Research Activities at the University of Vigo

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1 Introduction

Established in 1990, the University of Vigo (UVigo) has managed to consolidate itself in time as a reference of modernity and innovation in Galicia (Spain). Its three campuses at Ourense, Pontevedra and Vigo offer degree programs in the fields of science, humanities, technology and legal-social sciences. These are distributed over nearly thirty centres where research groups also carry out their R&D activities. A network of own centres completes the research infrastructure map of the University of Vigo.
The University of Vigo's general internationalisation objectives are to promote exchange of researchers, students and administrative staff and prepare them for the global labour market; gain recognition in the international education area by establishing strategic partnerships and internationalising teaching and research; promote innovative international projects within a multilateral, cross-border cooperation framework to attract and retain the best talent, for example, by participating in all education and research European calls.

In 2017, the University of Vigo was awarded the European Commission's HR Excellence in Research Award accreditation and the HRS4R seal of excellence [1]. This seal represents our commitment to continuous improvement, through alignment of our human resources strategies and policies with the principles of the European Charter for Research Staff and the Code of Conduct for Recruitment of Research Staff (C&C).

Within this excellence framework, the University of Vigo has developed various training, recruitment, retention, and stabilisation plans with the aim of attracting talented teaching and research staff to contribute to maintaining and improving research, transfer, innovation and creative capacity. The final objective is to retain persons with the greatest merit and capacity, by always abiding with the principle of equal opportunities. One of UVigo's strengths is that it has pioneered many gender equality actions, which have recently enabled us to lead the gender equality work package in the ATHENA proposal.

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2 The Research Landscape

The research structure (Fig. 1) is comprised of research groups, research institutes, research centres, and support centres. There are 172 research groups which span many disciplines such as science, technology, health sciences, humanities, and social sciences, that have 2630 researchers including staff and PhD students. All groups are comprised of at least three members. Some relevant groups funded by the Galician Government are: potential growth groups (PGG, minimum 3 members) and reference competitive groups (RCG, with a minimum of 5 members).

There are three university research institutes, namely; IFCAE (Physics & Aerospace Sciences Institute [2]), Agroecology & Food, and IXEX (Law & Gender Institute). The first two are located on the Ourense Campus while the third is distributed over the three campuses.

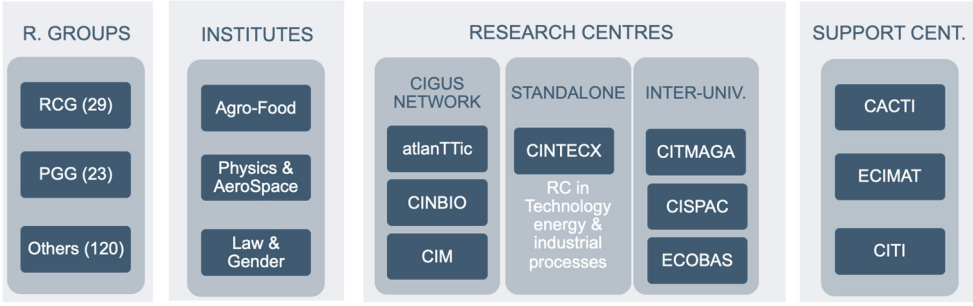

Figure 1. Main research structures at the University of Vigo.

The Research Centres (RC) are either standalone or inter-university centres. Three of them are recognized for excellence within the Galician University System's CIGUS network of Research Centres: atlanTTic [3] dedicated to Information and Communication Technologies; CINBIO [4], dedicated to nanomaterials and biomedicine, and CIM [5], dedicated to Marine Science. The fourth, CINTECX [6], is dedicated to Technology and Industrial Processes. There are three inter-university RCs that collaborate with the University of Santiago de Compostela (USC), and the University of Coruña (UDC). These are CITMAGA [7], dedicated to Research and Transference in Mathematics in Galicia; CISPAC [8], dedicated to Atlantic Cultural Landscapes; and ECOBAS [9], dedicated to Economy and Business Administration.

