

A Universidade do Porto no CWTS Leiden Ranking 2023

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A Universidade do Porto no CWTS Leiden Ranking 2023

<http://www.leidenranking.com/>

1. Metodologia do CWTS Leiden Ranking 2023

“Information about the CWTS Leiden Ranking

The CWTS Leiden Ranking is an online platform that offers important insights into the scientific performance of over 1400 major universities worldwide. Below we provide some general information about the Leiden Ranking.

Who produces the Leiden Ranking?

The Leiden Ranking is produced by the **Centre for Science and Technology Studies (CWTS)** at Leiden University in the Netherlands. CWTS is a research center in the field of science and technology studies. The CWTS staff members contributing to the Leiden Ranking are listed [here](#).

Why do you produce the Leiden Ranking?

Our aim in producing the Leiden Ranking is twofold:

1. We aim to provide a service to the scientific community by making available high-quality information on the scientific performance of universities and by offering an alternative to other well-known university rankings, such as the **[Times Higher Education World University Rankings](#)**, the **[QS World University Rankings](#)**, and the **[Academic Ranking of World Universities](#)**, which we believe to provide questionable information.
2. We aim to provide a demonstration of state-of-the-art bibliometric methods and of the information that CWTS is able to offer using such methods.

For whom do you produce the Leiden Ranking?

We produce the Leiden Ranking for policy makers, research managers, researchers, journalists, and anyone else with an interest in the scientific performance of universities. The Leiden Ranking does not consider the performance of universities in terms of teaching. We therefore expect the information provided by the Leiden Ranking to be of little value for students, and we advise students not to use the Leiden Ranking to choose where to study.

How do you obtain the data on which the Leiden Ranking is based?

The Leiden Ranking is based on bibliographic data on scientific publications, in particular on articles published in scientific journals. As discussed in more detail [here](#), we currently use **[Web of Science](#)** as our primary data source. CWTS has a special Web of Science license that enables us to use Web of Science data to produce the Leiden Ranking. Data from Web of Science is enriched by CWTS in various ways. In particular, as discussed [here](#), we take a very careful approach to identify the publications of a university. For the open access indicators in the Leiden Ranking, we use data from **[OpenAlex](#)**. The Leiden Ranking does not use any data obtained directly from universities.

How do you select the universities included in the Leiden Ranking?

We aim to include as many universities as possible in the Leiden Ranking, but we do not have the resources to comprehensively cover all universities worldwide. A university therefore needs to have a certain minimum number of scientific publications in order to be included in the Leiden Ranking. This is discussed in more detail [here](#).

How does the Leiden Ranking differ from other university rankings?

The Leiden Ranking offers a **[responsible approach to university ranking](#)**. We recognize that universities are complex organizations that have a variety of forms, contexts, and missions, which means that representing the performance of a university in a single number does not make sense. Unlike other well-known university rankings, the Leiden Ranking therefore presents a variety of indicators, enabling the performance of universities to be explored from a diversity of perspectives.

The exclusive focus on the scientific performance of universities also distinguishes the Leiden

Ranking from other university rankings. Other aspects of the performance of universities, in particular their contribution to teaching, are not considered in the Leiden Ranking. Unlike other university rankings, the Leiden Ranking is based entirely on bibliographic data on scientific publications. It relies on a **sophisticated approach to data collection** and provides a set of **advanced bibliometric indicators**.

How is the Leiden Ranking funded?

Most of the funding for the Leiden Ranking is currently provided by **U-Multirank** and the **European Research Infrastructure for Science, technology and Innovation policy Studies (RISIS)**. The Leiden Ranking is also partly self-funded by CWTS.

Do you have any competing interests?

Through **CWTS B.V.**, a company affiliated with the CWTS research center and owned by Leiden University, we offer **services** for research evaluation and strategic decision making to universities and other research organizations. As part of this, we provide organizations with bibliometric indicators similar to those made available in the Leiden Ranking. Revenues generated through CWTS B.V. are used to sustain and strengthen the work of the CWTS research center.

What are your future plans for the Leiden Ranking?

We are currently exploring the possibility of creating an open edition of the Leiden Ranking that is fully transparent and reproducible. More information about this ongoing project can be found in **this blog post**..¹

Data

The CWTS Leiden Ranking 2023 is based on bibliographic data from the Web of Science database produced by Clarivate. Below we discuss the Web of Science data that is used in the Leiden Ranking. We also discuss the enrichments made to this data by CWTS.

Web of Science

The Web of Science database consists of a number of citation indices. The Leiden Ranking uses data from the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The Leiden Ranking is based on Web of Science data because Web of Science offers a good coverage of the international scientific literature and generally provides high quality data.

The Leiden Ranking does not take into account conference proceedings publications and book publications. This is an important limitation in certain research fields, especially in computer science, engineering, and the social sciences and humanities.

Enriched data

CWTS enriches Web of Science data in a number of ways. First of all, CWTS performs its own citation matching (i.e., matching of cited references to the publications they refer to). Furthermore, in order to calculate the various indicators included in the Leiden Ranking, CWTS identifies publications by industrial organizations in Web of Science, CWTS performs geocoding of the addresses listed in publications, CWTS assigns open access labels (gold, hybrid, bronze, green) to publications, and CWTS disambiguates authors and attempts to determine their gender. Most importantly, CWTS puts a lot of effort in assigning publications to universities in a consistent and accurate way. This is by no means a trivial issue. Universities may be referred to using many different name variants, and the definition and delimitation of universities is not obvious at all. The methodology employed in the Leiden Ranking to assign publications to universities is discussed **here**.

More information

More information on the citation matching that is performed by CWTS is provided in a paper by Olensky, Schmidt, and Van Eck (2016). For more information on the geocoding of addresses, we refer to a paper by

¹ In <https://www.leidenranking.com/information/general>, acedido 21 de junho de 2023.

Waltman, Tijssen, and Van Eck (2011). The author disambiguation algorithm used by CWTS is documented in a paper by Caron and Van Eck (2014).

- Caron E., & Van Eck, N.J. (2014). Large scale author name disambiguation using rule-based scoring and clustering. In E. Noyons, editor, *Proceedings of the 19th International Conference on Science and Technology Indicators* (pp. 79-86).
- Olensky, M., Schmidt, M., & Van Eck, N.J. (2016). Evaluation of the citation matching algorithms of CWTS and iFQ in comparison to Web of Science. *Journal of the Association for Information Science and Technology*, 67(10), 2550–2564. ([paper](#), [preprint](#))
- Waltman, L., Tijssen, R.J.W., & Van Eck, N.J. (2011). Globalisation of science in kilometres. *Journal of Informetrics*, 5(4), 574–582. ([paper](#), [preprint](#))²

“Universities

The CWTS Leiden Ranking 2023 includes 1411 universities worldwide. These universities have been selected based on their number of Web of Science indexed publications in the period 2018–2021. As discussed below, a sophisticated data collection methodology is employed to assign publications to universities.

Identification of universities

Identifying universities is challenging due to the lack of clear internationally accepted criteria that define universities. Typically, a university is characterized by a combination of education and research tasks in conjunction with a doctorate-granting authority. However, these characteristics do not mean that universities are particularly homogeneous entities that allow for international comparison on every aspect. As a result of its focus on scientific research, the Leiden Ranking presents a list of institutions that have a high degree of research intensity in common. Nevertheless, the ranking scores for each institution should be evaluated in the context of its particular mission and responsibilities, which are strongly linked to national and regional academic systems. Academic systems - and the role of universities therein - differ substantially between countries and are constantly changing. Inevitably, the outcomes of the Leiden Ranking reflect these differences and changes.

The international variety in the organization of academic systems also poses difficulties in terms of identifying the proper unit of analysis. In many countries, there are collegiate universities, university systems, or federal universities. Instead of applying formal criteria, whenever possible we follow common practice based on the way these institutions are perceived locally.

Consequently, we treat the University of Cambridge and the University of Oxford as entities, whereas in the case of the University of London we distinguish between the constituent colleges. For the United States, university systems (e.g. the University of California) are split up into separate universities. The higher education sector in France, like in many other countries, has gone through several reorganizations in recent years. Many French institutions of higher education have been grouped together in *Communautés d'Universités et Établissements* (COMUEs), succeeding the earlier *Pôles de Recherche et d'Enseignement Supérieur* (PRES). Except in the case of full mergers, the Leiden Ranking still distinguishes between the different constituent institutions. The Leiden Ranking 2023 includes French organisations that are designated as "établissements publics expérimentaux (EPE)". This is a new type of HEI in France created by the law of 12 December 2018 in which different research and higher education institutions work together in order to eventually form a single HEI. Research and educational organisations that are part of a EPE as "établissements-composantes" will no longer be included as separate organisations in the Leiden Ranking 2023. Publications are assigned to universities based on their recent configuration. Changes in the organizational structures of universities up to 2022 have been taken into account.

Affiliated institutions

A key challenge in the compilation of a university ranking is the handling of publications originating from research institutes and hospitals affiliated with universities. Among academic systems, a wide variety exists in the types of relations maintained by universities with these affiliated institutions. Usually, these relationships are shaped by local regulations and practices affecting the comparability of universities on a global scale. As there is no easy solution for this issue, it is important that producers of university rankings employ a transparent methodology in their treatment of affiliated institutions.

² In <https://www.leidenranking.com/information/data>, accessed 21 de junho de 2023.

CWTS distinguishes three different types of affiliated institutions:

1. Component
2. Joint research facility or organization
3. Associated organization

In the case of a *component*, the affiliated institution is actually part of or controlled by the university. Universitaire Ziekenhuizen Leuven is an example of a component, since it is part of the legal entity of Katholieke Universiteit Leuven.

A *joint research facility or organization* is identical to a component except that it is administered by more than one organization. The Brighton & Sussex Medical School (the joint medical faculty of the University of Brighton and the University of Sussex) and Charité (the medical school of both the Humboldt University and the Freie Universität Berlin) are examples of this type of affiliated institution.

The third type of affiliated institution is the *associated organization*, which is more loosely connected to a university. This organization is an autonomous institution that collaborates with one or more universities based on a joint purpose but at the same time has separate missions and tasks. In many countries, hospitals that operate as teaching or university hospitals fall into this category. The Massachusetts General Hospital, one of the teaching hospitals of the Harvard Medical School, is an example of an associated organization.

The Leiden Ranking 2023 counts a publication as output of a university if at least one of the affiliations in the publication explicitly mentions either the university or one of its components or joint research facilities. In a limited number of cases, affiliations with institutions that are not controlled or owned by the university are also treated as if they were mentioning the university itself. The rationale for this is that in some cases institutions – although formally being distinct legal entities – are so tightly integrated with the university that they are commonly perceived as being a component or extension of that university. Examples of this situation include the university medical centers in the Netherlands and some of the academic health science systems in the United States and other countries. In these cases, universities have actually delegated their medical research and teaching activities to the academic hospitals and universities may even no longer act as the formal employer of the medical researchers involved. In other cases, tight integration between a university and an academic hospital may manifest itself by an extensive overlap in staff. In this situation, researchers may not always mention explicitly their affiliation with the university. An example of this tight integration is the relation between the University Hospital Zurich and the University of Zurich.

The list of affiliated institutions for the 2023 edition is available [here](#). Our approach is discussed in more detail in a blog post and in this [paper](#) on academic hospitals.

Affiliated institutions that are not classified as a component or a joint research facility or treated as such are labeled as associated institutions. In the case of publications with affiliations from associated organizations, a distinction is made between publications from associated organizations that also mention the university and publications from associated organizations that do not include a university affiliation. In the latter case, a publication is not considered to originate from the university. On the other hand, if a publication includes an affiliation from a particular university as well as an affiliation from an associated organization, both affiliations are considered to represent that particular university. The effect of this procedure depends on the [counting method](#) that is used in the calculation of bibliometric indicators. The procedure influences results obtained using the fractional counting method, but it has no effect on results obtained using the full counting method.

Selection of universities

The Leiden Ranking 2023 includes 1411 universities from 72 different countries. These are all universities worldwide that have produced at least 800 Web of Science indexed publications in the period 2018–2021. Only so-called [core publications](#) are counted, which are publications in international scientific journals. Also, only research articles and review articles are taken into account. Other types of publications are not considered. Furthermore, collaborative publications are counted fractionally. For instance, if a publication includes five authors of which two belong to a particular university, the publication is counted with a weight of $2 / 5 = 0.4$ for that university. It is important to note that universities do not need to apply to be included in the Leiden Ranking. The universities included in the Leiden Ranking are selected by CWTS according to the procedure described above. Universities do not need to provide any input themselves.

Data quality

The assignment of publications to universities is not free of errors, and it is important to emphasize that in general universities do not verify and approve the results of the Leiden

Ranking data collection methodology. Two types of errors are possible. On the one hand, there may be false positives, which are publications that have been assigned to a university when in fact they do not belong to the university. On the other hand, there may be false negatives, which are publications that have not been assigned to a university when in fact they do belong to the university. The data collection methodology of the Leiden Ranking can be expected to yield substantially more false negatives than false positives. In practice, it turns out to be infeasible to manually check all addresses occurring in Web of Science. Because of this, many of the 5% least frequently occurring addresses in Web of Science have not been manually checked. This can be considered a reasonable upper bound for errors, since most likely many of these addresses do not belong to universities.”³

“Fields

The CWTS Leiden Ranking 2023 provides statistics not only at the level of science as a whole but also at the level of the following five main fields of science:

- Biomedical and health sciences
- Life and earth sciences
- Mathematics and computer science
- Physical sciences and engineering
- Social sciences and humanities

As discussed below, these five main fields are defined based on large number of micro-level fields.

Algorithmically defined main fields

Each publication of a university belongs to one, or sometimes to more than one, of the above main fields. If a publication belongs to more than one main field, the publication is assigned fractionally to each of the main fields. For instance, a publication belonging to two main fields is assigned to each of the two fields with a weight of $1 / 2 = 0.5$.

Publications are assigned to the five main fields using an algorithmic approach. Traditionally, fields of science are defined by sets of related journals. This approach is problematic especially in the case of multidisciplinary journals such as *Nature*, *PLOS ONE*, *PNAS*, and *Science*, which do not belong to one specific scientific field. The five main fields listed above are defined at the level of individual publications rather than at the journal level. In this way, publications in multidisciplinary journals can be properly assigned to a field.

Publications are assigned to main fields in the following three steps:

1. We start with 4215 micro-level fields of science. These fields are constructed algorithmically. Using a computer algorithm, each publication in Web of Science is assigned to one of the 4215 fields. This is done based on a large-scale analysis of hundreds of millions of citation relations between publications.
2. We then determine for each of the 4215 micro-level fields the overlap with each of the 254 journal subject categories defined in Web of Science (excluding the *Multidisciplinary Sciences* subject category).
3. Each subject category in Web of Science has been linked to one of the five main fields. Based on the link between subject categories and main fields, we assign each of the 4215 micro-level fields to one or more of the five main fields. A micro-level field is assigned to a main field if at least 25% of the publications in the micro-level field belong to subject categories linked to the main field.

After the above steps have been taken, each publication in Web of Science has an assignment to a micro-level field, and each micro-level field in turn has an assignment to at least one main field. Combining these results, we obtain for each publication an assignment to one or more main fields.

The link between subject categories and main fields can be found in this [Excel file](#).

Overview of micro-level fields

Information on the 4215 micro-level fields is available in this [Excel file](#). . [...]

It should be noted that the micro-level fields play an important role in the calculation of the field-normalized **impact indicators** in the Leiden Ranking. [...]

³In <https://www.leidenranking.com/information/universities> , acedido 21 de junho de 2023.

More information

For more information on the methodology for the algorithmic construction of the micro-level fields, we refer to a paper by Waltman and Van Eck (2012). The methodology makes use of the Leiden algorithm. This algorithm is documented in a paper by Traag et al. (2019).

- Waltman, L., & Van Eck, N.J. (2012). A new methodology for constructing a publication-level classification system of science. *Journal of the American Society for Information Science and Technology*, 63(12), 2378–2392. ([paper](#), [preprint](#))
- Traag, V.A., Waltman, L., & Van Eck, N.J. (2019). From Louvain to Leiden: Guaranteeing well-connected communities. *Scientific Reports*, 9, 5233. ([paper](#), [preprint](#))⁴

“Indicators

The CWTS Leiden Ranking 2023 offers a sophisticated set of bibliometric indicators that provide statistics at the level of universities on scientific impact, collaboration, open access publishing, and gender diversity. The indicators available in the Leiden Ranking are discussed in detail below.

Publications

The Leiden Ranking is based on publications in the Web of Science database produced by Clarivate. The most up-to-date statistics made available in the Leiden Ranking are based on publications in the period 2018–2021, but statistics are also provided for earlier periods. Web of Science includes a number of citation indices. The Leiden Ranking uses the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. Only publications of the Web of Science document types *article* and *review* are taken into account. The Leiden Ranking does not consider book publications, publications in conference proceedings, and publications in journals not indexed in the above-mentioned citation indices of Web of Science.

The Leiden Ranking takes into account only a subset of the publications in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. We refer to the publications in this subset as core publications. Core publications are publications in international scientific journals in fields that are suitable for citation analysis. In order to be classified as a core publication, a publication must satisfy the following criteria:

- The publication has been written in English.
- The publication has one or more authors. (Anonymous publications are not allowed.)
- The publication has not been retracted.
- The publication has appeared in a core journal.

The last criterion is a very important one. In the Leiden Ranking, a journal is considered a core journal if it meets the following conditions:

- The journal has an international scope, as reflected by the countries in which researchers publishing in the journal and citing to the journal are located.
- The journal has a sufficiently large number of references to other core journals, indicating that the journal is situated in a field that is suitable for citation analysis. Many journals in the arts and humanities do not meet this condition. The same applies to trade journals and popular magazines.

In the calculation of the Leiden Ranking indicators, only core publications are taken into account. Excluding non-core publications ensures that the Leiden Ranking is based on a relatively homogeneous set of publications, namely publications in international scientific journals in fields that are suitable for citation analysis. The use of such a relatively homogeneous set of publications enhances the international comparability of universities. It should be emphasized that non-core publications are excluded not because they are considered less important than core publications. Non-core publications may have an important scientific value. About one-sixth of the publications in Web of Science are excluded because they have been classified as non-core publications.

