

Where is the Croatian Higher Education in 2025?

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Abstract

Among the eight Western Balkan countries, Croatia produces the largest absolute volume of academic citations and places the most institutions in the regional ARBU top 12. What Croatia's leadership consists of is a different question and has not previously been mapped through a single citation-based regional framework.

The analysis applies the Academic Ranking of Balkan Universities (ARBU) with data as of 30 June 2025. The methodology is quantitative, drawing on bibliometric data from Google Scholar profiles aggregated to the institutional level. Coverage extends to all 31 ranked Croatian higher education institutions, the regional top 12 universities, and the top 25 individual researchers across the Western Balkans.

Two findings dominate. First, Croatia's regional leadership is clear on absolute volume but does not extend to per-faculty productivity. The country generates 41 percent of all Western Balkan citations, but Slovenia produces more than double the Croatian rate per faculty member. Second, leadership rests on a narrow base. Five institutions, headed by Zagreb and Split, account for 95 percent of national citation output. The remaining 26 institutions, including the entire polytechnic system, account for 5 percent. All 13 Croatian researchers in the regional Western Balkan top 25 are based at just two universities, with Split overtaking

Zagreb at the elite level.

In summary, Croatia is regionally dominant in aggregate but internally lopsided. Two policy options follow: broadening the productive base across more institutions, or recognizing the tiered structure as a deliberate feature of policy rather than an artifact of incumbency.

Keywords: Croatian higher education; university rankings; ARBU; citation analysis; research concentration; Western Balkans; Google Scholar

1. Introduction

Defining what makes one university better than another is harder than it appears. Quality and quantity are not the same thing, and they often pull in opposite directions. A small specialized college can produce excellent teaching and tightly focused research without ever competing with a flagship research university on volume of publications. A large multidisciplinary university can dominate citation counts while delivering uneven teaching across its faculties. University ranking systems exist to navigate this tension, and the methodological choices they make determine which institutions become visible and which do not. The choices can have practical consequences for student mobility, faculty recruitment, public funding, and what national policymakers and the public believe about their own higher education system.

Three international ranking systems are widely used as global benchmarks: the QS World University Rankings, the Times Higher Education World University Rankings, and the Academic Ranking of World Universities published by ShanghaiRanking Consultancy (Quacquarelli Symonds, 2025; Times Higher Education, 2025; ShanghaiRanking Consultancy, 2024). These instruments combine bibliometric data, reputation surveys, and indicators of teaching quality and internationalization into composite scores. The catch, for any country in the Western Balkans, is that the global rankings reach only the largest institutions. In the Croatian case, only three of the country's 31 ranked higher education institutions hold a rank in any of the three systems. The remaining 28 sit below the visibility threshold the global rankings apply, which means any analysis of Croatian higher education that relies on the global rankings alone is examining a small sliver of the country's academic system.

The Academic Ranking of Balkan Universities (ARBU) was developed to address this gap. It applies a deliberately simple methodology, citation counts drawn from Google Scholar profiles of academic faculty, and aggregates them at the institutional level (Bojadjiev et al., 2023, 2026). The simplification is intentional. By relying on a single openly accessible data source and a single metric, ARBU produces a ranking that includes institutions of every size that have faculty on Google Scholar, not only those large enough to clear global visibility thresholds. The result is a regional ranking that captures far more of the institutional landscape of the Western Balkans than the visible peaks do. For the present study, this means a tool that can map Croatia institution by institution, including the polytechnics, specialized colleges, and smaller universities that the global rankings exclude.

A parallel application of ARBU to the Macedonian higher education system has recently been

published (Bojadjiev et al., 2026). That study found Macedonian higher education to be substantially behind its regional peers, with the flagship University Ss. Cyril and Methodius producing less than one tenth the citation volume of the leading Croatian institution and no Macedonian researcher reaching the regional top 25. The Croatian case sits at the opposite end of the regional spectrum, with the largest absolute citation volumes and the most representation in the regional ARBU ranking. What the Croatian system looks like once the lens moves below the aggregate national totals to the institution-by-institution level is the question this paper takes up. The paper is structured as follows. Section 2 reviews the literature on university rankings and positions ARBU within it. Section 3 describes the data and methodology. Sections 4 and 5 present the results at the institutional and individual researcher levels respectively. Section 6 concludes.