The support infrastructure is comprised of CACTI [10] (Scientific-Technical support Centre for Research), ECIMAT (Marine Science Station) and CITI (Technological and Industrial Centre). These research support centres provide instrumental, scientific, and technological assistance in all knowledge, research, development, and innovation areas, not only to UVigo but also to the other public bodies or companies. They facilitate use of equipment and facilities, which due to their specificity, technological level or cost, are best exploited in a centralised manner. The online platform RESUV [11] provides information on all technical facilities and services available at the university.

The research portal collates the scientific production generated by UVigo research staff, with a view to dissemination, thereby providing greater visibility and transfer of research results and know-how to society.

3 Outstanding Research

The University of Vigo occupies a relatively good position in national and international rankings as shown in Table 1. Considering the Times Higher Education (THE) Ranking, where 30% is based on research and 30% on citations, UVigo's overall ranking is 800-1000, but 601-800 in Engineering & Technology. In terms of the 2022 Shanghai ranking of World Universities, UVigo was placed among the 501-600 best universities in the world, and obtained best position in the following areas: Food Science & Technology: 51-75; Telecommunications & Civil Engineering: 201-300; Electric & Electronic Engineering together with Ecology: 301-400; Chemical Engineering & Biotechnology: 401-500, among others.

Table 1. Position of the University of Vigo in THE Ranking (World Universities), ARWU Ranking, 2022 Greenmetrics: overall, by fields, subjects, region, country, and rural campus.

Position	**THE 2022**	**Position**	**ARWU 2022**	**Position**	**Green metrics 2022**
Overall	801-1000	Overall	501-600	Overall	300
Engineering	601-800	Food Science & Technology	51-75	In Europe	94
Physical Sciences	601-800	Oceanography	151-200	In Spain	17
Computer Sciences	601-800	Telecommunications Engineering	201-300	Rural Campus	22
Social Sciences	601-800	Hospitality &Tourism Management	201-300	Setting & infrastructure	271
Business & Economics	601-800	Electrical & Electronic Engineering	301-400	Energy & Climate change	358
Education	601+	Political Sciences	301-400	Waste	222
Life Sciences	501-600	Oceanography	201-300	Water	210
Arts & Humanities	501-600	Political Sciences	301-400	Transportation	591
THE Citation Score	39.9	Earth Sciences	401-500	Teaching & Research	419
		Biotechnology	401-500		

The aforementioned positions by subject are clearly related to the structure of the university's institutes and centres as shown in Fig. 1. The Agro-Food Institute, which promotes personalized food oriented to biomedicine and attempts to reach zero hunger, is aligned with the second Sustainable Development Goal (SDG). The Marine RC (CIM), with climate change and underwater life as one of its main objectives, is aligned with SDGs 13 and 14. Telecommunications is the main focus of atlanTTic, which is a world reference in 5G and 6G technologies and is at the forefront of quantum communications. Its other lines of research

range from security and privacy, biomedical signal analysis, multimedia technologies, space communications, radar and remote sensing, to electronic services or radio and optical communications. These lines complement those of the Institute of Physics and Aerospace Sciences: fluid dynamics and thermodynamics, optical systems, unmanned aircraft, space sciences, modelling & simulation, and aim to maximise the potential for generating research excellence in the areas of applied physics, aeronautical, and aerospace sciences, to intensify results transfer to society.

Insofar as the Engineering fields are concerned, CINTECX covers aspects of electronics and automation, manufacturing and materials, energy, transport, biomedical engineering and sustainability. It is fully integrated into the Galician industrial ecosystem in key economy sectors such as automotive, naval and metal industries. This is also mirrored in the Greenmetrics ranking as shown in Table 1.

CINBIO is focussed on biotechnology, with its cutting-edge research applied to health through collaboration projects with hospitals, where personalized medicine is one of its main goals.

ECOBAS, the inter-university RC, is relevant in the Humanities and Social Sciences, and focuses its lines of research and transfer in the field of economic, environmental, and social sustainability, to respond to the great challenges of society.

The IXEX institute, is aligned with the 5th SDG. It applies a gender perspective and covers lines of research such as gender-based violence, equality in the labour market, women and social identity, family, mediation, therapeutic and restorative justice, among others.

