

# Research Activities at the Niccolò Cusano University

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## 1 Introduction

Niccolò Cusano University (UniCusano) is a relatively novel reality in the Italian academic landscape. Born as a telematic institution, i.e. the courses are primarily delivered through on-line asynchronous activities, its main mission was devoted to education. Because of a fast growth in the demand for such an academic profile, the institution maintained its telematic structure, thus collecting students from all over the national territory, but at the same time it established as a university strongly rooted to the roman territory, with the acquisition of a wide campus and an increasing attractivity for both students and professors or researchers. While the teaching activities gradually moved to a blended mode, in which both synchronous and asynchronous activities are carried out [1], research grew up as well, with the availability of a large research staff and a wide basin of students eligible to be introduced to research activities.

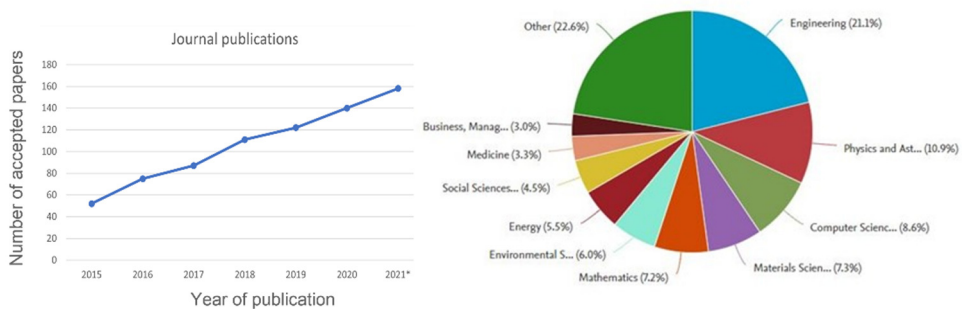
The introduction of the Engineering Faculty in 2015 gave the final boost to research in UniCusano, with the establishment of a number of novel laboratories capable of gathering the researchers' competences and creating new ones. The last five years have been used to both establish and consolidate the role of UniCusano as a young but fervent reality in the Italian research landscape, confirmed by its positioning at the apical places among the Italian universities for the research quality in Industrial Engineering, according to the last evaluation (2015-2019) of the Italian Research and University Ministry [2].

There is no doubt that the Engineering faculty can be identified as the main driver of the overall research at UniCusano, which decisively moved from a didactic-based institution to a more balanced institution, in which research play its pivotal role, together with the public engagement activities. In this framework, we can mention the establishment of the Research and Technological Transfer Office, the empowerment of the National and International Projects Office, the recent institution of the Industrial Doctorate and the formation of a large network of competences.

We can imagine research in Unicusano as an open construction site, yet possessing a defined vision on its role, with a strong vocation to grow within the national and international landscapes. In this framework, the participation in ATHENA represents a major chance to consolidate the trend of the last years.

## 2 The Research Landscape

Unicusano encompasses the cultural areas of Law, Psychology, Political Science, Economics, Education Science, Engineering, and it recently introduced Literature, Philosophy, Social Science, and Sport Science [3]. In many cases, the research activities are characterized by a strong interdisciplinarity, with a mixed humanistic-scientific approach where possible. Coming from appreciable results of the previous five-years period, research received a strong pulse during the last five years, where more than 1000 research products appeared on Scopus, which represented a 600% increase concerning the previous period [4].



**Figure 1.** Number of publications in the 2015-2021 period and corresponding subject areas partition at UniCusano.

The subject areas of such a wide production are indicated in Figure 1, where the prominent role of Engineering, Physics and Astronomy, Computer Science, Material Science, Mathematics, Environmental Science and Energy areas is clearly visible. These areas enlighten the strong scientific and technological vocation of the institution.

The Economy Faculty covers both the management area and the economic analysis, thus being in close connection with the mathematic area. Since 2019, UniCusano is the editor of the Open Access journal *Symphonia. Emerging Issues in Management*, the only Italian economic journal indexed by the Academic Journal Guide. Recently, CESDE (Study Center for Dynamic and Economic Analysis) has been created, a research center focused on behavioural economics and mathematics applied to economy, which activates collaboration with both other academic centers and consulting companies.

Sports Science is the most recent faculty in UniCusano, encompassing research in evidence-based exercise intensity in physical and sports activities, performance indicators, and psychophysical well-being. It includes three laboratories, namely the Physical Activity, the Sport Activity, and the Medical Sport Orthopaedic labs. The first evaluates suitable parameters for the optimization of physical exercise in different ages and the effectiveness of training activities in special populations. The second is oriented to the investigation of

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biological parameters during training activities of athletes and to the validation of novel training activities. The latter covers the area of technology-driven diagnosis, rehab, and treatment of sport-correlated illnesses.

The Engineering Faculty is the most structured at UniCusano and in the last five years has been equipped with several labs, some of them still growing. Research in Engineering follows the different branches of the different courses available for the students:

The Civil Engineering branch deals with the modelling of different phenomena, from fluid structure interaction to behavioural response in urban environment and transport. Mechanical Engineering ranges, among others, from fuel cell modelling, production, and optimization to material processing and characterization, passing through biomechanics and rehab robotics. Industrial Engineering found a main path to sustainability. Electronic covers metamaterial modelling and characterization, nanostructured semiconductors, and front-end for radiation detection.