Our concept of core publications should not be confused with the Web of Science Core Collection. The Web of Science Core Collection represents a subset of the citation indices available in Web of Science. As explained above, the core publications on which the Leiden Ranking is based represent a subset of the publications in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. A list of core and non-core journals is available in this [Excel file](#).

⁴In <https://www.leidenranking.com/information/fields>, accessed 21 de junho de 2023.

Size-dependent vs. size-independent indicators

Indicators included in the Leiden Ranking have two variants: A size-dependent and a size-independent variant. In general, size-dependent indicators are obtained by counting the absolute number of publications of a university that have a certain property, while size-independent indicators are obtained by calculating the proportion of the publications of a university with a certain property. For instance, the number of highly cited publications of a university and the number of publications of a university co-authored with other organizations are size-dependent indicators. The proportion of the publications of a university that are highly cited and the proportion of a university's publications co-authored with other organizations are size-independent indicators. In the case of size-dependent indicators, universities with a larger publication output tend to perform better than universities with a smaller publication output. Size-independent indicators have been corrected for the size of the publication output of a university. Hence, when size-independent indicators are used, both larger and smaller universities may perform well.

Scientific impact indicators

The Leiden Ranking provides the following indicators of scientific impact:

- P . Total number of publications of a university.
- $P(\text{top } 1\%)$ and $PP(\text{top } 1\%)$. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 1% most frequently cited.
- $P(\text{top } 5\%)$ and $PP(\text{top } 5\%)$. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 5% most frequently cited.
- $P(\text{top } 10\%)$ and $PP(\text{top } 10\%)$. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 10% most frequently cited.
- $P(\text{top } 50\%)$ and $PP(\text{top } 50\%)$. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 50% most frequently cited.
- TCS and MCS . The total and the average number of citations of the publications of a university.
- $TNCS$ and $MNCS$. The total and the average number of citations of the publications of a university, normalized for field and publication year. An $MNCS$ value of two for instance means that the publications of a university have been cited twice above the average of their field and publication year.

Citations are counted until the end of 2022 in the calculation of the above indicators. Author self-citations are excluded. All indicators except for TCS and MCS are normalized for differences in citation patterns between scientific fields. For the purpose of this field normalization, about **4000 fields** are distinguished. These fields are defined at the level of individual publications. Using a computer algorithm, each publication in Web of Science is assigned to a field based on its citation relations with other publications.

The TCS , MCS , $TNCS$, and $MNCS$ indicators are not available on the main ranking page. These indicators can be accessed by clicking on the name of a university. An overview of all bibliometric statistics available for the university will then be presented. This overview also includes the TCS , MCS , $TNCS$, and $MNCS$ indicators.

Collaboration indicators

The Leiden Ranking provides the following indicators of collaboration:

- P . Total number of publications of a university.
- $P(\text{collab})$ and $PP(\text{collab})$. The number and the proportion of a university's publications that have been co-authored with one or more other organizations.
- $P(\text{int collab})$ and $PP(\text{int collab})$. The number and the proportion of a university's publications that have been co-authored by two or more countries.
- $P(\text{industry})$ and $PP(\text{industry})$. The number and the proportion of a university's publications that have been co-authored with one or more industrial organizations. All private sector for profit business enterprises, covering all manufacturing and services sectors, are regarded as industrial organizations. This includes research institutes and other corporate R&D laboratories that are fully funded or owned by for profit business enterprises. Organizations in

the private education sector and private medical/health sector (including hospitals and clinics) are not classified as industrial organizations.

- $P(<100\text{ km})$ and $PP(<100\text{ km})$. The number and the proportion of a university's publications with a geographical collaboration distance of less than 100 km. The geographical collaboration distance of a publication equals the largest geographical distance between two addresses mentioned in the publication's address list.
- $P(>5000\text{ km})$ and $PP(>5000\text{ km})$. The number and the proportion of a university's publications with a geographical collaboration distance of more than 5000 km.

Some limitations of the above indicators need to be mentioned. In the case of the $P(\text{industry})$ and $PP(\text{industry})$ indicators, we have made an effort to identify industrial organizations as accurately as possible. Inevitably, however, there will be inaccuracies and omissions in the identification of industrial organizations. In the case of the $P(<100\text{ km})$, $pp(<100\text{ km})$, $P(>5000\text{ km})$, and $PP(>5000\text{ km})$ indicators, we rely on geocoding of addresses listed in Web of Science. There may be some inaccuracies in the geocoding that we have performed, and for addresses that are used infrequently no geocodes may be available. In general, we expect these inaccuracies and omissions to have only a small effect on the indicators.

Open access indicators

The Leiden Ranking provides the following indicators of open access publishing:

- P . Total number of publications of a university.
- $P(\text{OA})$ and $PP(\text{OA})$. The number and the proportion of open access publications of a university.
- $P(\text{gold OA})$ and $PP(\text{gold OA})$. The number and the proportion of gold open access publications of a university. Gold open access publications are publications in an open access journal.
- $P(\text{hybrid OA})$ and $PP(\text{hybrid OA})$. The number and the proportion of hybrid open access publications of a university. Hybrid open access publications are publications in a subscription journal that are open access with a license that allows the publication to be reused.
- $P(\text{bronze OA})$ and $PP(\text{bronze OA})$. The number and the proportion of bronze open access publications of a university. Bronze open access publications are publications in a subscription journal that are open access without a license that allows the publication to be reused.
- $P(\text{green OA})$ and $PP(\text{green OA})$. The number and the proportion of green open access publications of a university. Green open access publications are publications in a subscription journal that are open access not in the journal itself but in a repository.
- $P(\text{OA unknown})$ and $PP(\text{OA unknown})$. The number and the proportion of a university's publications for which the open access status is unknown. These publications typically do not have a DOI in the Web of Science database.

In the calculation of the $P(\text{OA})$ and $PP(\text{OA})$ indicators, a publication is considered open access if it is gold, hybrid, bronze, or green open access. The open access status of a publication is determined based on [OpenAlex](#) data.

Gender indicators

The Leiden Ranking provides the following indicators of gender diversity:

- A . The total number of authorships of a university. Consider for instance a publication that has five authors, of which three report university X as their affiliation and two report university Y as their affiliation. This publication then yields three authorships for university X and two authorships for university Y.
- $A(MF)$. The number of male and female authorships of a university, that is, a university's number of authorships for which the gender is known.
- $A(\text{unknown})$ and $PA(\text{unknown})$. The number of authorships of a university for which the gender is unknown and the number of authorships for which the gender is unknown as a proportion of a university's total number of authorships.
- $A(M)$, $PA(M)$, and $PA(M|MF)$. The number of male authorships of a university, the number of male authorships as a proportion of a university's total number of authorships, and the number of male authorships as a proportion of a university's number of male and female authorships.
- $A(F)$, $PA(F)$, and $PA(F|MF)$. The number of female authorships of a university, the number of female authorships as a proportion of a university's total number of authorships, and

the number of female authorships as a proportion of a university's number of male and female authorships.

For each authorship of a university, the gender is determined using the following four-step procedure:

1. *Author disambiguation.* Using an author disambiguation algorithm developed by CWTS, authorships are linked to authors. If there is sufficient evidence to assume that different publications have been authored by the same individual, the algorithm links the corresponding authorships to the same author.
2. *Author-country linking.* Each author is linked to one or more countries. If the country of the author's first publication is the same as the country occurring most often in the author's publications, the author is linked to this country. Otherwise, the author is linked to all countries occurring in his or her publications.
3. *Retrieval of gender statistics.* For each author, gender statistics are collected from three sources: **Gender API**, **Genderize.io**, and **Gender Guesser**. Gender statistics are obtained based on the first name of an author and the countries to which the author is linked.
4. *Gender assignment.* For each author, a gender (male or female) is assigned if Gender API is able to determine the gender with a reported accuracy of at least 90%. If Gender API does not recognize the first name of an author, Gender Guesser and Genderize.io are used. If none of these sources is able to determine the gender of an author with sufficient accuracy, the gender is considered unknown. For authors from Russia and a number of other countries, the last name is also used to determine the gender of the author.

Using the above procedure, the gender can be determined for about 70% of all authorships of universities included in the Leiden Ranking. For the remaining authorships, the gender is unknown.

Counting method

The scientific impact indicators in the Leiden Ranking can be calculated using either a full counting or a fractional counting method. The full counting method gives a full weight of one to each publication of a university. The fractional counting method gives less weight to collaborative publications than to non-collaborative ones. For instance, if a publication has been co-authored by five researchers and two of these researchers are affiliated with a particular university, the publication has a weight of $2 / 5 = 0.4$ in the calculation of the scientific impact indicators for this university. The fractional counting method leads to a more proper field normalization of scientific impact indicators and therefore to fairer comparisons between universities active in different fields. For this reason, fractional counting is the preferred counting method for the scientific impact indicators in the Leiden Ranking. Collaboration, open access, and gender indicators are always calculated using the full counting method.

Trend analysis

To facilitate trend analyses, the Leiden Ranking provides statistics not only based on publications from the period 2018–2021, but also based on publications from earlier periods: 2006–2009, 2007–2010, ..., 2017–2020. The statistics for the different periods are calculated in a fully consistent way. For each period, citations are counted until the end of the first year after the period has ended. For instance, in the case of the period 2006–2009 citations are counted until the end of 2010, while in the case of the period 2018–2021 citations are counted until the end of 2022.

Stability intervals

Stability intervals provide some insight into the uncertainty in bibliometric statistics. A stability interval indicates a range of values of an indicator that are likely to be observed when the underlying set of publications changes. For instance, the PP(top 10%) indicator may be equal to 15.3% for a particular university, with a stability interval ranging from 14.1% to 16.5%. This means that the PP(top 10%) indicator equals 15.3% for this university, but that changes in the set of publications of the university may relatively easily lead to PP(top 10%) values in the range from 14.1% to 16.5%. The Leiden Ranking employs 95% stability intervals constructed using a statistical technique known as bootstrapping.

More information

More information on the indicators available in the Leiden Ranking can be found in a number of papers published by CWTS researchers. A detailed discussion of the Leiden Ranking is presented by Waltman et al. (2012). This paper relates to the 2011/2012 edition of the Leiden Ranking. Although the paper is not up-to-date anymore, it still provides relevant information on

the Leiden Ranking. Field normalization of scientific impact indicators based on algorithmically defined fields is studied by Ruiz-Castillo and Waltman (2014). The methodology adopted in the Leiden Ranking for identifying core publications and core journals is outlined by Waltman and Van Eck (2013a, 2013b). Finally, the importance of using fractional rather than full counting in the calculation of field-normalized scientific impact indicators is explained by Waltman and Van Eck (2015).

- Waltman, L., Calero-Medina, C., Kosten, J., Noyons, E.C.M., Tijssen, R.J.W., Van Eck, N.J., Van Leeuwen, T.N., Van Raan, A.F.J., Visser, M.S., & Wouters, P. (2012). The Leiden Ranking 2011/2012: Data collection, indicators, and interpretation. *Journal of the American Society for Information Science and Technology*, 63(12), 2419–2432. ([paper](#), [preprint](#))
- Waltman, L., & Van Eck, N.J. (2013a). Source normalized indicators of citation impact: An overview of different approaches and an empirical comparison. *Scientometrics*, 96(3), 699–716. ([paper](#), [preprint](#))
- Waltman, L., & Van Eck, N.J. (2013b). A systematic empirical comparison of different approaches for normalizing citation impact indicators. *Journal of Informetrics*, 7(4), 833–849. ([paper](#), [preprint](#))
- Ruiz-Castillo, J., & Waltman, L. (2015). Field-normalized citation impact indicators using algorithmically constructed classification systems of science. *Journal of Informetrics*, 9(1), 102–117. ([paper](#))
- Waltman, L., & Van Eck, N.J. (2015). Field-normalized citation impact indicators and the choice of an appropriate counting method. *Journal of Informetrics*, 9(4), 872–894. ([paper](#), [preprint](#))”⁵

“Updates and corrections

The following updates and corrections have been made to the CWTS Leiden Ranking.

June 21, 2023. Release of the 2023 edition of the Leiden Ranking. The number of universities included in the ranking has increased from 1318 to 1411. More information on the release of the 2023 edition of the Leiden Ranking is available in [this blog post](#).

[...]”⁶

⁵In <https://www.leidenranking.com/information/indicators>, acessido 21 de junho de 2023.

⁶In <https://www.leidenranking.com/information/updates> , acessido 21 de junho de 2023.

2. Evolução 2013-2023 dos indicadores e posições da U.Porto no CWTS Leiden Ranking

De 2022 para 2023, a metodologia do ranking de Leiden não sofreu alteração.

Recorde-se que a alteração do indicador pré-definido de ordenação (PP(top10%), em 2015 e P, em 2016) inviabiliza a comparação de posições entre 2015 e 2016.

O **Anexo I** contém a proposta de uso responsável dos rankings universitários apresentada pelo CWTS.

Evolução⁷ U.Porto no Leiden Ranking

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Impacto (contagem fracionada)	P	4057	4450	4970	5377	5772	5993	5983	6469	6539	6823	7356
	PP(top10%)	7.7%	8.5%	8.8%	8.8%	8.8%	9.0%	9.3%	9.2%	9.9%	10,2%	10,1%
	PP(top1%)			0.8%	0.7%	0.8%	0.8%	1.0%	0.8%	0,9%	1,0%	1,0%
	PP(top50%)			49.7%	50.4%	50.6%	51.7%	52.4%	51.6%	52,4%	53,4%	53,1%
	PP(top5%)						4.2%	4.5%	4.7%	5,2%	4,9%	4,9%
	MNCS	0.86	0.91	0.93	0.94	0.95	0.95	0.99	0.98	1,01	1,01	1,02
Colaboração (contagem inteira)	P	7234	8314	9462	10436	11386	12309	12829	13811	14497	15548	17119
	PP(collab)	75.0%	79.7%	80.7%	80.4%	82.0%	83.4%	84.3%	82.9%	84.3%	85,2%	85,9%
	PP(int collab)	48.8%	49.7%	50.0%	50.4%	50.9%	52.4%	54.5%	56.0%	57.4%	58,3	58,4%
	PP (industry)					2.8%	3.7%	3.6%	3.4%	3.9%	4,2%	4,7%
	PP(<100 km)		19.8%	20.3%	20.6%	20.3%	19.9%	19.5%	19.3%	19.0%	19,0%	19,3%
	PP(>5000 km)			21.5%	22.3%	23.6%	25.3%	27.9%	29.4%	30.7%	31,6%	31,7%
Acesso aberto (contagem inteira) Novo 2019	PP(OA)							41.7%	49.7%	50,4%	53,5%	57,3%
	PP(gold OA)							13.1%	18.1%	20,6%	24,0%	30,0%
	PP(hybrid OA)							5.8%	4.9%	4,6%	5,5%	5,7%
	PP(bronze OA)							7.4%	7.5%	7,6%	7,4%	6,3%
	PP(green OA)							35.0%	44.8%	17,5%	16,5%	15,3%
	PP(OA unknown)							2.5%	1.9%	1,7%	1,4%	1,1%
Género (contagem inteira) Novo 2019	A							35919	40819	42521	45618	50730
	A(MF)							33806	38701	41109	44426	49688
	PA(unknown)							5.9%	5.2%	3.3%	2,6%	2,1%
	PA(M)							48.5%	49.5%	50.2%	50,1%	50,6%
	PA(F)							45.6%	45.3%	46.4%	47,3%	47,3%
	PA(MJMF)							51.5%	52.2%	52.0%	51,4%	51,7%
	PA(FJMF)							48.5%	47.8%	48.0%	48,5%	48,3%
Rank	World	391	436	425/750	149/842	143/902	145/938	159/963	153/1176	160/1225	161/1318	160/1411
	Europe	177	203	200/285	42/316	40/334	40/345	41/346	38/413	39/423	38/441	36/470
	Iberoamerica	12	13	12/54	5/63	5/69	5/72	6/74	5/91	5/95	5/105	5/111
	Portugal	4	3	4/6	2/6	2/6	2/6	2/6	2/6	2/6	2/8	2/8

⁷ Dados de 2013 a 2015 foram retirados de <http://www.leidenranking.com> em 20 de maio de 2015; 2016 a 2023 foram acedidos respetivamente em 18 de maio de 2016, 17 de maio de 2017, 16 de maio de 2018, 15 de maio de 2019, 8 de julho de 2020, 2 de junho de 2021, 22 de junho de 2022 e 21 de junho de 2023.

3. Universidades portuguesas no CWTS Leiden Ranking 2023

3.1 All Sciences ⁸

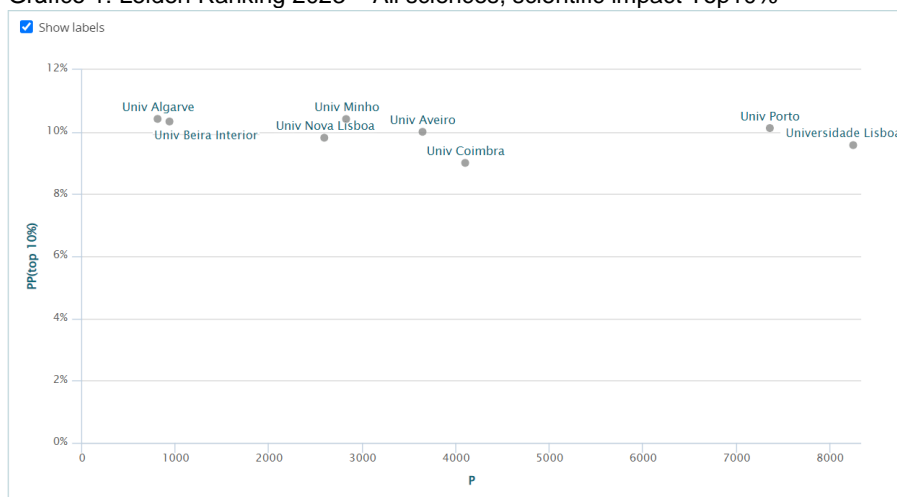
3.1.1 Type of indicators: Scientific impact

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting.