4 From Research to Innovation

A university that generates basic and applied knowledge, also must work with companies, and define cooperation policies. Figure 2 compares some research and innovation indicators between UVigo (black line) and the average of the Spanish universities (blue area).

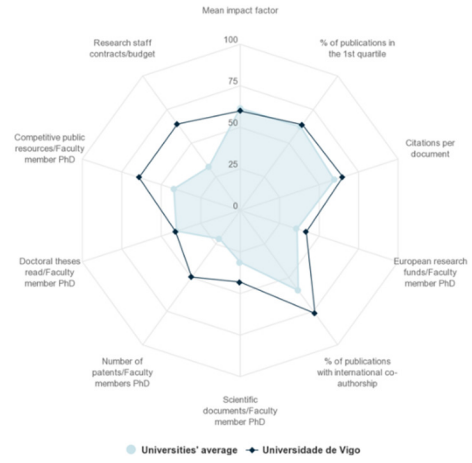

Figure 2. Research and innovation indicators in comparison with the Spanish Universities' average. Minimum value = 0 and maximum value= 100. Taken from [12]

UVigo shows higher than average values for research staff contracts/budget and number of patents; two good indicators for innovation. On average, UVigo has about 500-600 contracts/year that represent about € 6M/year. The number of UVigo spin-offs is another good indicator. Forty-two knowledge-based spin-offs have emerged from the University of Vigo since 2004, which transfer UVigo's high benefit and economic potential knowledge, technology and research results to society. Some examples in the technological field are: Alén Space [13], Ancora Mobile [14], Codelab 17 [15], CoderIam, S.L. [16], EM3works [17], Environmental Physics Technologies [18], etc.

UVigo is also part of the Digital Innovation Hubs: DIHGIGAL, DATAlife and INFABHUB, and Business Incubators (BF): BFAuto, BFFood, BFAero as an integrative part in the Galician Innovation Ecosystem.

5 Student participation

UVigo students actively participate in research via three student associations: UVigo Space Lab, UVigo MotorSport and UVigo Aerotech, which is the most outstanding in terms of technological focus.

UVigo Space Lab is comprised of a multidisciplinary team of university students from different engineering fields (industrial, telecommunications, aerospace, computer science) dedicated to the design, manufacture and operation of small educational satellites and space missions. The next mission of this association is the BIXO project, which will be key to understanding the effect of prolonged exposure of living organisms in space.

UVigo Motorsport has been designing and manufacturing single-seater racing cars for several years and currently involves 70 students from mechanical engineering, computer science, aerospace, and artificial intelligence. It also has students from other degrees such as Social Education, Organizational Engineering or Business Administration and Management. The objective is to pass all technical & mechanical inspections and safety tests of the single-seater, and thus qualify for competing in the Formula Student race. The plan is to achieve a functional and truly autonomous prototype to participate in an autonomous car competition.

UVigo Aerotech is an aeromodelling team of 18 Aerospace Engineering students from the Ourense campus. This team was created to broaden knowledge beyond the academic field and thus facilitate entry into the aeronautical sector. They started in December 2019 and currently are in the final stretch of designing a prototype.

6 The ATHENA research-based cooperation vision

UVigo's entry into the ATHENA alliance will facilitate synergies for new research and transfer projects, thereby promoting quality and impact research. This will contribute to creating a network of research infrastructures and teams, to increase competitiveness of project proposals and fundraising, thus boosting socio-economic development and reciprocally facilitating infrastructures and resources from UVigo, Galicia and the Galicia-North Portugal Euroregion to ATHENA partners.

Teaching and research staff, as well as technical and administrative staff, will avail of training opportunities within a European cooperation environment. From the point of view of educational offer, ATHENA will also promote internationalisation of UVigo's bachelor and master's degrees, and doctoral programmes. At the industrial and social level, the ATHENA membership will provide benefits in relation to the transfer of results, training of professionals for excellence, better European level job prospects and for fostering exchange between universities, industry and society.

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