Although UniCusano has not a Mathematic Faculty, there are a bunch of transversal research subjects in the mathematic area, including algebra and group theory, fractal groups, harmonic analysis and probability, statistical modelling and econometrics, community detection algorithms, data mining, and artificial intelligence. Each of them finds an application in at least one of the areas described above, setting a multidisciplinary approach to the research subjects.

### 3 Outstanding Research

Here we do not want to report one or more specific research topics which are considered at the top level, but rather to describe what resulted to be a best practice at Unicusano for the establishment of a research setting within the Engineering Faculty. Since its foundation in 2012, the Engineering Faculty at UniCusano distinguished itself for its strong vocation toward research, which was not straightforward in an on-line university like Unicusano. A close inspection of the stakeholders' demand brought heavy investments in human capital and infrastructure, allowing the formation of the critical mass needed to develop a virtuous circle among formation, research, and industry. One of the outstanding results of such politics was the positioning of the Engineering Faculty at the top of Italian academic institutions, according to the assessment of the research quality by the Italian University and Research Ministry.

At the moment, the Engineering Faculty dedicates 550 m<sup>2</sup> to research laboratories, encompassing 9 laboratories dedicated to specific activities, plus two more areas which are accessible to all groups [5]. All the labs are born to be inter- and multi-disciplinary, covering all the engineering areas, from civil to industrial and information.

The list of all the laboratories is shown in Table 1.

**Table 1.** List of the Laboratory in the Engineering Faculty

<b>Laboratory</b>	<b>Reference Area</b>
Civil Engineering lab	Civil Engineering
Fluid dynamics lab	Industrial Engineering
Mechanics of Machines	Industrial Engineering
Manufacturing Technologies and Systems	Industrial Engineering
Machines and Energy and Environmental Systems lab	Industrial Engineering
Material Science and Technology	Industrial Engineering
Mechanical Measurements and Mechatronics	Industrial Engineering
Optoelectronic and Microelectronic lab	Information Engineering
Applied Electromagnetism lab	Information Engineering
Mechanical Characterization lab	Shared
Mechanical Workshop	Shared

The fast growth of the personnel, including Professors, Researchers, Post-Docs and PhD students and their dense and constant scientific production allowed the possibility to form an Engineering Department (to be settled within 2023), which means more financial independence, more dedicated HR management, and more weight within the academic Senate, in other words more possibilities to further grow and established as a reference point for research and technological transfer. Correspondingly, research founding raised as well, with more than 30 approved research projects founded by regional, national and European agencies.

## 4 From Research to Innovation

The technological transfer initiatives at UniCusano during the last years intensified together with the research activities, confirming the role of an academic institution strongly oriented toward the production sector. In this framework it is worth mentioning a couple of activities involving the Economy and Engineering Faculties.

The first is the Niccolò Cusano Smart Factory, which can be considered a knowledge farm to promote the formation and the development of new start-up on the regional and national landscape. It operates in close connections with the different poles of UniCusano and with other centers for innovation promotion along the national territory, with the vision of reinforcing the production sector by diversifying the industrial innovation offer.

The second is the creation of a cluster of both Universities/research centers and companies [6], most of which operating in the regional landscape, started in 2015 and intended as a close network for promoting applied research and applying common regional and national research projects. The pulse to technological transfer involves an internal structure able to collect the various competences and make them available for the productive sector. The Committee for Research and Technological Transfer and the National and International Projects Office [4] continuously monitored the industrial requests to promote innovation in the productive processes and formation of new professional figures. A result of this activity was the creation

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of a multidisciplinary technological cluster formed by companies and public research entities, encompassing Ferrari, the Italian National Research Council, and some companies working in aerospace, material processing and sustainability at the national and international level, able to propose several regional and national research projects.

## 5 Involvement of Students

As said, contrarily to initial vocation strongly oriented to education activities UniCusano recently moved toward introducing students to research. At the end of their master's studies, students are allowed to access the laboratories and all the faculties encourage them to participate in internships within the university or in external companies/research institutions. During the last five years, UniCusano promoted the natural prosecution of the student career in research, increasing the offer of Doctorate schools and courses to form young researchers. Nowadays, five Doctorates are accessible [3]:

- Law and Cognitive Neuroscience
- Epistemology and Neuroscience Applied in Education
- Management for Digital Transformation: Business, Communication, and Ethics
- Territory, Innovation, and Sustainability
- Civil and Industrial Engineering

Remarkably, in the last two years, UniCusano promoted collaborations with local and national companies and obtained funds for about ten doctorate fellowships for the Industrial Doctorate program, to directly connect young researchers with the productive fabric.

## 6 The vision of ATHENA research-based cooperation

Research at UniCusano is an established reality that is still growing fast, due to the synergistic effect of the formation of researchers, the collaboration with the production realities, and the effort to match between the two parts. In the framework of continuing to play a major role in the Italian research landscape and over, ATHENA represents a natural and perfect opportunity to create other links towards other European subjects.

What ATHENA can bring to UniCusano is a solid network of advanced research partners with whom to interact, a research infrastructure which can sustain its activities, and a way to enlarge its competences.

What Unicusano can bring to ATHENA is its model of an institution working in close connection with companies and industries, its established experience in advanced technology-driven education which can favour the formation and the mobility of researchers at all levels promoting the development of remote and/or shared research models, and the enthusiasm of a young institution which is growing due to its ability to fully recognize the need of its reference market.

## References

- [1] <https://www.unicusano.it/en/teaching/learning-programme-options>
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