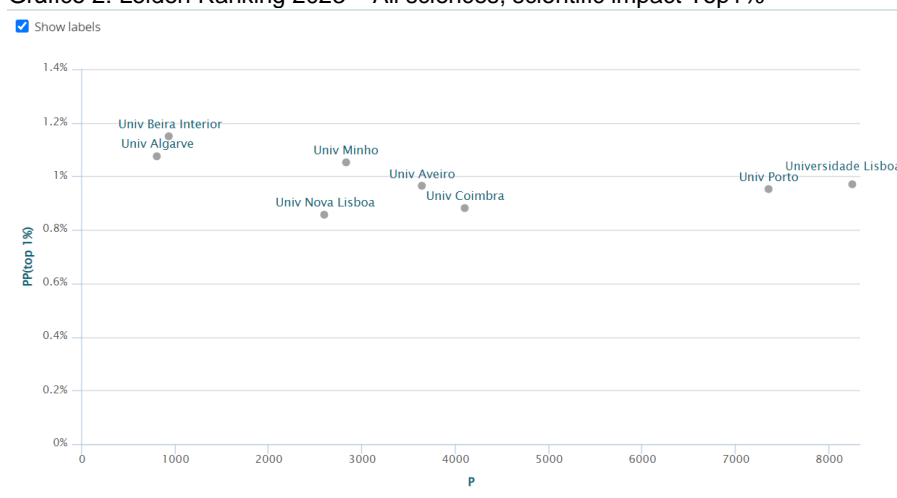
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Universidade Lisboa	8249	9,60%	1,0%	4,7%	50,9%	131	1
Univ Porto	7356	10,1%	1,0%	4,9%	53,1%	160	2
Univ Coimbra	4100	9,0%	0,9%	4,3%	50,3%	385	3
Univ Aveiro	3646	10,0%	1,0%	4,8%	52,4%	442	4
Univ Minho	2829	10,4%	1,1%	5,2%	51,9%	563	5
Univ Nova Lisboa	2599	9,8%	0,9%	5,0%	51,2%	605	6
Univ Beira Interior	937	10,3%	1,1%	4,8%	53,0%	1279	7
Univ Algarve	811	10,4%	1,1%	5,8%	52,5%	1403	8
# IES						1411	8

Gráfico 1: Leiden Ranking 2023 – All sciences, scientific impact Top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 2: Leiden Ranking 2023 – All sciences, scientific impact Top1%



Fonte: CWTS, Leiden ranking 2023, chart view

⁸ Retirado de <https://www.leidenranking.com/ranking/2023/list> e de <https://www.leidenranking.com/ranking/2023/chart>, em 21 de junho 2023.

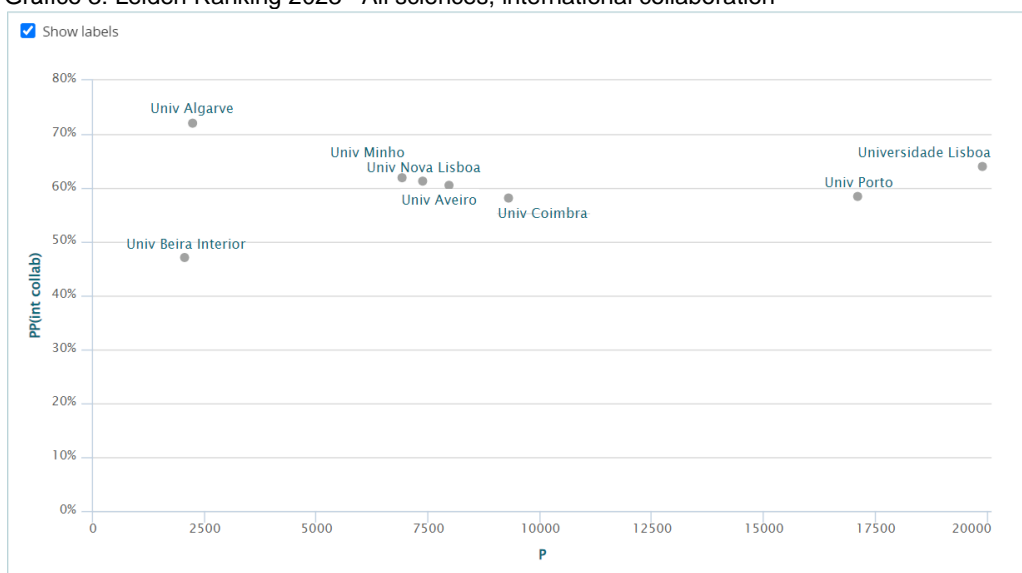
3.1.2 Type of indicators: Collaboration

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

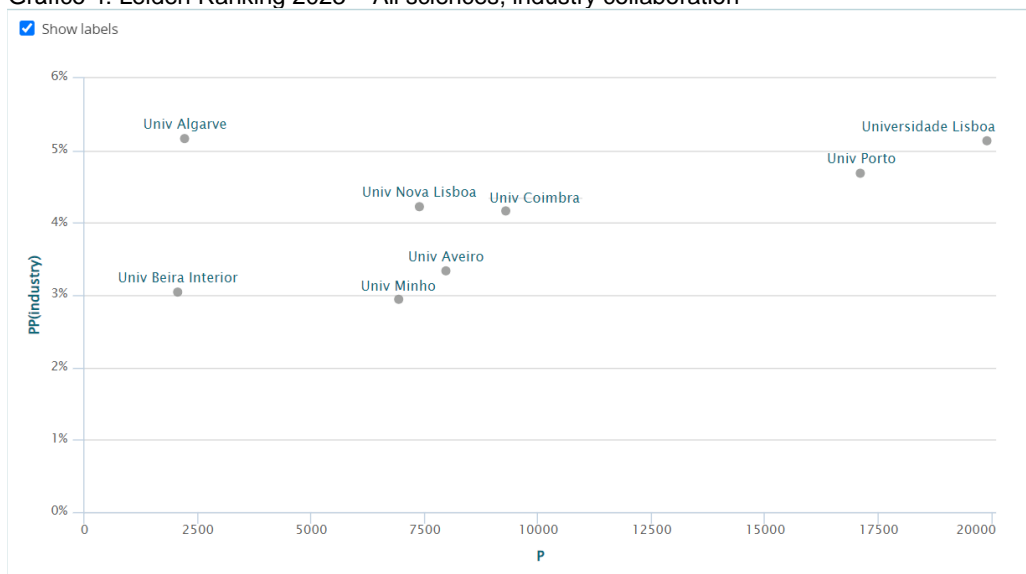
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Universidade Lisboa	19889	5,1%	86,0%	64,0%	12,4%	33,3%	127	1
Univ Porto	17119	4,7%	85,9%	58,4%	19,3%	31,7%	168	2
Univ Coimbra	9294	4,2%	83,7%	58,1%	13,0%	32,1%	380	3
Univ Aveiro	7975	3,3%	84,9%	60,5%	12,9%	29,3%	445	4
Univ Nova Lisboa	7389	4,2%	90,1%	61,3%	17,7%	31,2%	476	5
Univ Minho	6934	2,9%	88,1%	61,9%	14,7%	35,3%	511	6
Univ Algarve	2227	5,2%	90,5%	72,0%	3,4%	34,1%	1233	7
Univ Beira Interior	2071	3,0%	86,3%	47,1%	14,8%	24,3%	1280	8
# IES							1411	8

Gráfico 3: Leiden Ranking 2023– All sciences, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 4: Leiden Ranking 2023 – All sciences, industry collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

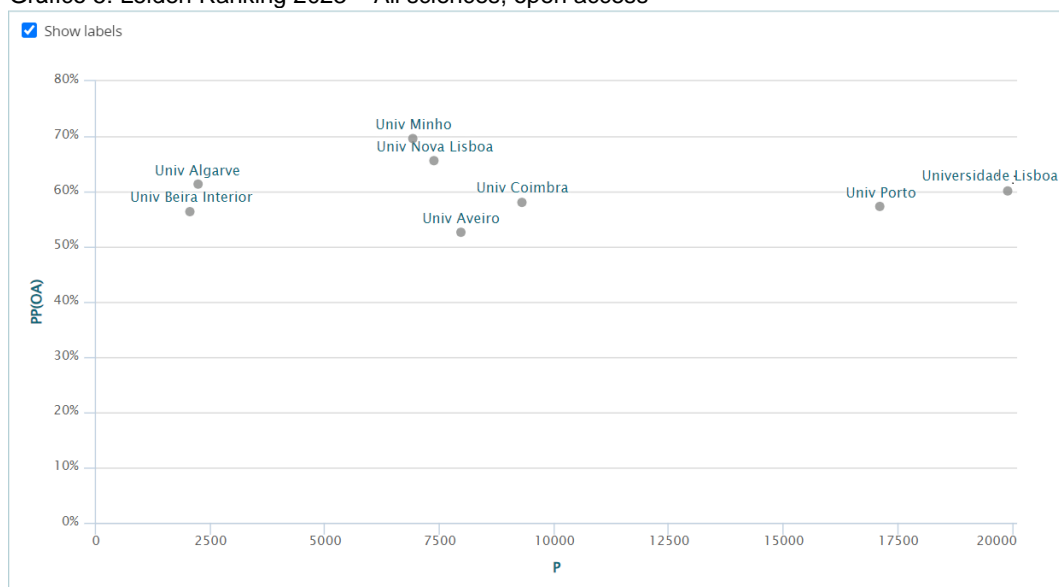
3.1.3 Type of indicators: Open access

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

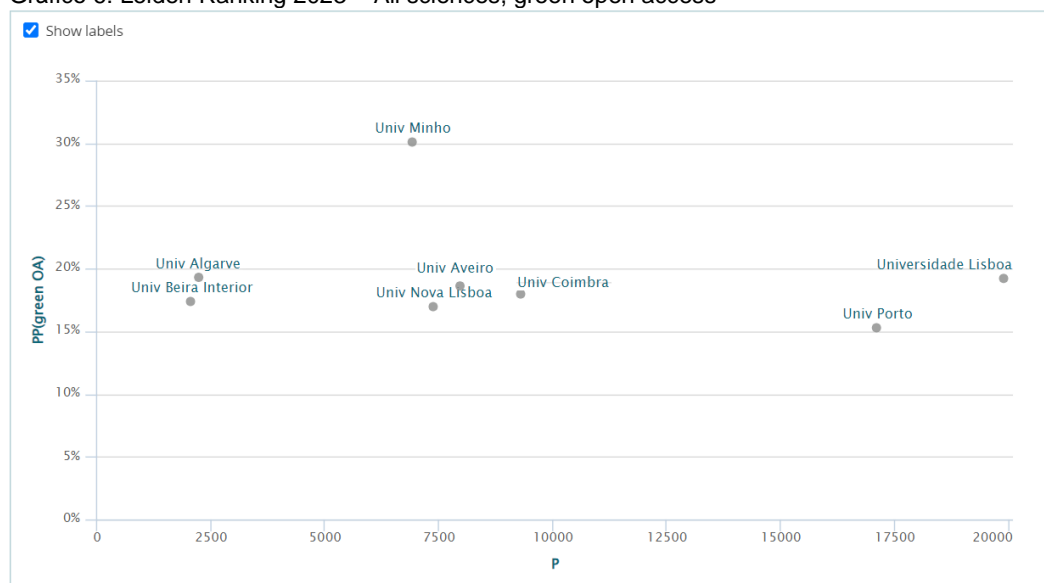
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Universidade Lisboa	19889	60,1%	28,7%	7,6%	4,6%	19,2%	1,1%
Univ Porto	17119	57,3%	30,0%	5,7%	6,3%	15,3%	1,1%
Univ Coimbra	9294	58,0%	29,3%	6,6%	4,2%	18,0%	1,1%
Univ Aveiro	7975	52,6%	26,1%	4,5%	3,3%	18,6%	0,6%
Univ Nova Lisboa	7389	65,6%	36,0%	8,1%	4,5%	17,0%	1,0%
Univ Minho	6934	69,6%	30,9%	5,3%	3,3%	30,1%	0,8%
Univ Algarve	2227	61,3%	31,9%	5,7%	4,4%	19,3%	1,3%
Univ Beira Interior	2071	56,3%	34,1%	2,0%	2,8%	17,4%	0,9%

Gráfico 5: Leiden Ranking 2023 – All sciences, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 6: Leiden Ranking 2023 – All sciences, green open access



Fonte: CWTS, Leiden ranking 2023, chart view

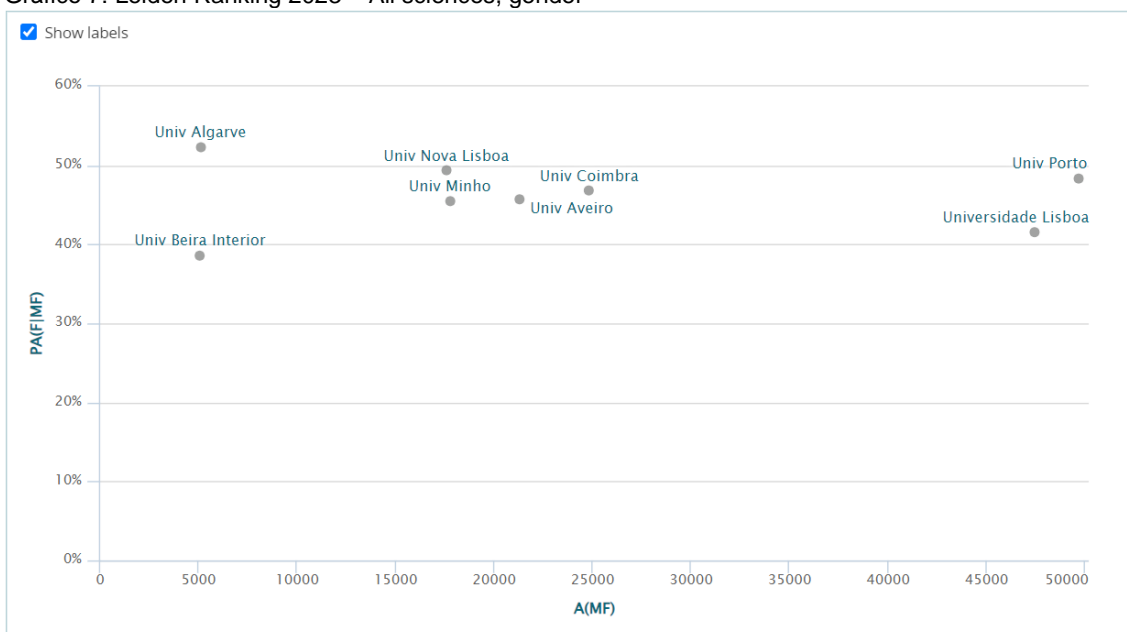
3.1.4 Type of indicators: Gender

Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Univ Porto	49688	56990	16,7%	51,7%	48,3%	96	1
Universidade Lisboa	47477	50730	2,1%	58,5%	41,5%	108	2
Univ Coimbra	24807	27012	8,2%	53,2%	46,8%	270	3
Univ Aveiro	21337	22181	3,8%	54,3%	45,7%	332	4
Univ Minho	17773	18970	6,3%	54,5%	45,5%	400	5
Univ Nova Lisboa	17586	17995	2,3%	50,6%	49,4%	402	6
Univ Algarve	5117	5234	2,2%	47,7%	52,3%	1076	7
Univ Beira Interior	5063	5184	2,3%	61,4%	38,6%	1082	8
# IES						1411	8

Gráfico 7: Leiden Ranking 2023 – All sciences, gender



Fonte: CWTS, Leiden ranking 2023, chart view

3.2 By Fields⁹

3.2.1 Biomedical and health sciences

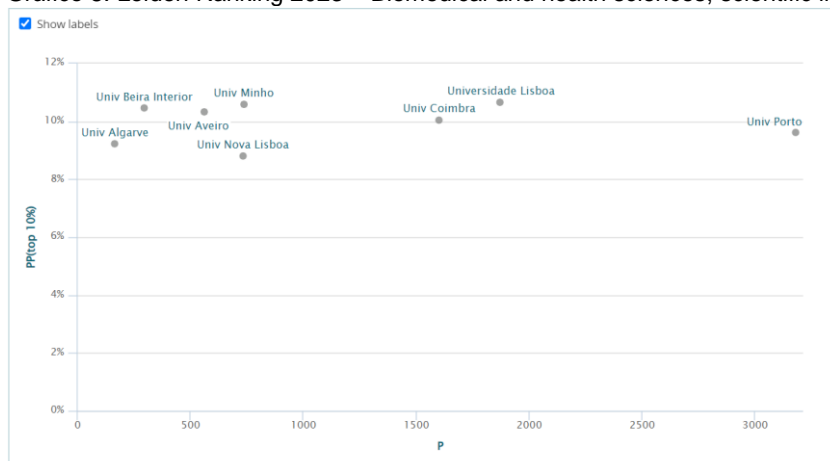
Type of indicators: Scientific impact

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting.

