



Finanziato dall'Unione europea NextGenerationEU



Università degli Studi di Messina



Allegato A Breve descrizione del Progetto formativo
[da replicare per ciascuno nel caso di più progetti formativi]

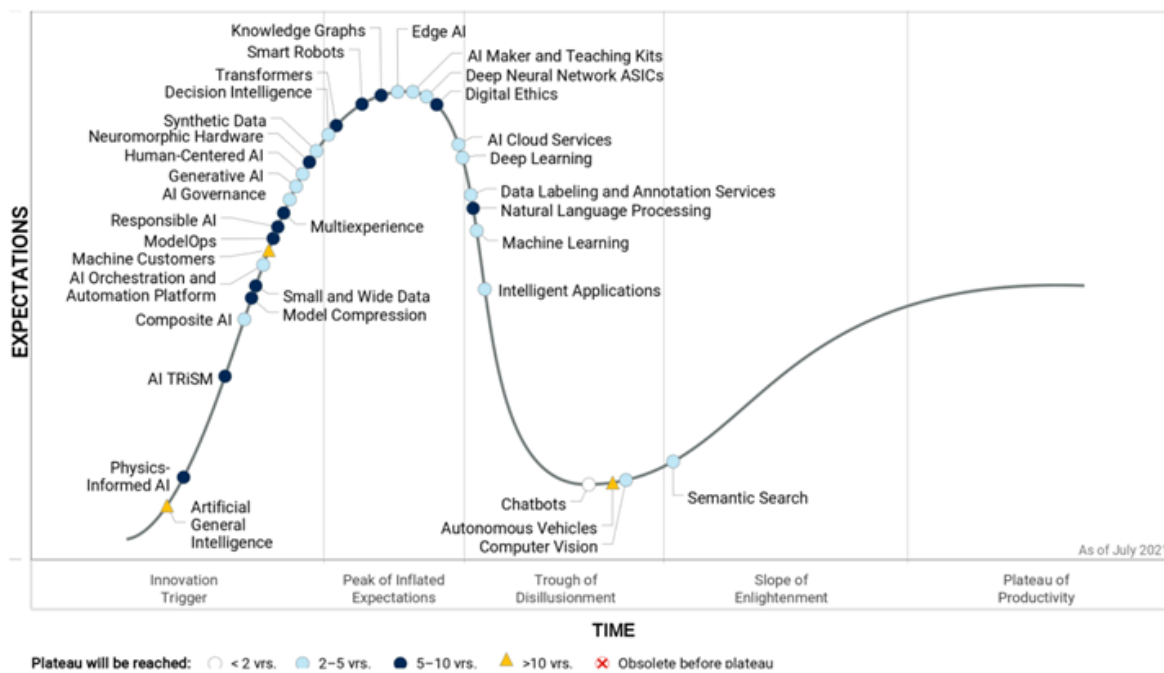
Titolo del Progetto Formativo:

Algorithms and optimization techniques for the artificial intelligence of virtual assistants

Descrizione dell'obiettivo scientifico e formativo: (min 1.000 caratteri - MAX 5.000 caratteri)

[specificare anche la coerenza con aree disciplinari e tematiche coerenti con i fabbisogni del Paese, nonché dei territori regionali interessati dal programma, in termini di figure ad alta qualificazione e orientate a soddisfare i fabbisogni di innovazione delle imprese di cui al PNRR;]

The situation due to SARS-COV-2 pandemic has launched a multitude of online services. This has paved the way for growing user expectations for fast, simple, and seamless experiences. Virtual assistants based on artificial intelligence, chatbots, and conversational artificial intelligence have played an important role in meeting this need, establishing themselves as the de facto standard services in handling user requests. The concomitant use of public and private cloud solutions has also given stakeholders further space to make investments in a market of services based and tailor-made for users. According to Gartner, in fact, the trend of Figure associated with virtual assistants is on the rise and will reach the production plateau in less than two years.



Gartner

Therefore, we note the ambivalent academic and industrial need to form a scientific profile in the context of natural language processing (NLP), ready for the challenges of the sector that will be encountered at the end of the three years.

The scientific and educational objective revolves around the study of well-known computational techniques of natural language processing (Recurrent Neural Network, Transformers, etc.), as well as the definition of new models. Further focus will be given to optimization techniques (First-Order or Second-Order Algorithms, Stochastic Algorithms, Population Algorithms, etc.) useful for finding the

input parameters or arguments of a function that give as a result the minimum or maximum output of the modeled function.

In this regard, the creation of user-driven tools for the management of requests that can be used through artificial intelligence-based virtual assistants, studying it in terms of syntactic and semantics, as well as applying an analytical study for the extraction, is of considerable interest. By exploiting the natural language processing both in understanding the request and in the generation of a relevant response, we work on that part of the life cycle of the request that begins when it is transcribed by the system and ends when a response is generated back.

