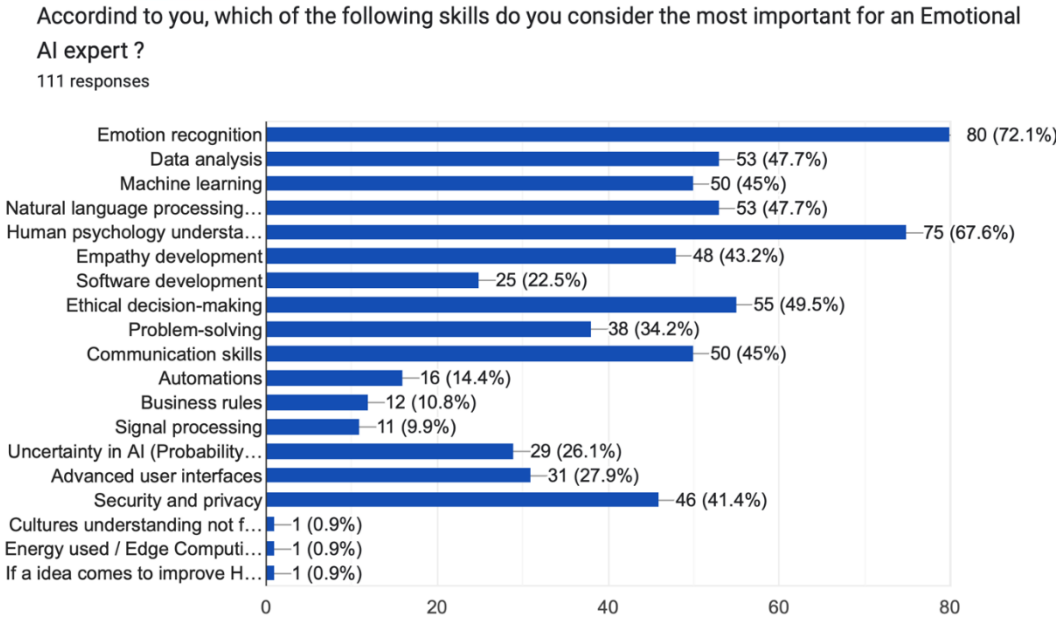

Figure P. Which skills are important for an emotion AI expert?

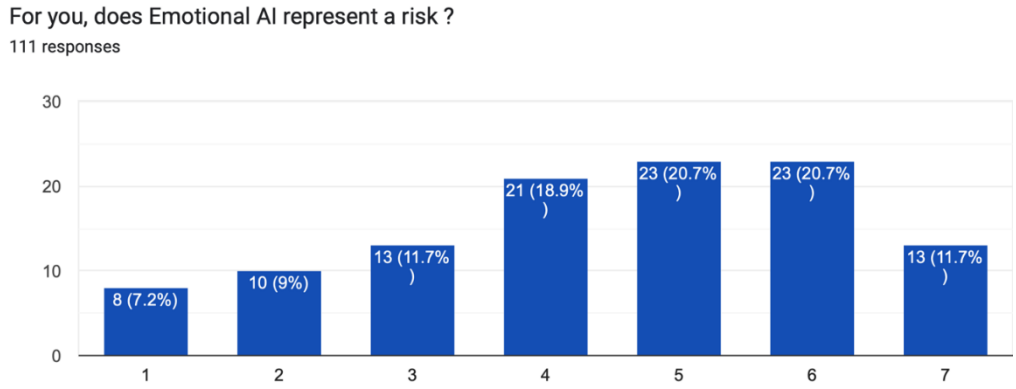

Figure Q. Does emotion AI represent a risk?

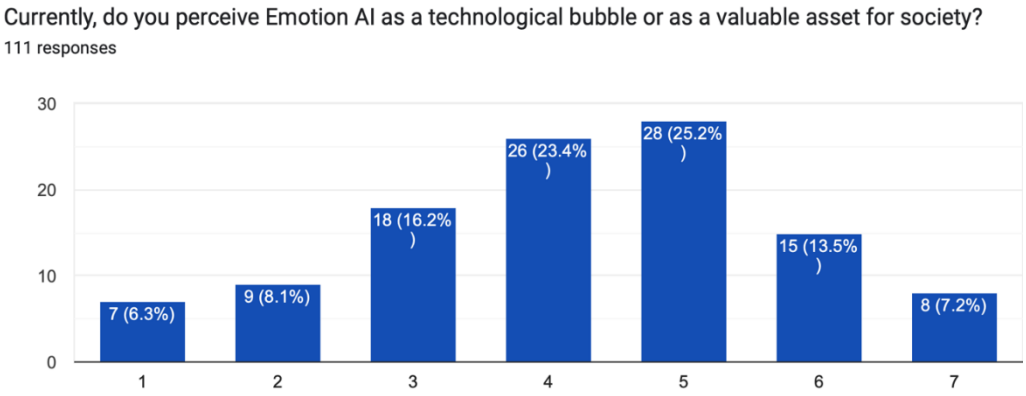

Figure R. Do you perceive emotion AI as a technological bubble or as an asset for society?