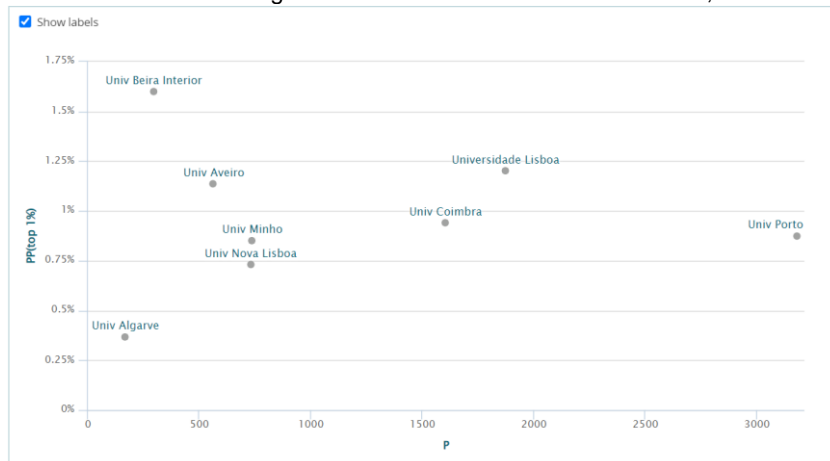
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Univ Porto	3180	9,6%	0,9%	4,6%	51,4%	151	1
Universidade Lisboa	1874	10,7%	1,2%	5,5%	51,8%	289	2
Univ Coimbra	1603	10,0%	0,9%	5,1%	51,0%	347	3
Univ Minho	737	10,6%	0,9%	5,0%	52,5%	615	4
Univ Nova Lisboa	733	8,8%	0,7%	4,0%	49,4%	621	5
Univ Aveiro	564	10,3%	1,1%	5,5%	51,7%	704	6
Univ Beira Interior	296	10,5%	1,6%	4,9%	55,3%	985	7
Univ Algarve	167	9,2%	0,4%	5,7%	49,9%	1162	8
# IES						1273	8

Gráfico 8: Leiden Ranking 2023 – Biomedical and health sciences, scientific impact top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 9: Leiden Ranking 2023 – Biomedical and health sciences, scientific impact top1%



Fonte: CWTS, Leiden ranking 2023, chart view

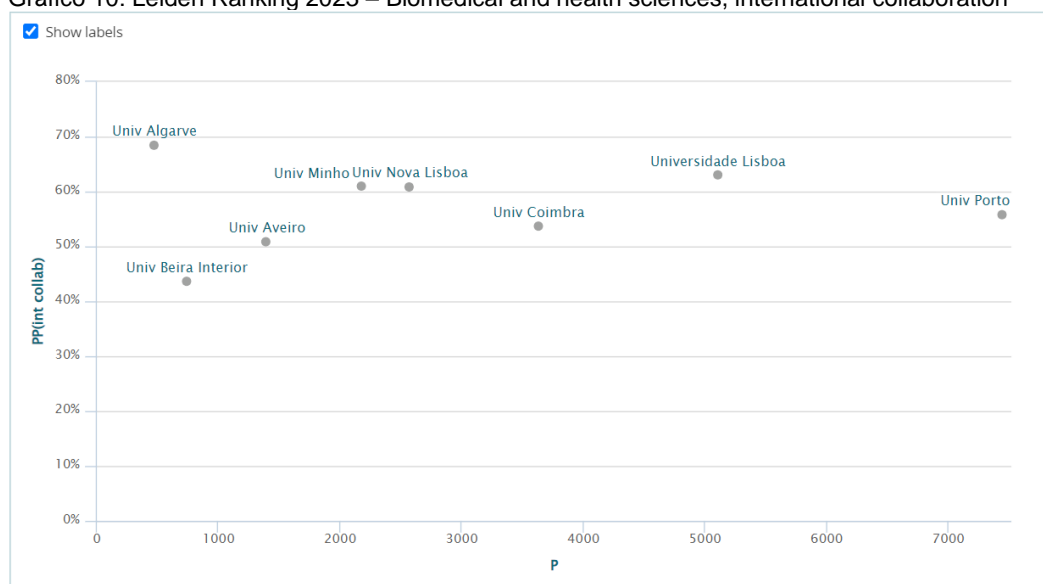
⁹Retirado de <https://www.leidenranking.com/ranking/2023/list> e de <https://www.leidenranking.com/ranking/2023/chart>, em 21 de junho de 2023.

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

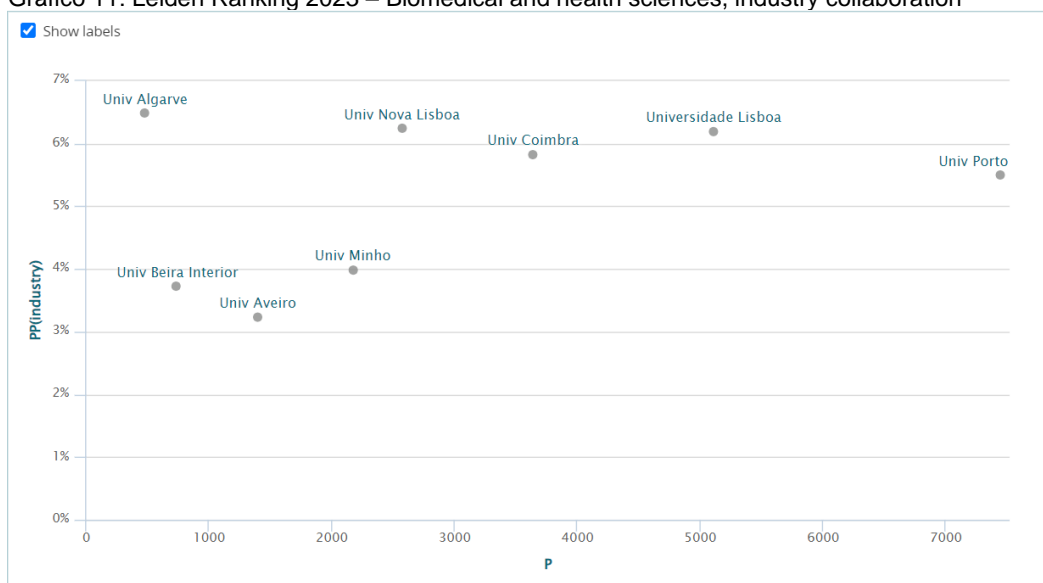
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Univ Porto	7443	5.5%	86.1%	55.8%	24.5%	30.4%	165	1
Universidade Lisboa	5107	6.2%	89.6%	63.0%	16.7%	33.1%	261	2
Univ Coimbra	3638	5.8%	83.0%	53.7%	17.9%	29.0%	372	3
Univ Nova Lisboa	2576	6.2%	94.5%	60.8%	20.6%	29.8%	490	4
Univ Minho	2177	4.0%	92.1%	61.0%	19.9%	38.6%	547	5
Univ Aveiro	1398	3.2%	87.5%	50.9%	21.2%	23.0%	711	6
Univ Beira Interior	738	3.7%	91.9%	43.6%	19.1%	19.5%	964	7
Univ Algarve	478	6.5%	92.1%	68.4%	4.6%	32.5%	1118	8
# IES							1366	8

Gráfico 10: Leiden Ranking 2023 – Biomedical and health sciences, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 11: Leiden Ranking 2023 – Biomedical and health sciences, industry collaboration



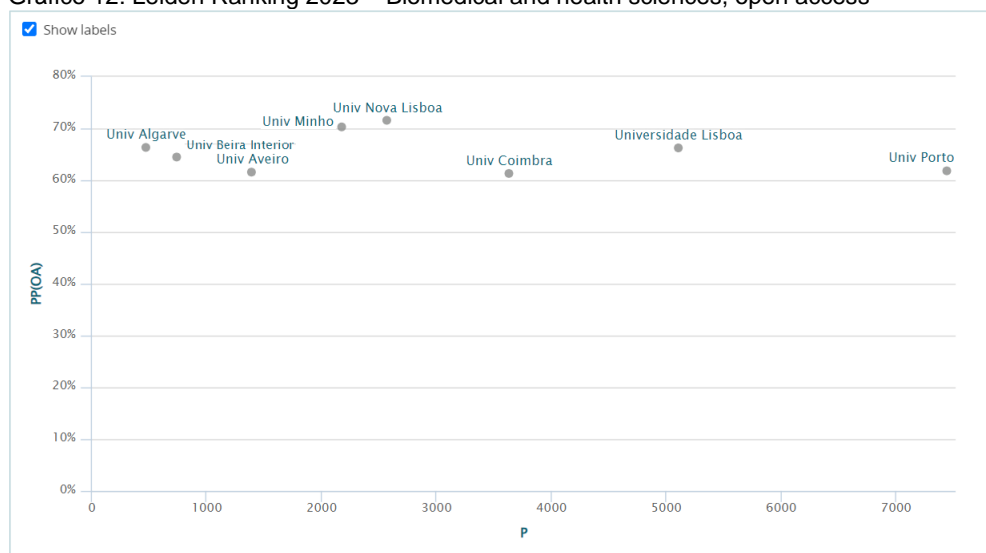
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Open access
 Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

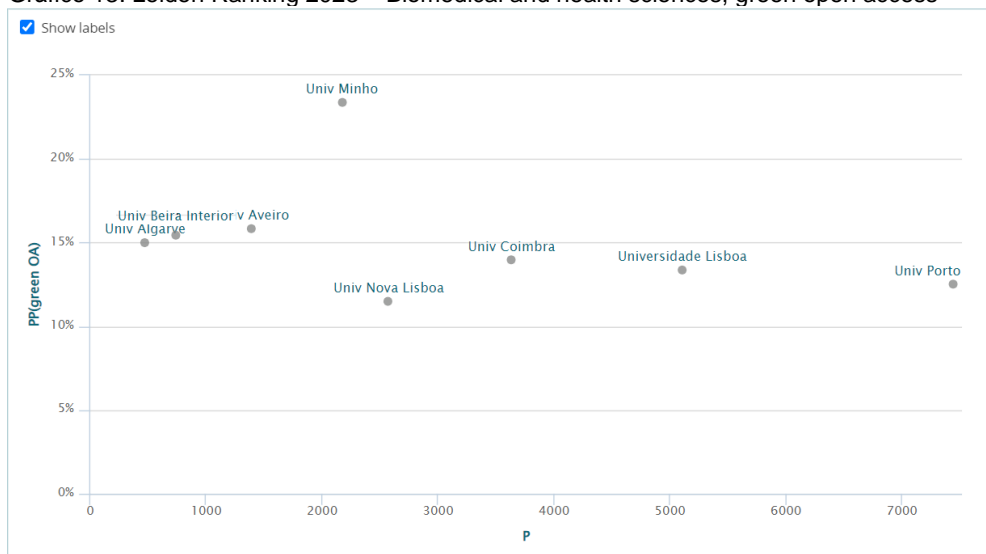
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Univ Porto	7443	61,8%	35,3%	6,6%	7,4%	12,5%	1,3%
Universidade Lisboa	5107	66,2%	37,4%	8,2%	7,3%	13,4%	1,6%
Univ Coimbra	3638	61,3%	35,3%	6,1%	6,0%	14,0%	1,7%
Univ Nova Lisboa	2576	71,6%	43,7%	9,3%	7,1%	11,5%	1,7%
Univ Minho	2177	70,3%	37,2%	4,4%	5,3%	23,4%	0,5%
Univ Aveiro	1398	61,6%	36,2%	4,8%	4,7%	15,8%	0,7%
Univ Beira Interior	738	64,5%	42,7%	1,4%	4,9%	15,4%	1,2%
Univ Algarve	478	66,3%	38,2%	5,8%	7,3%	15,0%	0,9%

Gráfico 12: Leiden Ranking 2023 – Biomedical and health sciences, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 13: Leiden Ranking 2023 – Biomedical and health sciences, green open access



Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Gender
Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Univ Porto	24767	25133	1,5%	45,9%	54,1%	127	1
Universidade Lisboa	13661	13834	1,2%	47,2%	52,8%	253	2
Univ Coimbra	11802	12051	2,1%	45,7%	54,3%	292	3
Univ Nova Lisboa	6819	6942	1,8%	44,3%	55,7%	468	4
Univ Minho	6513	6601	1,3%	47,8%	52,2%	478	5
Univ Aveiro	3722	3783	1,6%	43,6%	56,4%	668	6
Univ Beira Interior	2145	2172	1,2%	53,3%	46,7%	845	7
Univ Algarve	1207	1246	3,1%	39,9%	60,1%	1035	8
# IES						1399	8

Gráfico 14: Leiden Ranking 2023 – Biomedical and health sciences, gender



Fonte: CWTS, Leiden ranking 2023, chart view

3.2.2 Life and earth sciences

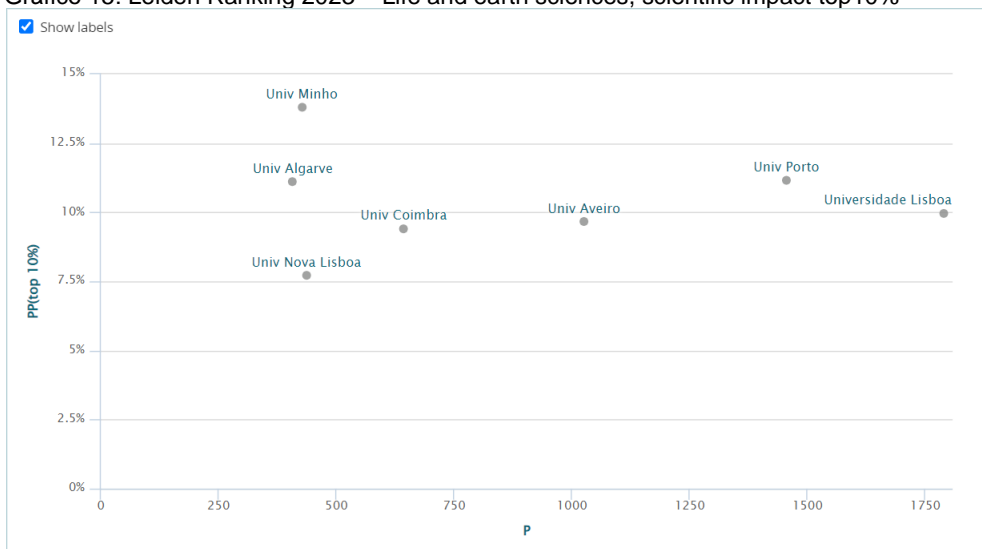
Type of indicators: Scientific impact

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting.

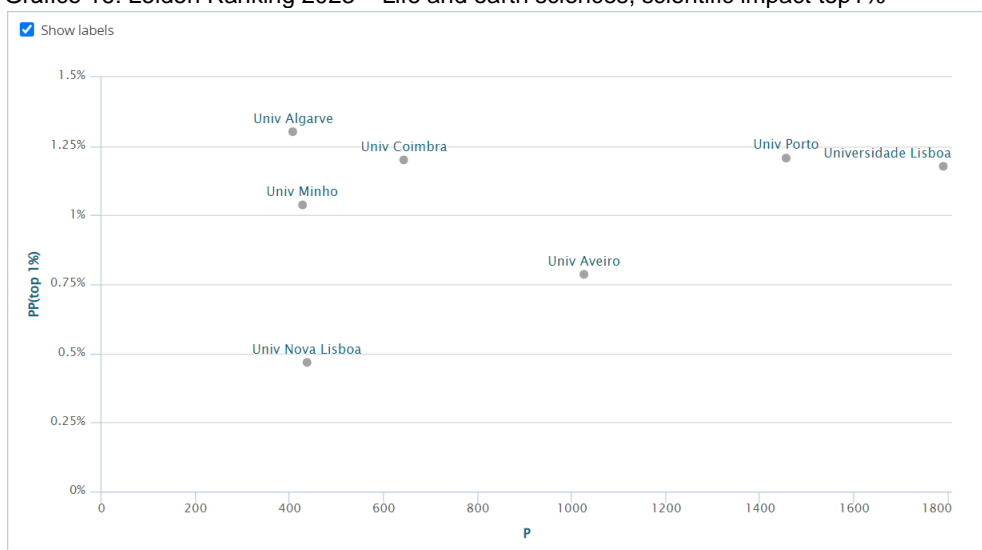
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Universidade Lisboa	1790	10,0%	1,2%	5,2%	50,6%	60	1
Univ Porto	1456	11,2%	1,2%	5,6%	56,4%	95	2
Univ Aveiro	1026	9,7%	0,8%	4,4%	53,6%	168	3
Univ Coimbra	645	9,4%	1,2%	4,4%	53,0%	337	4
Univ Nova Lisboa	438	7,7%	0,5%	4,0%	49,2%	532	5
Univ Minho	428	13,8%	1,0%	6,0%	59,2%	542	6
Univ Algarve	407	11,1%	1,3%	6,3%	52,6%	559	7
# IES						1194	7

Gráfico 15: Leiden Ranking 2023 – Life and earth sciences, scientific impact top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 16: Leiden Ranking 2023 – Life and earth sciences, scientific impact top1%



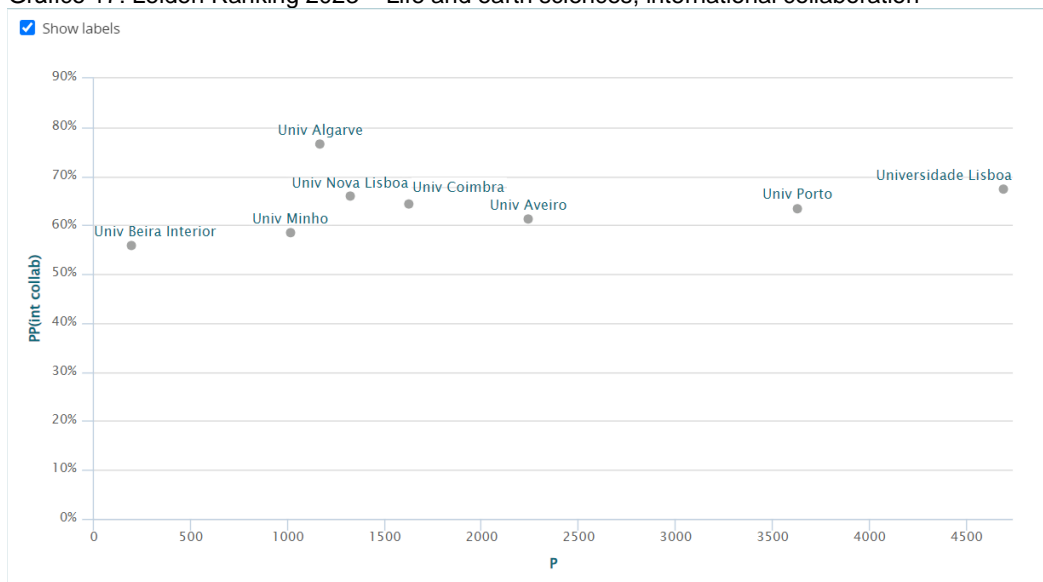
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