The starting point is a technique known in the NLP sector, namely Transformers. This is an encoder-decoder type architecture born on the Attention mechanism. More specifically, at a high level, the encoder maps a sequence of inputs into an abstract continuous representation that contains all the learned information of that input. The decoder then takes that continuous representation and, step by step generates a single output feeding the previous output as well.

Strategically, it is considered to firstly work in the context of Natural Language Understanding (NLU). This, being a subfield of NLP, represents the first step of any process, focusing on understanding human language in terms of grammar correctness (syntactic) and context meaning (semantics). In a complementary way, a second subfield of the NLP will be treated in the following for the natural language generation (NLG). Specifically, in the first year, the research activity will be carried out on-site, to acquire more knowledge about the topic, algorithms involved, technologies, and strategies underlying natural language processing for virtual assistants. In the second year, part of the activity will be carried out at a foreign university to deepen optimization techniques. In the third year, part of the activity will be carried out in the company to investigate the applicability of the technologies developed in public and/or private contexts.

With respect to the strategic plans of the PNRR, the proposal is part of both mission 1, called "Digitization, innovation, competitiveness and culture", and mission 4, called "Education and research". With respect to the United Nations Sustainable Development Goals (SDGs), the proposal falls within the objectives: 4 - quality education and 9 - business, innovation, and infrastructure. Looking at the National Strategy for Intelligent Specialization (SNSI), the proposal falls within the thematic area of "Smart and sustainable industry, energy and environment".

Supervisore Aziendale:
Giancarlo Todaro (CEO)

Modalità di svolgimento delle attività formative e di ricerca:

The supplementary training activities for the Ph.D. student will include seminars planned by the Doctoral College, which aim to provide multidisciplinary knowledge in the field of computational mathematics.

In addition to these seminars, further ones will be provided by the FCRIlab group of the MIFT Department of the University of Messina, on the following topics and to give basic knowledge:

IoT (Internet of Things), technologies to implement interaction between environment, people, and technological platforms with the main objective of collecting data.

Big data management, to learn about the technological solutions useful for the collection and storage of large quantities of data.

Cloud and Edge Computing, to implement and use distributed computing infrastructures to be integrated also in decentralized systems.

IT Security and Cybersecurity, to learn about the approaches and technologies that make IT communications and access to digital data secure.

The student's training will be completed with participation in one or two international doctoral schools.

The research activities will be carried out with bi-monthly meetings of the student, academic manager, and company coordinator, to jointly identify the research needs, verify the results achieved over time and agree on any additional requirements.

Ricadute e risultati attesi con particolare rilievo alla promozione dello sviluppo economico e del sistema produttivo:

Training is an intangible form of investment that adds value to human resources and generates profit for the company. It does not provide solutions, but tools for achieving the best solution in terms of costs/benefits applied in any business context.

In this regard, the importance of learning must be considered to verify the economic return in terms of company profitability. Training assumes strategic importance for the organization's enhancement in a perspective of continuous development and innovation, ensuring to organization adaptability to technological and organizational changes. This is realized through the transfer learning of knowledge and skills in a manner consistent with the objectives of the organization itself.

Based on training, we place the enhancement of individuals both in terms of personal and professional growth. A methodological path is, indeed, proposed to verify how effective the training initiative has been for the development and improvement of skills in terms of positive adaptability to company routines, personal satisfaction, and the improvement of company performance.

In the most innovative companies, it is now established that the economic well-being of an organization, and therefore profit and its survival, can be based on a different concept of productivity, shifting the focus from mere production to the needs of the people who, in fact, they contribute and influence the production itself.

Investing in training for a company means gaining in terms of competitiveness. Hence, the need to enhance human resources, retrain and implement skills, reorganize production processes to achieve effective company competitiveness, ensuring effective training.

The use of AI technologies allows companies to overcome the traditional limits of automation processes and to increase the efficiency and productivity of their people and assets, acting in support of human activity and guaranteeing not only faster but also better results for the company.

* It is estimated that the adoption of AI technologies can have a significant impact on the growth rate of companies: on average, the growth in the turnover of companies that will adopt AI technologies will be 2.8 percentage points higher than the average of companies in the sector. From the application of AI, about 40% of respondents expect greater efficiency of business processes and a reduction in costs, while less than 20% aim at an improvement in the customer experience or greater efficiency of their employees.

* Source: a working group led by Microsoft and McKinsey

Risultati attesi:

Better Response Times

Better quality in customer response

Better Customer Experience

Better corporate image

Better reputation

Service to make assistance and therefore availability on different communication channels and 24 hours a day more accessible and usable

Multilingual

Analysis of the use of dialogues: topics requested

Length of the conversation, information collected during the conversation, "hot" points touched during the free conversation

Successful results report

Reduction of Sales Lead Time

Order Conversion Rate increased

Reduction of physical space

Less Employment of Workers

Deltacom srl will host the Ph.D. student beneficiary of the scholarship financed on the resources of the Ministerial Decree 352/2022 for n. 6 months (min 6 max 18) during the Ph.D. program.

Period abroad for no.6 months (min 6 max 18) at the following institution:

_____TO BE DECIDED_____