Part 5. Training

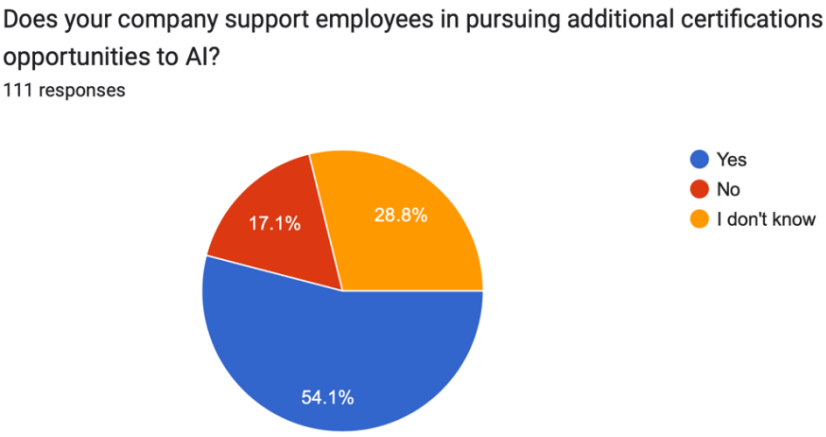

Figure S. Does your company support employees in pursuing additional certifications or continuous learning opportunities to AI?

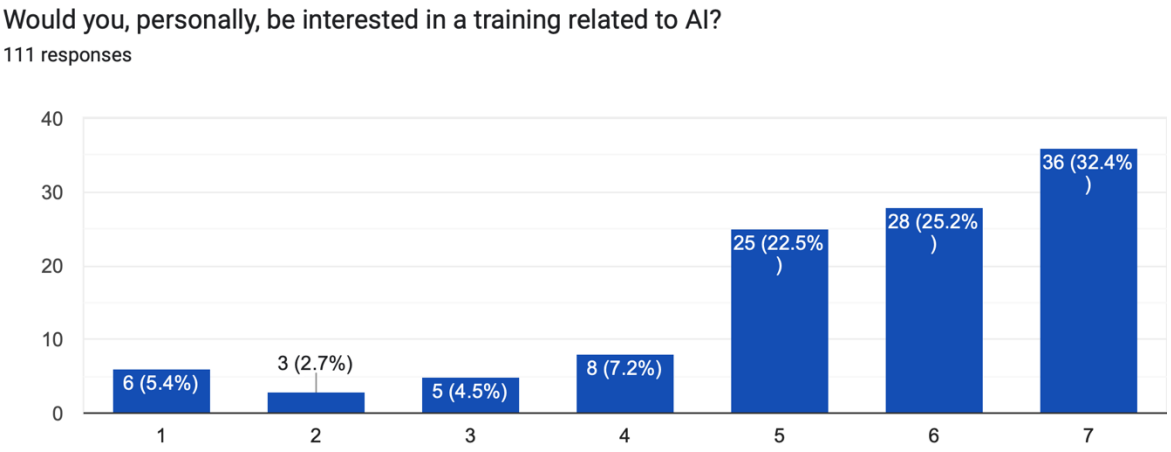

Figure U. Would you, personally, be interested in a training related to AI?

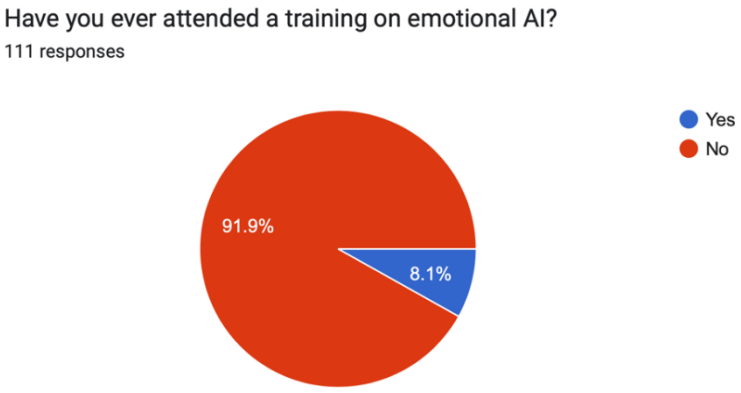

Figure V. Have you ever attended a training on emotional AI?