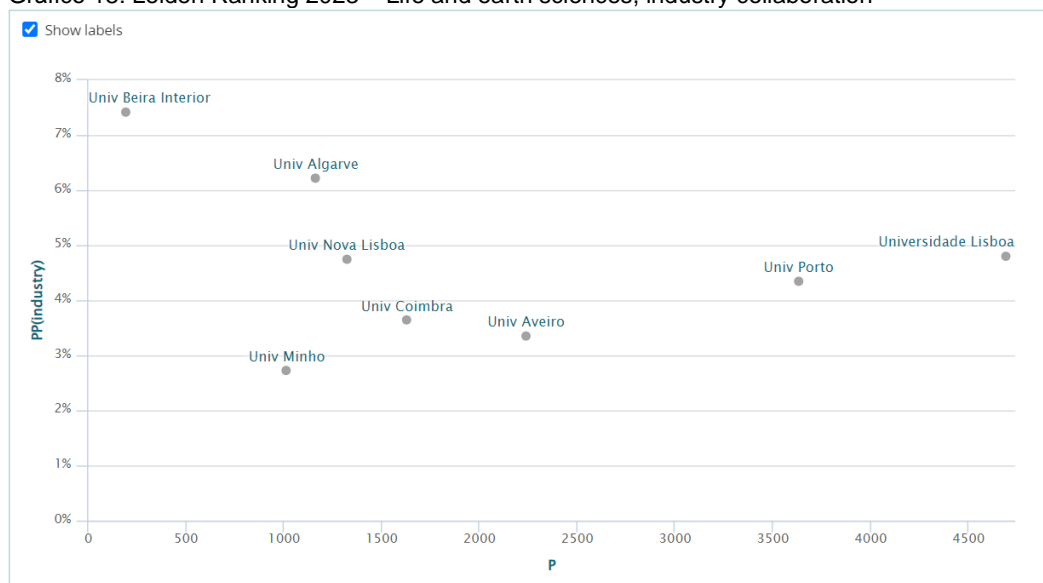
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Universidade Lisboa	4691	4,8%	90,0%	67,4%	9,6%	33,3%	55	1
Univ Porto	3632	4,3%	89,2%	63,4%	12,9%	30,7%	87	2
Univ Aveiro	2243	3,4%	86,1%	61,3%	11,2%	26,0%	209	3
Univ Coimbra	1628	3,6%	89,4%	64,3%	9,9%	32,8%	328	4
Univ Nova Lisboa	1324	4,7%	92,6%	65,9%	13,3%	32,3%	420	5
Univ Algarve	1166	6,2%	91,5%	76,6%	3,7%	38,4%	477	6
Univ Minho	1015	2,7%	86,2%	58,5%	13,9%	28,3%	541	7
Univ Beira Interior	196	7,4%	83,2%	55,8%	13,8%	30,5%	1239	8
# IES							1265	8

Gráfico 17: Leiden Ranking 2023 – Life and earth sciences, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 18: Leiden Ranking 2023 – Life and earth sciences, industry collaboration



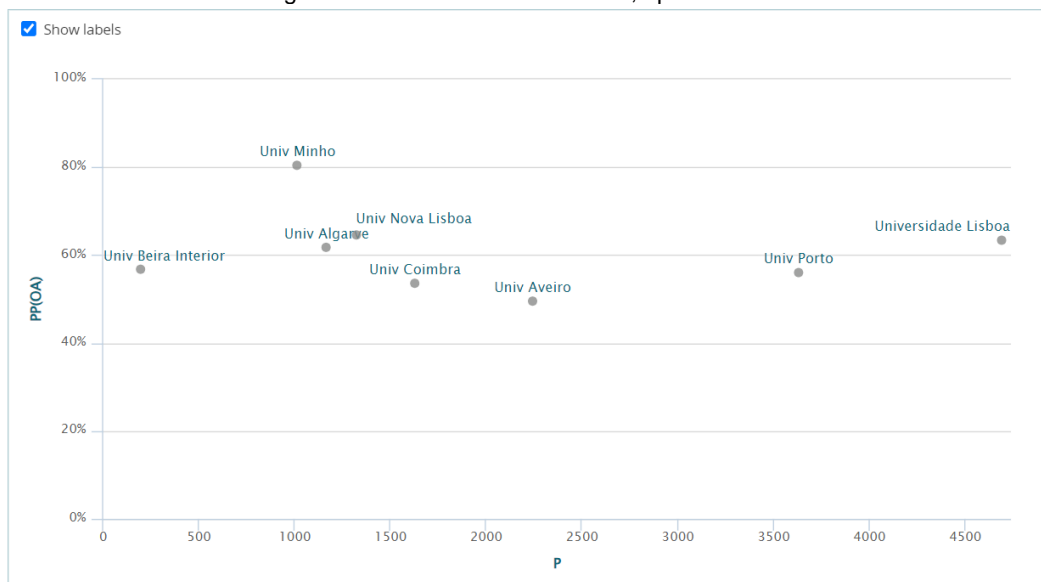
Fonte: CWTS, Leiden ranking 2022, chart view

Type of indicators: Open access
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

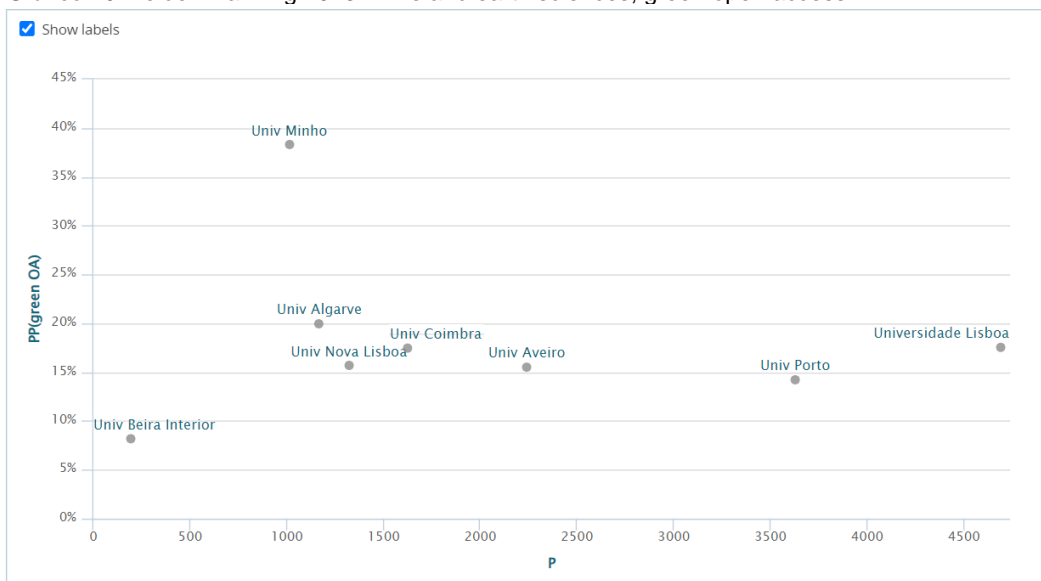
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Universidade Lisboa	4691	63,4%	34,9%	7,2%	3,8%	17,5%	0,8%
Univ Porto	3632	56,0%	32,3%	5,7%	3,8%	14,2%	1,2%
Univ Aveiro	2243	49,5%	25,1%	4,9%	4,1%	15,5%	0,6%
Univ Coimbra	1628	53,6%	27,5%	4,8%	3,8%	17,5%	0,6%
Univ Nova Lisboa	1324	64,6%	38,9%	5,9%	4,1%	15,7%	0,9%
Univ Algarve	1166	61,8%	32,5%	5,3%	3,9%	20,0%	0,7%
Univ Minho	1015	80,4%	33,5%	4,9%	3,7%	38,3%	0,6%
Univ Beira Interior	196	56,8%	41,2%	4,1%	3,3%	8,2%	0,5%

Gráfico 19: Leiden Ranking 2023 – Life and earth sciences, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 20: Leiden Ranking 2023 – Life and earth sciences, green open access



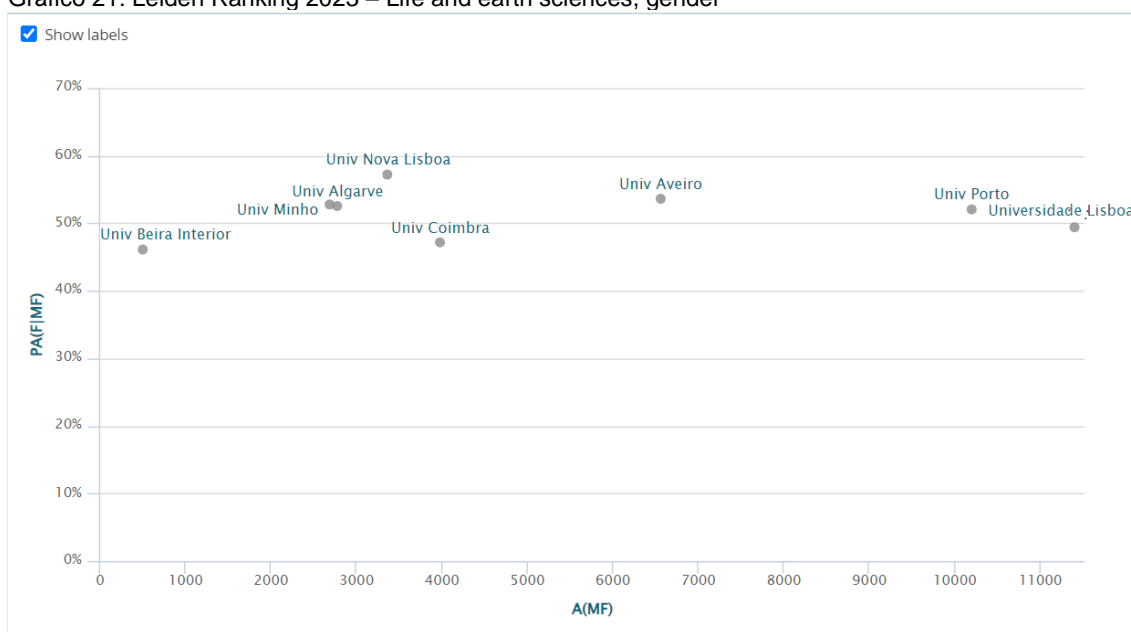
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Gender
Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Universidade Lisboa	11404	11586	1.6%	50.6%	49.4%	26	1
Univ Porto	10207	10344	1.3%	47.9%	52.1%	37	2
Univ Aveiro	6566	6640	1.1%	46.4%	53.6%	114	3
Univ Coimbra	3985	4045	1.5%	52.8%	47.2%	249	4
Univ Nova Lisboa	3373	3438	1.9%	42.8%	57.2%	320	5
Univ Algarve	2779	2836	2.0%	47.4%	52.6%	397	6
Univ Minho	2695	2743	1.7%	47.2%	52.8%	410	7
Univ Beira Interior	504	511	1.5%	53.9%	46.1%	1125	8
# IES						1400	8

Gráfico 21: Leiden Ranking 2023 – Life and earth sciences, gender



Fonte: CWTS, Leiden ranking 2023, chart view

3.2.3 Mathematics and computer science

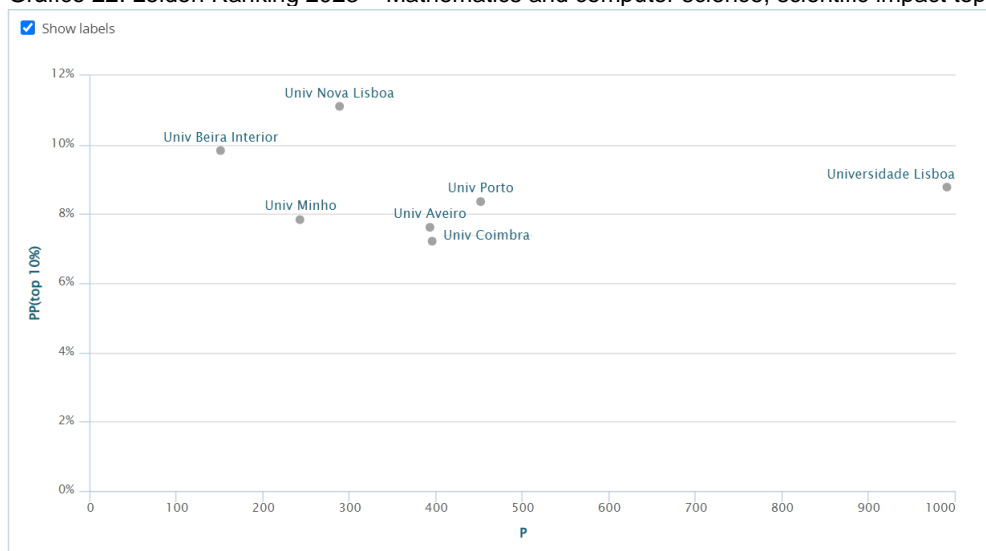
Type of indicators: Scientific impact

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting

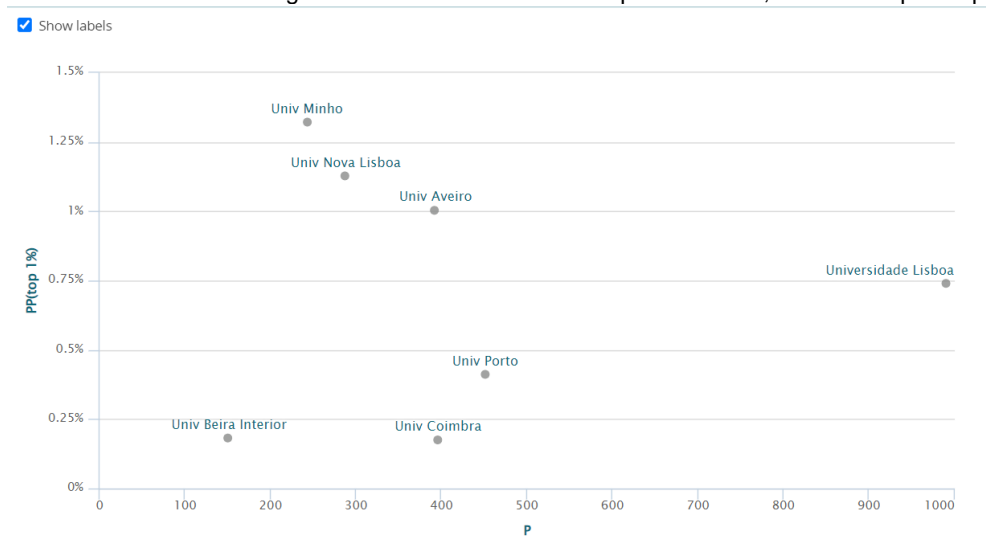
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Universidade Lisboa	991	8.8%	0.7%	4.1%	50.6%	118	1
Univ Porto	451	8.4%	0.4%	2.9%	49.3%	362	2
Univ Coimbra	396	7.2%	0.2%	3.5%	47.1%	419	3
Univ Aveiro	393	7.6%	1.0%	3.6%	46.8%	430	4
Univ Nova Lisboa	288	11.1%	1.1%	6.0%	50.2%	606	5
Univ Minho	243	7.8%	1.3%	4.8%	50.2%	698	6
Univ Beira Interior	151	9.8%	0.2%	4.0%	51.5%	943	7
# IES						1086	7

Gráfico 22: Leiden Ranking 2023 – Mathematics and computer science, scientific impact top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 23: Leiden Ranking 2023 – Mathematics and computer science, scientific impact top1%



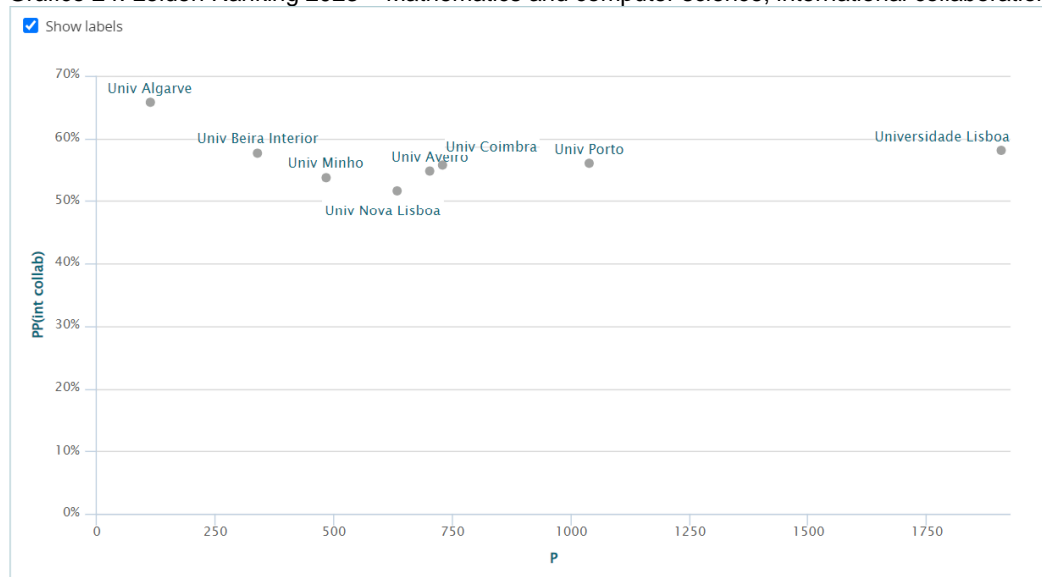
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