2. Literature Review

Two strands of literature inform this study. The first concerns how the international ranking systems work, what they capture, and where their limits lie. The second concerns the case for regional and citation-based ranking instruments as complements to the global systems, particularly for academic spaces that the global systems cover only partially. Together, these strands provide the framing for the analysis. The discussion below begins with the broader question of how higher education quality is assessed (Section 2.1), then turns to the position of Croatian higher education in the international rankings (Section 2.2), and concludes with a description of ARBU as the analytical framework used in this study (Section 2.3).

2.1 Assessing Quality in Higher Education

There is no single agreed standard for what constitutes a good university. Higher education institutions perform multiple roles simultaneously: they teach students, conduct research, transfer knowledge to industry, and contribute to public discourse. Each role can in principle be measured, but the indicators vary in tractability and comparability across countries. The most tractable indicators tend to focus on:

- Research output, typically measured through publication and citation counts
- Teaching and learning, measured indirectly through faculty-student ratios, completion rates, or graduate destinations
- Engagement with industry and society, captured through patents, research income, and similar indicators

Composite ranking systems combine these and other indicators into single scores. The methodological literature has long pointed out that this combining is itself a normative act. Different weightings can produce different orderings. Critics have long argued that this sensitivity should make us more cautious about treating any single ranking as authoritative (Marginson, 2014).

ARBU's response to this concern is to simplify rather than complicate. Instead of

constructing a composite score across multiple indicators, ARBU uses citations alone, drawn from Google Scholar profiles of academic faculty (Bojadjev et al., 2023). The simplification has both methodological and practical motivations. Methodologically, a single-indicator ranking is transparent: anyone can inspect the public Google Scholar profiles behind the ranking. Practically, citation counts are an indicator consistently available across the institutional landscape of the Balkan region, where reputation surveys and detailed teaching-quality data are not systematically collected. The trade-off is acknowledged. ARBU does not claim to capture teaching quality, social impact, or institutional governance. Google Scholar's citation information is, however, of inconsistent accuracy and less often updated (Falagas et al., 2008).

2.2 The Position of Croatian Higher Education According to the Big Three

Croatia is among the better-represented Western Balkan countries in the international rankings, though the depth of representation is shallow. The country's flagship, the University of Zagreb, is the only Croatian institution to appear in all three of the major systems. According to the Academic Ranking of World Universities, Zagreb is one of four universities from the former Yugoslavia in the global top 1000, alongside Belgrade, Ljubljana, and Novi Sad (ShanghaiRanking Consultancy, 2024). The QS World University Rankings extend slightly further into the Croatian system, listing three Croatian institutions in 2026: Zagreb in the 701-710 band, alongside Split and Rijeka in the 1201-1400 band (Quacquarelli Symonds, 2025). Times Higher Education places Zagreb and Split in the 1201-1500 band and Rijeka at 1501+ in its 2026 ranking; University North and the University of Dubrovnik are listed with reporter status, without a rank (Times Higher Education, 2025).

Across the three systems combined, three Croatian universities are ranked: Zagreb, Split, and Rijeka. Twenty-eight other Croatian higher education institutions, including the country's polytechnic system, several specialized colleges, and a number of smaller universities, hold no rank. They fall below the scale, citation, and visibility thresholds that the global systems apply. The result is the same in any Western Balkan country, but particularly visible in Croatia given the size of the system: any analysis of Croatian higher education that relies on the international rankings examines only a portion of what exists.

Two consequences of this gap are worth flagging. The first is analytical. If only three Croatian institutions are ranked in the international rankings, comparison across the Croatian system as a whole has to be done using a different instrument. The second is practical. Croatian institutions outside the global rankings have few externally validated ways to compare their research performance against regional peers. They can compare against domestic peers, but the domestic comparison says little about how a Croatian polytechnic performs against, say, a Slovenian polytechnic or a Serbian specialized college. Regional ranking instruments fill this gap by extending coverage downward from the global thresholds while retaining cross-border comparability.

2.3 What Is ARBU - Academic Ranking of Balkan Universities

ARBU was developed to address exactly this gap. It is a citation-based regional ranking

system covering higher education institutions across the Balkans (Bojadjev et al., 2023). Methodologically, ARBU uses three indicators: the number of faculty members associated with each institution, the total citation count aggregated across those faculty members from their Google Scholar profiles, and a rank coefficient defined as total citations divided by the number of faculty (Bojadjev et al., 2026). The use of Google Scholar as the primary data source reflects a methodological choice, whose advantages are reviewed by Bojadjev et al. (2024): Google Scholar results are, on average, more scholarly than materials found only in library databases (Howland et al., 2009).