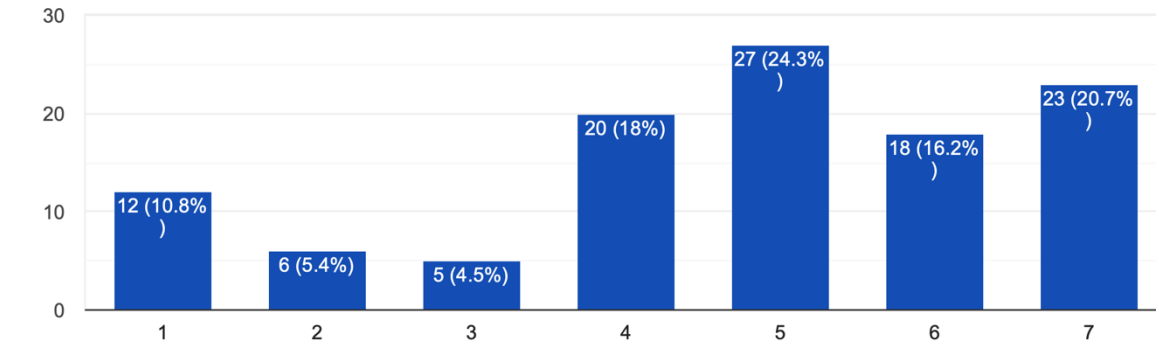

Figure W. Would you, personally, be interested in a more specific AI training on emotion?

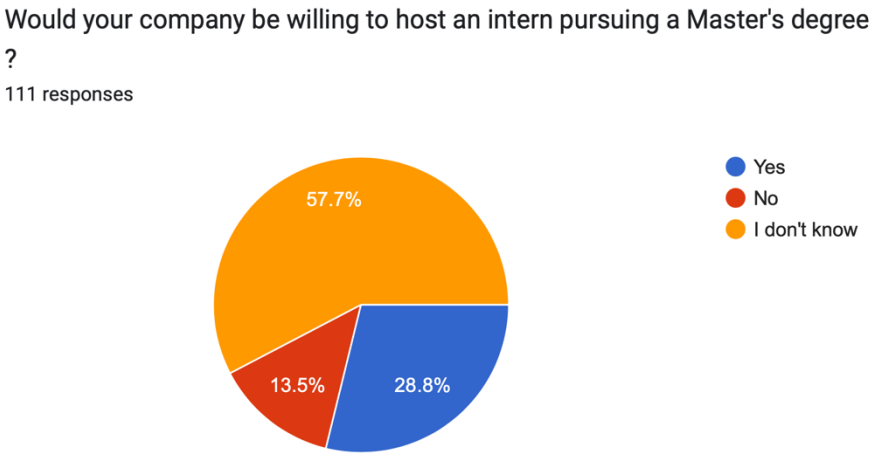

Figure X. Would your company be willing to host an intern pursuing a Master's degree in AI and emotional AI?

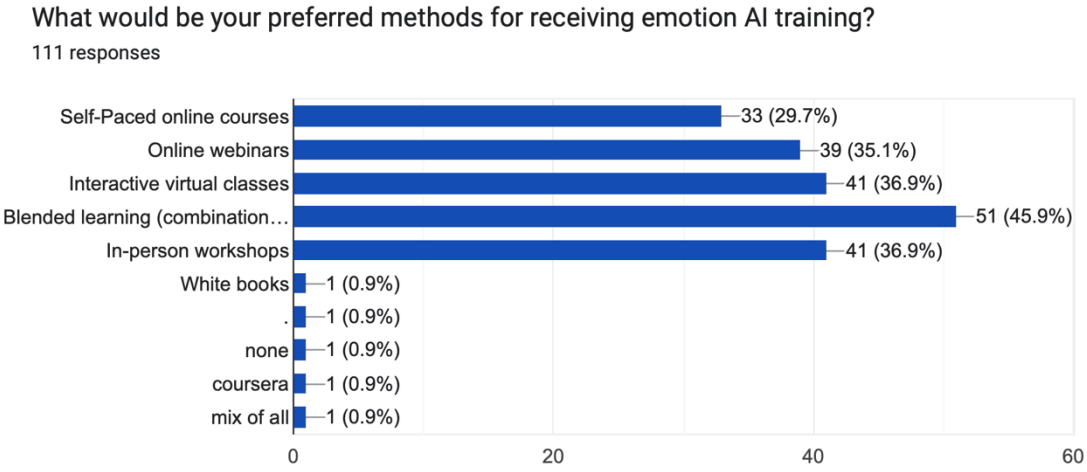

Figure Y. What would be your preferred method for receiving emotion AI training?