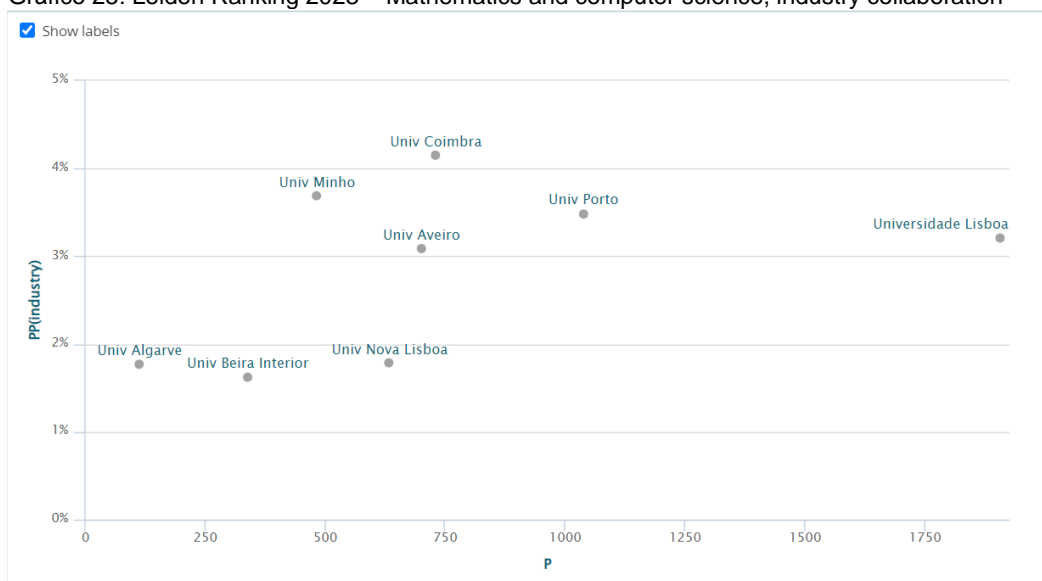
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Universidade Lisboa	1907	3.2%	78.4%	58.1%	13.1%	27.9%	121	1
Univ Porto	1039	3.5%	85.2%	56.0%	21.8%	33.5%	287	2
Univ Coimbra	731	4.2%	79.4%	55.7%	10.7%	27.2%	449	3
Univ Aveiro	702	3.1%	76.6%	54.8%	16.0%	26.1%	475	4
Univ Nova Lisboa	635	1.8%	85.8%	51.6%	21.8%	25.0%	528	5
Univ Minho	483	3.7%	83.0%	53.7%	17.0%	26.9%	690	6
Univ Beira Interior	339	1.6%	84.7%	57.6%	6.9%	36.0%	879	7
Univ Algarve	113	1.8%	82.0%	65.8%	2.7%	30.5%	1222	8
# IES							1238	8

Gráfico 24: Leiden Ranking 2023 – Mathematics and computer science, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 25: Leiden Ranking 2023 – Mathematics and computer science, industry collaboration



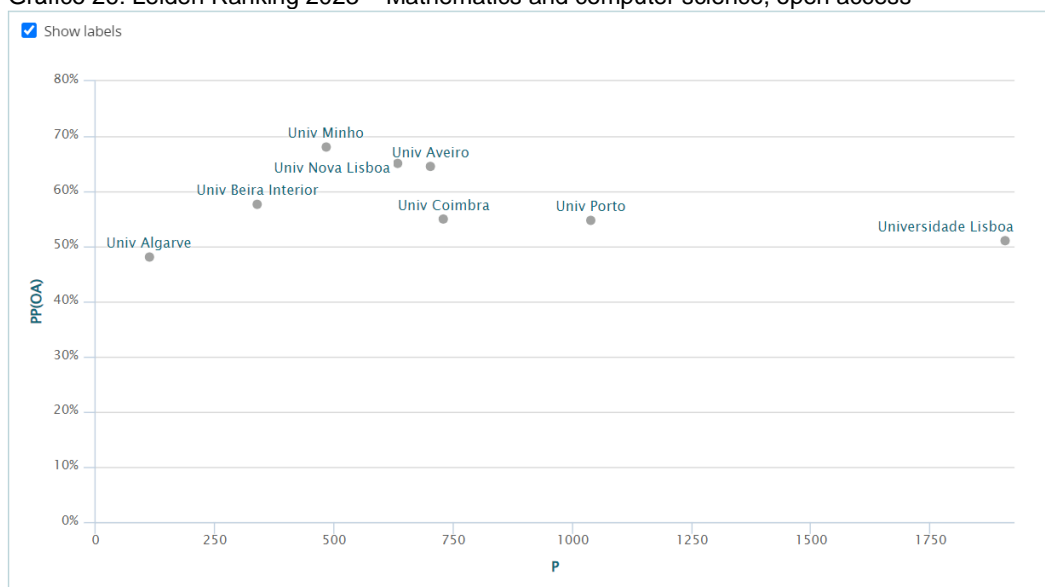
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Open access
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

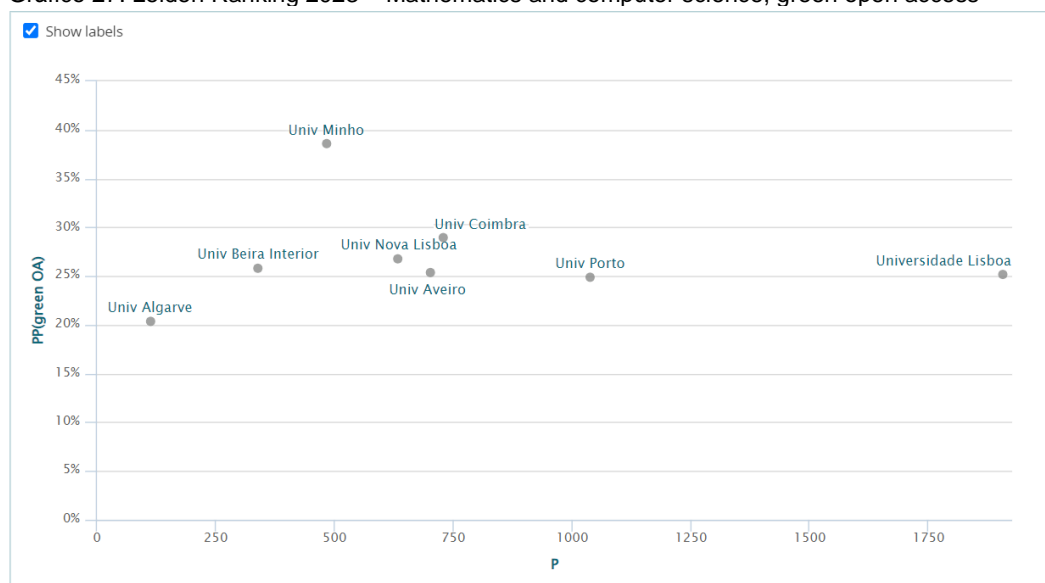
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Universidade Lisboa	1907	51.0%	18.0%	3.9%	4.0%	25.2%	2.6%
Univ Porto	1039	54.7%	22.8%	2.9%	4.1%	24.9%	1.3%
Univ Coimbra	731	55.0%	19.7%	2.5%	3.9%	28.9%	2.0%
Univ Aveiro	702	64.5%	30.2%	4.1%	4.9%	25.4%	2.4%
Univ Nova Lisboa	635	65.1%	30.5%	3.9%	3.9%	26.8%	2.0%
Univ Minho	483	68.0%	22.9%	2.9%	3.6%	38.6%	2.8%
Univ Beira Interior	339	57.6%	29.0%	1.3%	1.5%	25.8%	1.5%
Univ Algarve	113	48.1%	22.0%	3.5%	2.2%	20.4%	7.5%

Gráfico 26: Leiden Ranking 2023 – Mathematics and computer science, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 27: Leiden Ranking 2023 – Mathematics and computer science, green open access



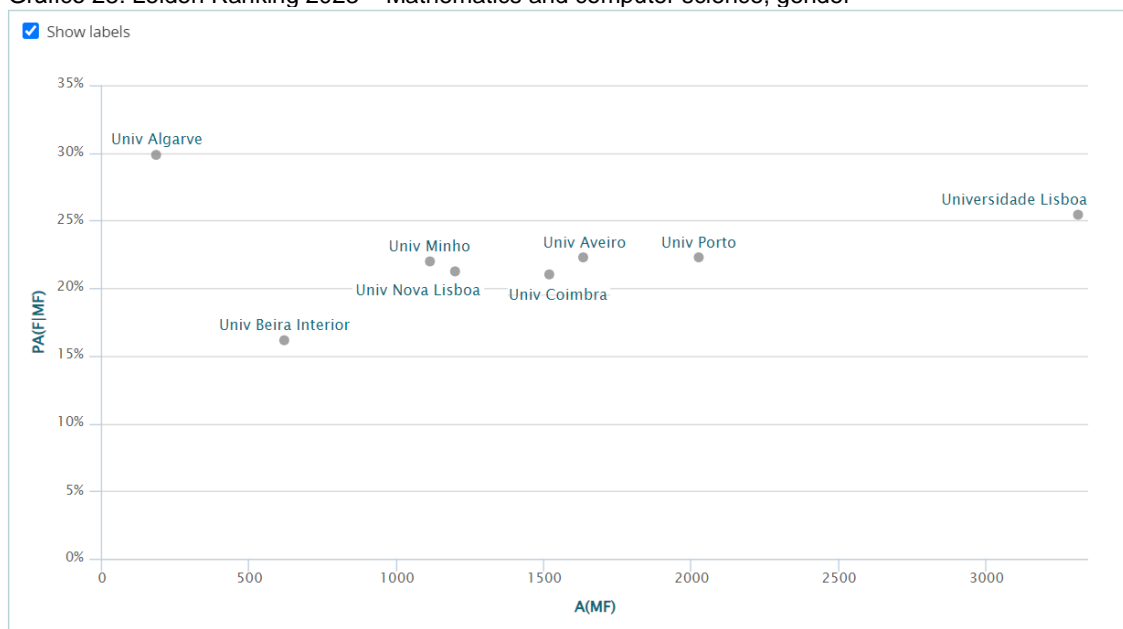
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Gender
Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Universidade Lisboa	3312	3477	4.7%	74.6%	25.4%	83	1
Univ Porto	2025	2058	1.6%	77.7%	22.3%	199	2
Univ Aveiro	1636	1689	3.1%	77.7%	22.3%	267	3
Univ Coimbra	1520	1564	2.8%	79.0%	21.0%	307	4
Univ Nova Lisboa	1198	1212	1.1%	78.8%	21.2%	400	5
Univ Minho	1114	1147	2.9%	78.0%	22.0%	428	6
Univ Beira Interior	619	651	4.9%	83.8%	16.2%	729	7
Univ Algarve	185	191	3.1%	70.1%	29.9%	1182	8
# IES						1313	8

Gráfico 28: Leiden Ranking 2023 – Mathematics and computer science, gender



Fonte: CWTS, Leiden ranking 2023, chart view

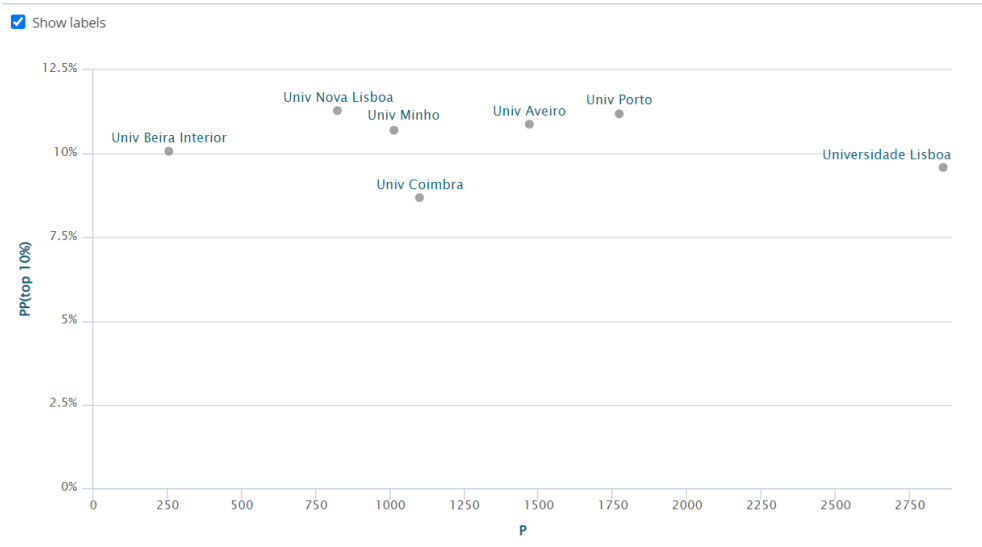
3.2.4 Physical sciences and engineering

Type of indicators: Scientific Impact
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting

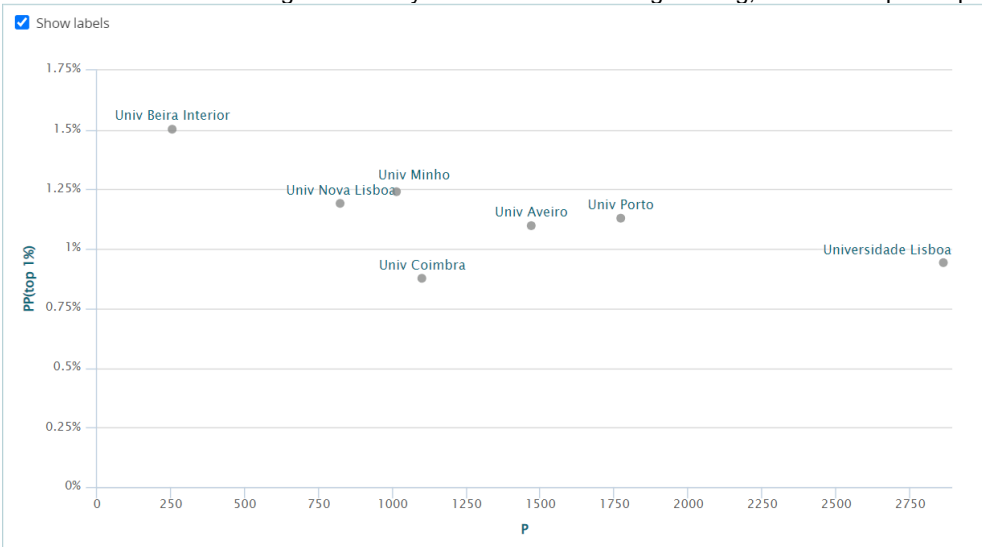
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Universidade Lisboa	2863	9.6%	0.9%	4.7%	51.6%	106	1
Univ Porto	1773	11.2%	1.1%	5.7%	56.0%	228	2
Univ Aveiro	1470	10.9%	1.1%	5.4%	54.0%	285	3
Univ Coimbra	1102	8.7%	0.9%	3.8%	50.4%	400	4
Univ Minho	1015	10.7%	1.2%	5.6%	53.3%	440	5
Univ Nova Lisboa	825	11.3%	1.2%	6.0%	54.1%	531	6
Univ Beira Interior	256	10.1%	1.5%	5.0%	50.7%	1118	7
# IES						1310	7

Gráfico 29: Leiden Ranking 2023 – Physical sciences and engineering, scientific impact top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 30: Leiden Ranking 2023 – Physical sciences and engineering, scientific impact top1%



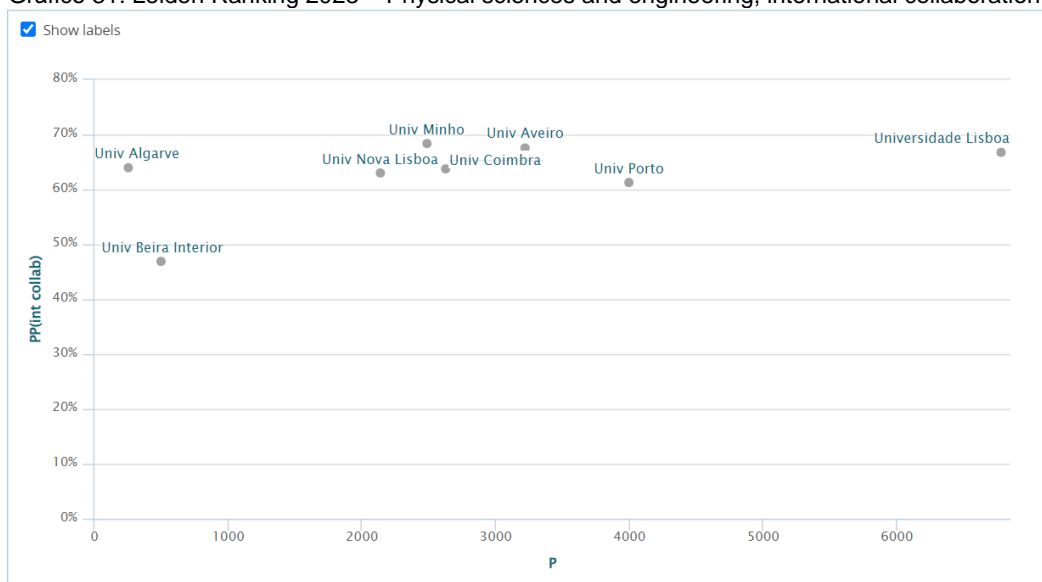
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

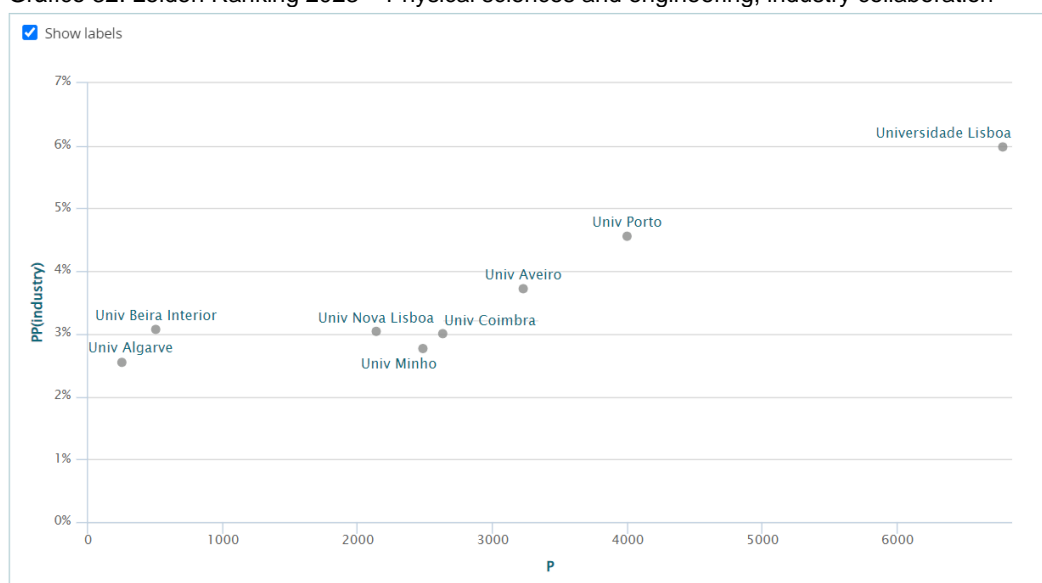
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Universidade Lisboa	6781	6.0%	84.6%	66.8%	10.5%	37.4%	92	1
Univ Porto	3998	4.6%	84.0%	61.3%	15.5%	36.3%	221	2
Univ Aveiro	3226	3.7%	85.4%	67.6%	9.6%	36.3%	300	3
Univ Coimbra	2630	3.0%	84.1%	63.8%	9.3%	39.6%	387	4
Univ Minho	2489	2.8%	89.1%	68.4%	10.1%	40.0%	409	5
Univ Nova Lisboa	2138	3.0%	86.9%	63.0%	16.2%	34.0%	473	6
Univ Beira Interior	505	3.1%	82.8%	46.9%	16.0%	22.1%	1169	7
Univ Algarve	255	2.5%	89.8%	64.0%	2.0%	24.7%	1296	8
# IES							1371	8