ARBU's stated scope is the Balkan region in the wider sense; Greece, Romania, Bulgaria and European Turkey are marked as still to be added. The 30 June 2025 snapshot covers 151 ranked higher education institutions across the eight countries active in ARBU, referred to in this paper as the Western Balkans: Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, North Macedonia, Albania, and Kosovo. The dataset is updated semi-annually (ARBU, 2025). For the present study, the focus is on Croatia within the eight Western Balkan countries. Eligibility criteria are deliberately broad. Any legally registered and accredited higher education institution within the region qualifies, including academies of sciences and arts. Individual researchers are included if they list a Balkan institution as primary affiliation on Google Scholar, regardless of formal employment status. Output is classified into seven academic fields, derived from a synthesis of the QS, Times Higher Education, and Frascati classifications: Natural Sciences; Engineering and Technology; Medical Sciences; Agriculture and Forestry; Social Sciences; Humanities and Arts; and Economics, Business and Organizational Sciences.

ARBU's relevance to the Croatian case is direct. The country has 31 ranked institutions in the dataset. Three are ranked in the international rankings; the other 28 are not. ARBU enables analysis covering the entire Croatian institutional landscape, places Croatian institutions in a regional comparative frame, and identifies leading individual researchers across both national and regional contexts. A parallel application of the same instrument to the Macedonian higher education system has been published (Bojadjev et al., 2026). Two limitations apply. ARBU privileges research output as the dimension being measured, which means teaching quality, employability, and broader societal contribution are not captured, and any ranking exercise carries serious methodological limitations (Salmi, 2009). Citation conventions also vary by discipline. Section 3.3 returns to these and other methodological considerations.

3. Methodology

3.1 Data Sources

The empirical material for this study is drawn from the ARBU dataset as of 30 June 2025 (ARBU, 2025). At the institutional level, the dataset includes all 31 ranked Croatian higher education institutions, with three indicators recorded for each: faculty count from the institutional Google Scholar profiles, total citations aggregated across those profiles, and the rank coefficient defined as citations divided by faculty. At the individual researcher level, ARBU provides a ranking of Croatian researchers, from which this study uses the top 50,

plus a top 10 within each of the seven academic fields. Each researcher record includes institutional affiliation, primary field, and a normalized citation point score. Reference data on the international rankings come from the 2026 editions of the QS and Times Higher Education rankings and the 2024 edition of the Shanghai ranking (Quacquarelli Symonds, 2025; Times Higher Education, 2025; ShanghaiRanking Consultancy, 2024).

ARBU operates on three indicators applied uniformly across all institutions:

1. Number of faculty: a count of academic staff with Google Scholar profiles affiliated to the institution. This serves as a baseline of institutional size in research-active terms
2. Total citations: the cumulative citation count across all institutional faculty profiles. This is the headline measure of institutional research impact
3. Rank coefficient: total citations divided by faculty count, expressing citations per professor. This is an efficiency measure that complements total citations

One methodological detail about the researcher-level data is worth flagging upfront. ARBU rescales citation point scores to a 0-100 range against the highest-scoring researcher in the relevant geographic frame. The Croatia-only ranking and the regional Western Balkan ranking therefore use different reference points: the same researcher will have a higher score in the Croatia-only frame than in the regional frame, because the Croatian leader scores 100 in one and the regional leader scores 100 in the other. The orderings and the ratios between researchers' scores are comparable across frames; the absolute scores and the point gaps are not.

3.2 Analytical Approach

The analysis proceeds across four levels:

1. Regional positioning: Croatia is compared against the other seven Western Balkan countries (Slovenia, Serbia, Bosnia and Herzegovina, North Macedonia, Albania, Kosovo, and Montenegro) on country totals and on representation in the regional top 12 universities
2. National institutional ranking: all 31 Croatian institutions are examined on both total citations and rank coefficient, with attention to whether the volume and efficiency orderings converge or diverge
3. Disciplinary breakdown: the seven ARBU academic fields are used to disaggregate institutional output, identifying field-level leaders and assessing whether the patterns observed at the aggregate level reproduce within fields
4. Individual researcher analysis: the top 25 most-cited Croatian researchers are examined by institutional affiliation, field, and position within the regional top 25

Where the same pattern surfaces at multiple levels, this is treated as evidence that the pattern is structural rather than an artifact of a single analytical choice. The introduction's question,

what does Croatian higher education look like beyond the three institutions ranked in the global rankings, is answered by reading across these four levels in combination rather than relying on any one of them in isolation.