Annex 3: List of the courses for each Entry and Exit program

ELTE

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
Methods and Tools for Artificial Intelligence Applications	1	6
Introduction to Data Science	1	6
Deep Network Developments	1	6
Advanced Deep Network Development	1	6
Legal and ethical aspects of DS and AI	1	4
Affective Computing	2	6
Elective Major Courses		
Cognitive Science	2	6
Embodied Intelligence	2	6
Introduction to NLP	2	6
Compulsory I&E Courses		
Innovation and Entrepreneurship Basics	1	6
Business Development Lab I.	1	4
Innosocial Aspects of the Entrepreneurship	2	6
Business Development Lab II.	2	4
Elective I&E Courses		
I&E for Venture Creation	2	4
EXIT YEAR		
Compulsory Courses		
Natural Language Processing	1	12
Thesis	2	30
Specialisation Courses/Electives		
Computational Intelligence	1	6
Collective Intelligence	1	6
3D Point Cloud Processing and Analysis	1	6
3D Computer Vison	1	6

I&E		
Innovation and Entrepreneurship Study	1	6

EURECOM

EXIT YEAR		
Compulsory Courses		
Machine Learning and Information System (MALIS)	1	5
Database Management System Implementation (DBSYS)	1	5
Semester Project	1	8
Language Course	1	1
Thesis/Internship	2	30
Specialisation Courses		
Distributed Systems and Cloud Computing (CLOUDS)	1	5
Semantic Web and Information Extraction Technologies (WebSem)	1	2.5
Quantum Information Science (QUANTIS)	1	2.5
Optimization Theory With Applications (OPTIM)	1	2.5
Digital Image Processing (ImProc)	1	2.5
Sound and Music Processing (SoundProc)	1	2.5
Basics on Reinforcement Learning (ReLearn)	1	2.5
I&E		
Innovation and Entrepreneurship Study	1	6

POLIMI

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
SOFTWARE ENGINEERING 2	1	5
SYSTEMS AND METHODS FOR BIG AND UNSTRUCTURED DATA	1	5
FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	1	5
COMPUTING INFRASTRUCTURES	2	5
MACHINE LEARNING	2	6
Elective Major Courses		
ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING	1	5
RECOMMENDER SYSTEMS	1	5
UNCERTAINTY IN ARTIFICIAL INTELLIGENCE	1	5
DATA MINING	1	5

IMAGE ANALYSIS AND COMPUTER VISION	1	5
ADVANCED USER INTERFACES	1	5
NATURAL LANGUAGE PROCESSING	2	5
COMPUTER ETHICS	2	5
ROBOTICS AND DESIGN	2	5
I&E Courses		
DESIGN THINKING FOR BUSINESS	1	5
HIGH-TECH ENTREPRENEURSHIP	2	5
DIGITAL BUSINESS LAB	2	10
COMMUNICATION AND ARGUMENTATION	2	5
PHILOSOPHICAL ISSUES OF COMPUTER SCIENCE	2	5
AGILE INNOVATION	2	5
MULTIDISCIPLINARY PROJECT (I&E SUMMER SCHOOL)	-	4

UCA

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
Data science	1	3
Deep Learning	1	3
Mathematics and Statistics	1	3
Modeling and Optimalization in ML	1	3
Ethical aspects of data	2	3
Natural Language Processing	2	3
Human/Robot interaction	2	3
Elective Major Courses		
Individual R&D project	1 and/or 2	3
Artificial intelligence engineering	1	3
Problem Solving	1	3
Information visualization	1	3
Blockchain & Privacy	1	3
Introduction to Security	1	3
Security & Privacy 3.0	1	3
Computer networks	1	3
Large Scale distributed systems	1	3
Big data technologies	1	3
Introduction to Constraint Programming	1	3
Advanced Logic	2	3
Anthropology and Ethics of Technics	2	3
Virtual Reality	2	3