Gráfico 31: Leiden Ranking 2023 – Physical sciences and engineering, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 32: Leiden Ranking 2023 – Physical sciences and engineering, industry collaboration



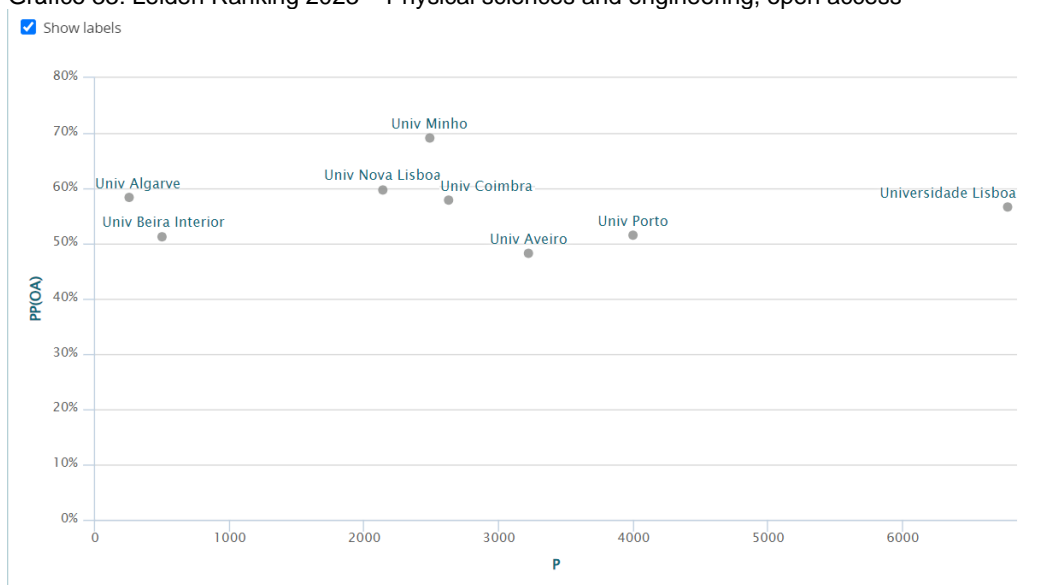
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Open access
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

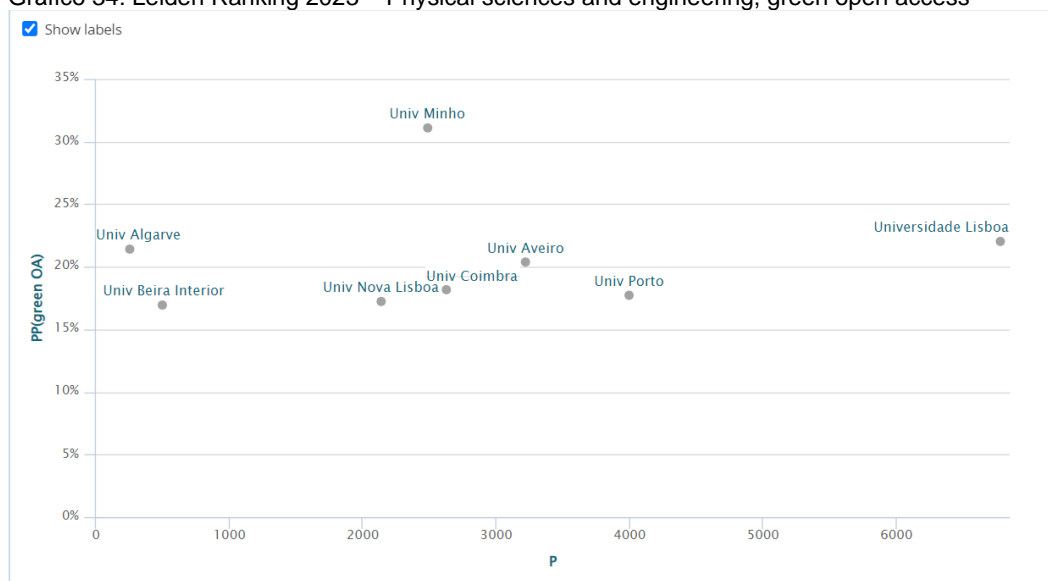
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Universidade Lisboa	6781	56.6%	22.2%	8.7%	3.6%	22.0%	0.3%
Univ Porto	3998	51.5%	20.7%	5.1%	8.0%	17.7%	0.3%
Univ Aveiro	3226	48.2%	21.7%	4.1%	2.1%	20.4%	0.1%
Univ Coimbra	2630	57.9%	27.2%	10.1%	2.4%	18.2%	0.4%
Univ Minho	2489	69.1%	28.7%	7.5%	1.8%	31.1%	0.4%
Univ Nova Lisboa	2138	59.7%	31.0%	9.8%	1.7%	17.2%	0.1%
Univ Beira Interior	505	51.2%	30.6%	2.2%	1.5%	16.9%	0.1%
Univ Algarve	255	58.4%	25.8%	8.0%	3.1%	21.4%	0.0%

Gráfico 33: Leiden Ranking 2023 – Physical sciences and engineering, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 34: Leiden Ranking 2023 – Physical sciences and engineering, green open access



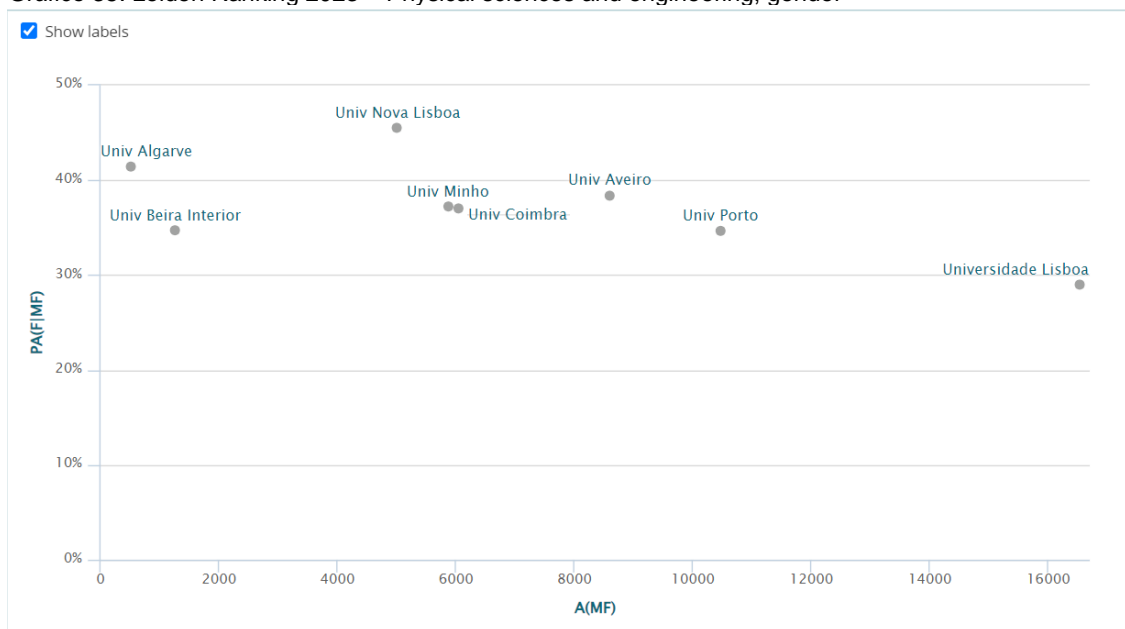
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Gender
Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Universidade Lisboa	16532	25480	35.1%	71.0%	29.0%	41	1
Univ Porto	10473	10956	4.4%	65.3%	34.7%	124	2
Univ Aveiro	8600	9252	7.0%	61.6%	38.4%	177	3
Univ Coimbra	6062	7896	23.2%	63.0%	37.0%	297	4
Univ Minho	5873	6889	14.7%	62.8%	37.2%	308	5
Univ Nova Lisboa	5017	5204	3.6%	54.5%	45.5%	368	6
Univ Beira Interior	1260	1312	4.0%	65.3%	34.7%	1047	7
Univ Algarve	528	542	2.6%	58.6%	41.4%	1271	8
# IES						1395	8

Gráfico 35: Leiden Ranking 2023 – Physical sciences and engineering, gender



Fonte: CWTS, Leiden ranking 2023, chart view

3.2.5 Social sciences and humanities

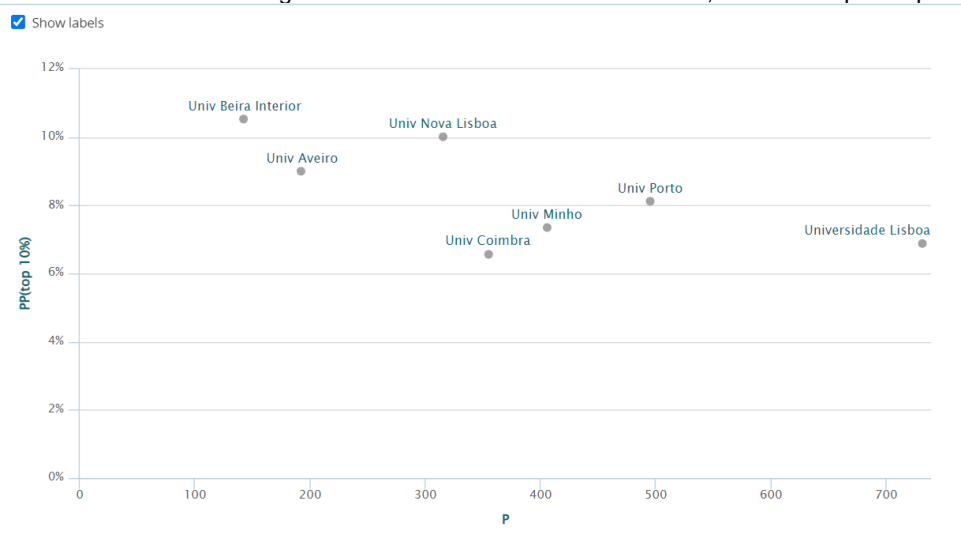
Type of indicators: Scientific impact

Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100; Calculate impact indicators using fractional counting.

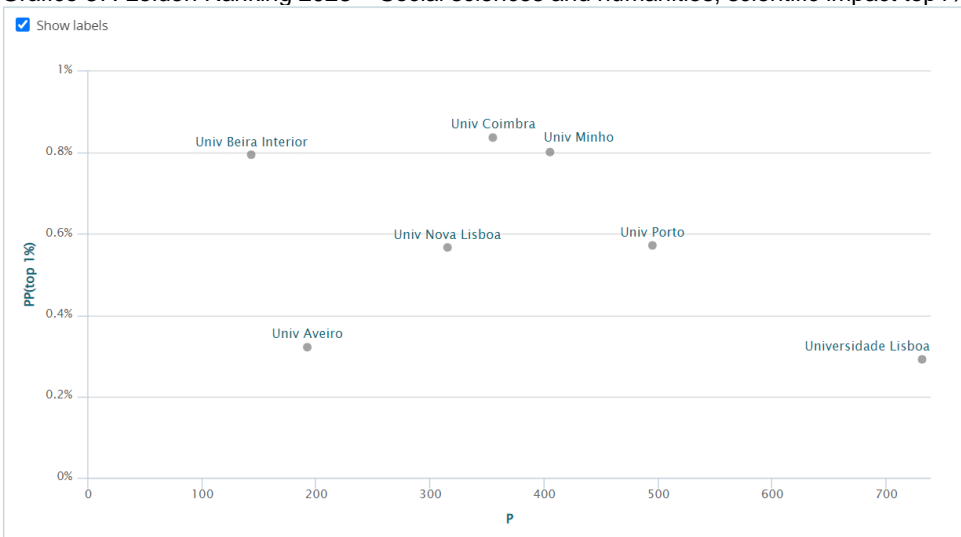
	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	#PT
Universidade Lisboa	731	6.9%	0.3%	2.2%	46.7%	165	1
Univ Porto	495	8.1%	0.6%	3.7%	46.9%	273	2
Univ Minho	406	7.4%	0.8%	4.0%	40.8%	336	3
Univ Coimbra	355	6.6%	0.8%	3.6%	45.2%	395	4
Univ Nova Lisboa	315	10.0%	0.6%	5.2%	51.4%	432	5
Univ Aveiro	193	9.0%	0.3%	4.0%	47.6%	602	6
Univ Beira Interior	143	10.5%	0.8%	4.2%	52.4%	696	7
# IES						810	7

Gráfico 36: Leiden Ranking 2023– Social sciences and humanities, scientific impact top10%



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 37: Leiden Ranking 2023 – Social sciences and humanities, scientific impact top1%



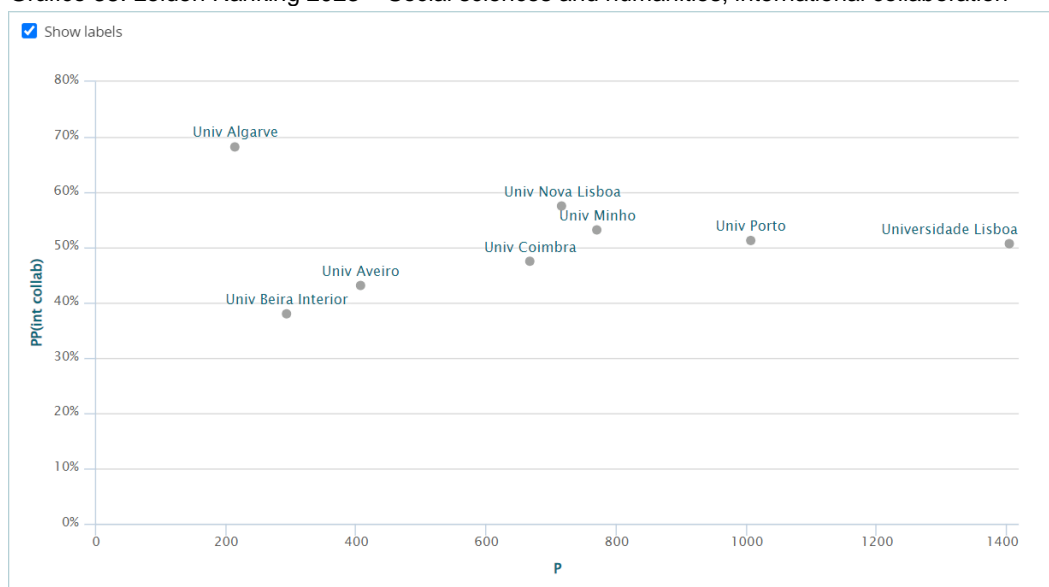
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

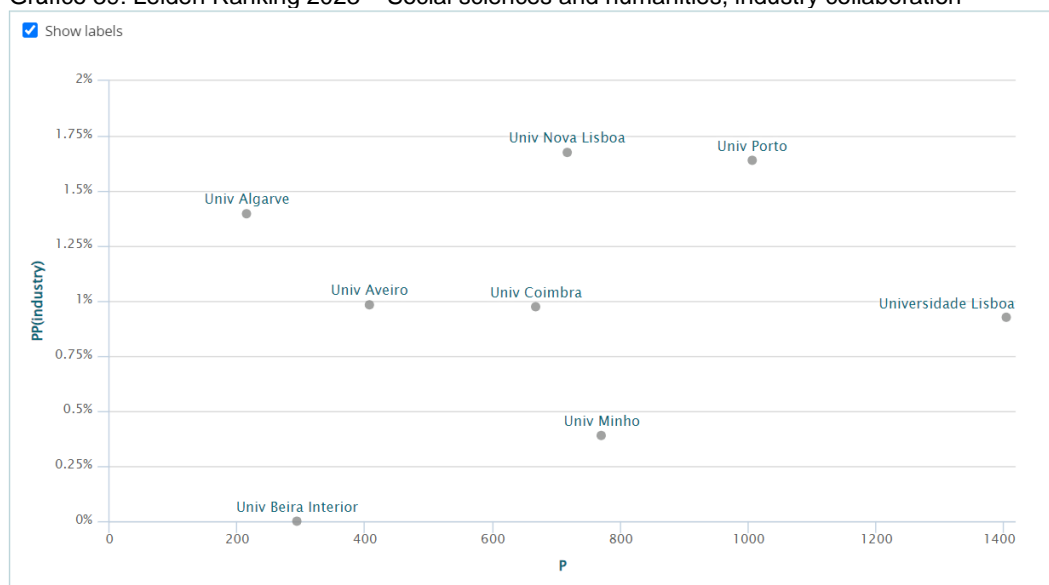
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	#PT
Universidade Lisboa	1404	0.9%	76.0%	50.7%	14.5%	22.3%	176	1
Univ Porto	1007	1.6%	80.5%	51.3%	16.3%	24.8%	268	2
Univ Minho	771	0.4%	78.9%	53.2%	14.5%	25.7%	357	3
Univ Nova Lisboa	717	1.7%	82.4%	57.5%	16.1%	31.6%	379	4
Univ Coimbra	667	1.0%	75.9%	47.5%	10.5%	22.9%	409	5
Univ Aveiro	407	1.0%	80.6%	43.1%	15.0%	19.4%	571	6
Univ Beira Interior	294	0.0%	82.1%	38.0%	11.6%	22.7%	689	7
Univ Algarve	215	1.4%	87.3%	68.2%	1.2%	27.7%	789	8
# IES							1032	8