Operational Research	2	3
Graphs	2	3
Functional programming	2	3
Advanced Computer networks	2	3
Creating interactive virtual worlds	2	3
Web	2	3
Embedded Artificial Intelligence, sensors, actuators	2	3
Data Valorisation	2	3
Reinforcement learning	2	3
Parallelism	2	3
Compulsory I&E Courses		
Basics in I&E (technology ideation and basics)	1	3
Business Dev Lab 1 (project management)	1	3
Business Intelligence 1 (data science for business)	1	3
I&E for venture creation (summer school format)	2	4
Business Dev Lab (with application of business concepts learned earlier)	2	5
Elective I&E Courses		
I&E complementary course 1 (strategy and internationalisation)	2	3
Business Intelligence 2 (marketing)	2	3
EXIT YEAR		
Compulsory Courses		
Decision theory and health care	1	2
AI and emotions	1	2
Multimodal emotion recognition from video and biosignals	1	2
Emotion and decision-making process	1	2
Behavioural economics and emotions	1	2
Machine learning for image analysis	1	2
R&D Project	1	6
Thesis/Internship	2	30
Specialisation Courses/Electives		
Applied artificial intelligence	1	2
Artificial Intelligence engineering	1	2
Advanced topics in deep learning	1	2
Discourse dialog modeling	1	2
Spiking neural networks	1	2
Reinforcement learning	1	2
Virtual Reality	1	2

Advanced Optimization	1	4
Fundamentals of ML	1	4
I&E Courses		
I&E study (in Emotion AI scope)	1	6

UNITN

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
AI and Ethics	1	6
Machine Learning/Deep learning	1 and 2	12
Signal Image and Video	1	6
Natural Language Understanding	2	6
Compulsory I&E Courses		
AI and innovations	2	6
Business Development lab	2	9
ICT Innovation	2	9
EXIT YEAR		
Compulsory Courses		
Affective Computing	1	6
Advanced HCI	1	6
Human-Centric AI	1	6
Thesis / Internship	2	30
I&E Courses		
Innovation and Entrepreneurship Basic	1	6

UPM

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
Statistical Data Analysis	x	3
Data Processes	1	4.5
Data Visualization	1	3
Intelligent Systems	1	4.5
Cloud Computing	1	4.5
Deep Learning	2	3
Information Retrieval	2	4.5
Emotion and Sentiment Analysis in text	2	6
Image mining	2	3
Elective Major Courses		
Big Data	1	3
Experimentation in software engineering	2	4.5

Programming for AI	2	5
Compulsory I&E Courses		
Introduction to Innovation and Entrepreneurship Management	1	6
Introduction to Technology Watch	2	1
Business Development Lab	2	6
Launching of ICT products	2	2
Elective I&E Courses		
I&E Seminars	2	5
EXIT YEAR		
Compulsory Courses		
Data Analysis	1	4.5
Image Processing, Analysis and Classification	1	5
Open Data and Management Graphs	1	4.5
Massively parallel machine learning	1	4.5
Thesis / Internship	2	30
Specialisation Courses/Electives		
Complex Data Analysis	1	4.5
Time Series	1	4.5
Cloud Computing	1	4.5
I&E		
I&E Study	1	6

UR

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
ACO - Object-Oriented Analysis and Design	1	5
BDD - Advanced Databases	1	4
RO - Operations Research	1	5
BDA - Basics of Data Analysis	1	6
WS - Semantic Web Technologies	2	5
SBD - Database Security	2	5
MPC - Machine learning 1	2	5
TWA - Technological Watch	2	5

Compulsory I&E Courses		
IEB - Innovation & Entrepreneurship (basics)	1	5
BDL1 - Business Development Lab 1	1	5
BDL2 - Business Development Lab 2	2	5
Elective I&E Courses		
KNI - Knowledge and Intangible Asset Management	2	5

UTU

ENTRY YEAR		
Compulsory Major Courses	**Semester**	**ECTS**
Statistical Data Analysis	1	5
Data Analysis and Knowledge Discovery	1	5
Evaluation of Machine Learning Methods	1	5
Introduction to Deep Learning	1	5
Introduction to Human Language Technology	2	5
Cognitive Neuroscience	2	5
Compulsory I&E Courses		
Introduction to Innovation and Business	1	5
Lean Digital Business Design	2	10
Summer School	2	4
Elective I&E Courses		
Knowledge and Innovation Management	1	5
Enterprise Architecture	2	6
Digital Business	2	3
Digital Business Models		3
EXIT YEAR		
Compulsory Courses		
Acquisition and Analysis of Biosignals	1	5
Programming for Health Wearables	1	5
Gamification and Serious Games	1	5
Thesis / Internship	2	30
Specialisation Courses		
Introduction to Game Development Tools	1	5
Machine learning health technology project	1	5

I&E Courses		
Innovation and Entrepreneurship Study	1	6