Gráfico 38: Leiden Ranking 2023 – Social sciences and humanities, international collaboration



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 39: Leiden Ranking 2023 – Social sciences and humanities, industry collaboration



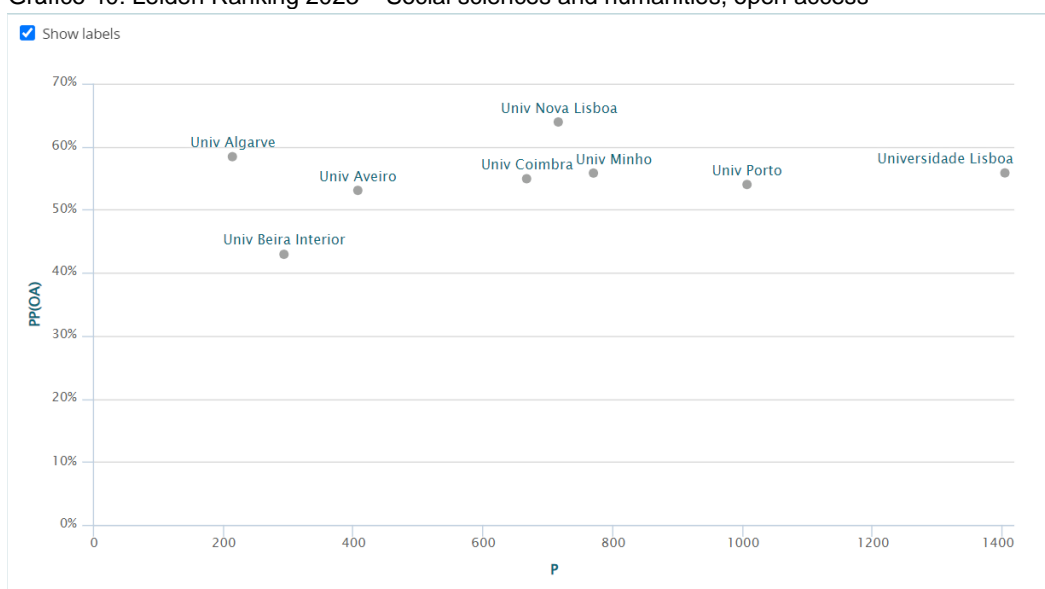
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Open access
 Indicator used for ranking: P

Parâmetros: Time period: 2018-2021. Min. publication output=100

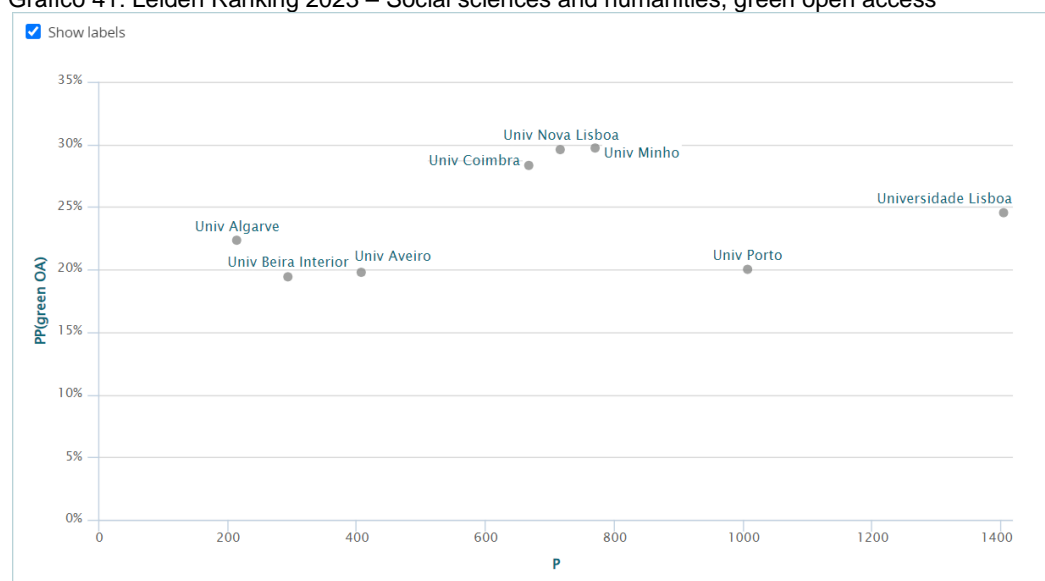
	P	PP(OA)	PP(gold OA)	PP(hybrid OA)	PP(bronze OA)	PP(green OA)	PP(OA unknown)
Universidade Lisboa	1404	55.8%	22.1%	6.1%	3.1%	24.5%	2.0%
Univ Porto	1007	54.0%	26.2%	4.7%	3.1%	20.0%	1.6%
Univ Minho	771	55.8%	21.4%	2.5%	2.1%	29.7%	1.6%
Univ Nova Lisboa	717	63.9%	22.3%	7.3%	4.7%	29.6%	0.8%
Univ Coimbra	667	54.9%	19.3%	4.7%	2.5%	28.3%	0.9%
Univ Aveiro	407	53.1%	25.7%	5.3%	2.3%	19.8%	0.4%
Univ Beira Interior	294	42.9%	19.8%	2.6%	1.2%	19.4%	1.0%
Univ Algarve	215	58.4%	27.2%	5.4%	3.5%	22.3%	3.0%

Gráfico 40: Leiden Ranking 2023 – Social sciences and humanities, open access



Fonte: CWTS, Leiden ranking 2023, chart view

Gráfico 41: Leiden Ranking 2023 – Social sciences and humanities, green open access



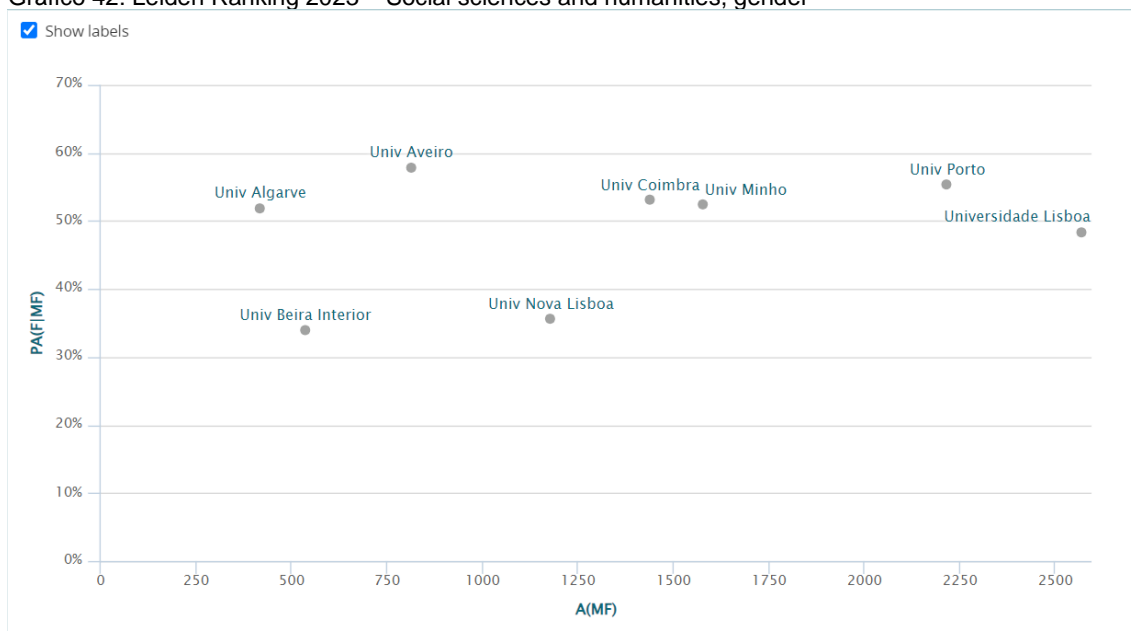
Fonte: CWTS, Leiden ranking 2023, chart view

Type of indicators: Gender
 Indicator used for ranking: A(MF)

Parâmetros: Time period: 2018-2021. Min. publication output=100

	A(MF)	A	PA(unknown)	PA(M MF)	PA(F MF)	# World	#PT
Universidade Lisboa	2569	2614	1.7%	51.7%	48.3%	134	1
Univ Porto	2217	2240	1.0%	44.6%	55.4%	167	2
Univ Minho	1578	1590	0.8%	47.6%	52.4%	261	3
Univ Coimbra	1438	1456	1.3%	46.9%	53.1%	279	4
Univ Nova Lisboa	1179	1199	1.7%	64.4%	35.6%	353	5
Univ Aveiro	814	817	0.4%	42.2%	57.8%	488	6
Univ Beira Interior	536	538	0.4%	66.0%	34.0%	632	7
Univ Algarve	418	419	0.2%	48.1%	51.9%	705	8
# IES						1197	8

Gráfico 42: Leiden Ranking 2023 – Social sciences and humanities, gender



Fonte: CWTS, Leiden ranking 2023, chart view

4. Anexo I: Uso responsável dos Rankings

“Responsible use

University rankings should be used in a responsible manner. Below we present ten principles developed by CWTS that are intended to guide the responsible use of university rankings. These principles apply to university rankings in general. They are not restricted to the Leiden Ranking. The principles were introduced in a [blog post](#) published in 2017. A summary of the principles was published in [Research Europe](#). The principles are also summarized in the animation provided below. For related work, please see the [evaluation of six university rankings](#) carried out by the INORMS Research Evaluation Working Group.

Design of university rankings

1. A generic concept of university performance should not be used

The **THE ranking** claims to “provide the definitive list of the world’s best universities”. Similar claims are sometimes made by other major university rankings. This is highly problematic. Different users of university rankings are interested in different dimensions of university performance, and therefore a shared notion of ‘best university’ does not exist. Whether a university is doing well or not depends on the dimension of university performance that one is interested in. Some universities for instance may be doing well in teaching, while others may be doing well in research. There is no sensible way in which a good performance in one dimension can be weighed against a less satisfactory performance in another dimension.

The problematic nature of a generic concept of university performance is also visible in the composite indicators that are used in university rankings such as **ARWU**, **THE**, and **QS**. These composite indicators combine different dimensions of university performance in a rather arbitrary way. The fundamental problem of these indicators is the poorly defined concept of university performance on which they are based.

The Leiden Ranking considers only the scientific performance of universities and does not take into account other dimensions of university performance, such as teaching performance. More specifically, based on the publications of a university in international scientific journals, the Leiden Ranking focuses on the scientific impact of a university and on the participation of a university in scientific collaborations. Different aspects of the scientific performance of universities are quantified separately from each other in the Leiden Ranking. No composite indicators are constructed.

2. A clear distinction should be made between size-dependent and size-independent indicators of university performance

Size-dependent indicators focus on the overall performance of a university. Size-independent indicators focus on the performance of a university relative to its size or relative to the amount of resources it has available. Size-dependent indicators can be used to identify universities that make a large overall contribution to science or education. Size-independent indicators can be used to identify universities that make a large contribution relative to their size. Size-dependent and size-independent indicators serve different purposes. Combining them in a composite indicator, as is done for instance in the ARWU ranking, therefore makes no sense. In the Leiden Ranking, size-dependent and size-independent indicators are clearly distinguished from each other.

Users of university rankings should be aware that constructing proper size-independent indicators is **highly challenging**. These indicators require accurate data on the size of a university, for instance internationally standardized data on a university’s number of researchers or its amount of research funding. This data is very difficult to obtain. In the Leiden Ranking, no such data is used. Instead, size-independent indicators are constructed by using the number of publications of a university as a surrogate measure of university size.

3. Universities should be defined in a consistent way

In order to make sure that universities can be properly compared, they should be defined as much as possible in a consistent way. When a university ranking relies on multiple data sources

(bibliometric databases, questionnaires, statistics provided by universities themselves, etc.), the definition of a university should be consistent between the different data sources. However, even when relying on a single data source only, achieving consistency is a **major challenge**. For instance, when working with a bibliometric data source, a major difficulty is the consistent treatment of hospitals associated with universities. There is a large worldwide variation in the way in which hospitals are associated with universities, and there can be significant discrepancies between the official relation of a hospital with a university and the local perception of this relation. Perfect consistency at an international level cannot be achieved, but as much as possible a university ranking should make sure that universities are defined in a consistent way. Rankings should also explain the approach they take to define universities. The Leiden Ranking offers such an **explanation**. Unfortunately, major university rankings such as ARWU, THE, and QS do not make clear how they define universities.

4. University rankings should be sufficiently transparent

Proper use of a university ranking requires at least a basic level of understanding of the design of the ranking. University rankings therefore need to be sufficiently transparent. They need to explain their methodology in sufficient detail. University rankings such as ARWU, THE, and QS offer a methodological explanation, but the explanation is quite general. The Leiden Ranking provides a significantly more detailed **methodological explanation**. Ideally, a university ranking should be transparent in a more far-reaching sense by making available the data underlying the ranking. This for instance could enable users of a ranking to see not only how many highly cited publications a university has produced, but also which of its publications are highly cited. Or it could enable users to see not only the number of publications of a university that have been cited in patents, but also the specific patents in which the citations have been made. Most university rankings, including the Leiden Ranking, do not reach this level of transparency, both because of the proprietary nature of some of the underlying data and because of commercial interests of ranking producers.

Interpretation of university rankings

5. Comparisons between universities should be made keeping in mind the differences between universities

Each university is unique in its own way. Universities have different missions and each university has a unique institutional context. Such differences between universities are reflected in university rankings and should be taken into account in the interpretation of these rankings. A university in the Netherlands for instance can be expected to be more internationally oriented than a university in the US. Likewise, a university focusing on engineering research can be expected to have stronger ties with industry than a university active mainly in the social sciences. To some extent, university rankings correct for differences between universities in their disciplinary focus. So-called field-normalized indicators are used for this purpose, but these indicators are used only for specific aspects of university performance, for instance for quantifying scientific impact based on citation statistics. For other aspects of university performance, no correction is made for the disciplinary profile of a university. The collaboration indicators in the Leiden Ranking for instance do not correct for this. In the interpretation of the indicators provided in a university ranking, one should carefully consider whether the disciplinary profile of a university has been corrected for or not.

6. Uncertainty in university rankings should be acknowledged

University rankings can be considered to be subject to various types of uncertainty. First, the indicators used in a university ranking typically do not exactly represent the concept that one is interested in. For instance, citation statistics provide insight into the scientific impact of the research of a university, but they reflect this impact only in an approximate way. Second, a university ranking may have been influenced by inaccuracies in the underlying data or by (seemingly unimportant) technical choices in the calculation of indicators. Third, there may be uncertainty in a university ranking because the performance of a university during a certain time period may have been influenced by coincidental events and may therefore not be fully representative of the performance of the university in a more general sense. It is important to be

aware of the various types of uncertainty in university rankings. To some extent it may be possible to quantify uncertainty in university rankings (e.g., using **stability intervals** in the Leiden Ranking), but to a large extent one needs to make an intuitive assessment of this uncertainty. In practice, this means that it is best not to pay attention to small performance differences between universities. Likewise, minor fluctuations in the performance of a university over time can best be ignored. The focus instead should be on structural patterns emerging from time trends.

7. An exclusive focus on the ranks of universities in a university ranking should be avoided; the values of the underlying indicators should be taken into account

The term 'university ranking' is somewhat unfortunate, since it implies a focus on the ranks of universities, which creates the risk of overlooking the values of the underlying indicators. Focusing on the ranks of universities can be misleading because universities with quite similar values for a certain indicator may have very different ranks. For instance, when universities in the Leiden Ranking are ranked based on their proportion of highly cited publications, the university at rank 300 turns out to have just 10% fewer highly cited publications than the university at rank 200. By focusing on the ranks of universities, one university may seem to perform much better than another, while the performance difference may in fact be relatively small.

Users of university rankings should also be aware that the rank of a university may drop when the number of universities included in a university ranking is increased. Such a drop in rank may be incorrectly interpreted as a decline in the performance of the university. The value of the underlying indicator may show that there actually has been no performance decline and that the drop in rank is completely due to the increase in the number of universities included in the ranking.

Use of university rankings

8. Dimensions of university performance not covered by university rankings should not be overlooked

University rankings focus on specific dimensions of university performance, typically dimensions that are relatively easy to quantify. The Leiden Ranking for instance has a quite narrow scope focused on specific aspects of the scientific performance of universities. Some other university rankings have a broader scope, with **U-Multirank** probably being the most comprehensive ranking system. However, there is no university ranking that fully covers all relevant dimensions of university performance. Teaching performance and societal impact are examples of dimensions that are typically not very well covered by university rankings. Within the dimension of scientific performance, scientific impact and collaboration can be captured quite well, but scientific productivity is much more difficult to cover. Dimensions of university performance that are not properly covered by university rankings should not be overlooked. Users of university rankings should be aware that even the most comprehensive rankings offer only a partial perspective on university performance. The information needs of users should always be leading, not the information supply by university rankings.

9. Performance criteria relevant at the university level should not automatically be assumed to have the same relevance at the department of research group level

Performance criteria that are relevant at the level of universities as a whole are not necessarily relevant at the level of individual departments or research groups within a university. It may for instance be useful to know how often articles published by a university are cited in the international scientific literature, but for a specific research group within the university, such as a research group in the humanities, this may not be a very useful performance criterion. Similarly, one may want to know how many publications of a university have been co-authored with industrial partners. However, for research groups active in areas with little potential of commercial application, this may not be the most appropriate performance criterion. It may be tempting for a university to mechanically pass on performance criteria from the university level to lower levels within the organization, but this temptation should be resisted. This is especially important when the distribution of resources within a university is partially dependent on key performance indicators, as is often the case.

10. University rankings should be handled cautiously, but they should not be dismissed as being completely useless

When used in a responsible manner, university rankings may provide relevant information to universities, researchers, students, research funders, governments, and other stakeholders. They may offer a useful international comparative perspective on the performance of universities. The management of a university may use information obtained from university rankings to support decision making and to make visible the strengths of the university. However, when doing so, the limitations of university rankings and the caveats in their use should be continuously emphasized..¹⁰

¹⁰ In <http://www.leidenranking.com/information/responsibleuse>, acedido 21 de junho de 2023.