3.3 Limitations

Several caveats apply. First, the use of citation counts as the sole quality indicator is a simplification. Teaching quality is not captured, a gap that rankings share in general (Altbach, 2006). Social impact, employability of graduates, and institutional governance are not captured either, even though all are dimensions of what makes a university good. Second, Google Scholar coverage may vary by discipline, which means cross-field comparisons of raw citation volume should be read with disciplinary baselines in mind. Third, hyper-authored publications, particularly in experimental high-energy physics and large biomedical collaborations, can lift individual researcher citation counts and institutional totals in ways that reflect collaboration scale rather than individual research contribution. The Croatian dataset includes researchers participating in such collaborations, especially at the University of Split. Subsections 4.3 and 5.2 return to this. Fourth, the dataset is a single snapshot. The 30 June 2025 snapshot captures Croatian research output as it stood on that date; it does not directly observe trajectory or trend. Fifth, ARBU is a regional instrument: Croatian institutions look favorable against Western Balkan peers, but the same institutions might appear less favorable when compared against European or global benchmarks. None of these limitations invalidate the analysis. They are the boundary conditions within which the findings should be read.

4. Results - Croatian Institutions

4.1 Regional Positioning

The 30 June 2025 ARBU snapshot covers 151 ranked institutions across the eight Western Balkan countries that form the comparative frame for this paper. Across those eight countries, total citations reach roughly 19.7 million across approximately 33 000 ranked faculty. Croatia accounts for the largest share on every volume measure in the dataset (institutions, professors, and citations).

Table 1 presents the country-level totals.

Table 1. Western Balkans country totals (ARBU, 30 June 2025)

Country	Institutions	Professors	Total Citations	Cites/Prof
Croatia	31	11 967	8 100 527	677
Slovenia	18	2860	4 375 724	1530
Serbia	16	6138	4 202 375	685

Country	Institutions	Professors	Total Citations	Cites/Prof
Bosnia and Herzegovina	21	5430	1 112 662	205
North Macedonia	20	2706	730 977	270
Kosovo	14	2255	594 752	264
Albania	27	1088	245 938	226
Montenegro	4	713	373 753	524
Western Balkans total	151	33 157	19 736 708	595

Croatia's share of the regional aggregate is large. The country produces 41.0 percent of all Western Balkan citations, while accounting for 36.1 percent of regional faculty and 20.5 percent of the ranked institutional base. To put the volume in proportion: Croatian citation output exceeds Albanian output by a factor of approximately 33, and Montenegrin output by a factor of approximately 22. The three largest national systems by citation output, Croatia, Slovenia, and Serbia, between them produce 84.5 percent of regional citations, leaving the five smaller systems with the residual 15.5 percent. This first observation is straightforward. By aggregate citation volume, the Western Balkan academic landscape is dominated by three countries, with Croatia at the top.

The intensity picture is different. Slovenia produces 1530 citations per professor against Croatia's 677, more than double the Croatian rate. With only 8.6 percent of regional faculty, Slovenia generates 22.2 percent of regional citations. Serbia and Croatia register similar per-professor rates, around 680. Montenegro follows at 524; the remaining four countries register between 205 and 270. The Croatian regional leadership claim therefore needs precision: Croatia leads on absolute volume and on the breadth of leading institutions, but it does not lead on per-faculty intensity. Slovenia does. The two leadership claims are not equivalent and should not be conflated.

At the institutional level, Croatia places four universities in the regional top 12. No other country places more than three. Table 2 presents this ranking.

Table 2. Top 12 universities in the Western Balkans by total citations (ARBU, 30 June 2025)

#	University	Country	Total Citations
1	University of Zagreb	Croatia	4 619 105
2	University of Belgrade	Serbia	2 490 515
3	University of Ljubljana	Slovenia	2 082 950

#	University	Country	Total Citations
4	University of Split	Croatia	1 810 012
5	Jozef Stefan International Postgraduate School	Slovenia	1 143 404
6	University of Rijeka	Croatia	667 801
7	University of Maribor	Slovenia	615 908
8	University of Novi Sad	Serbia	547 214
9	University of Sarajevo	Bosnia and Herzegovina	492 884
10	University of Osijek	Croatia	470 925
11	University of Kragujevac	Serbia	398 854
12	University Ss. Cyril and Methodius (UKIM)	North Macedonia	396 854

The University of Zagreb sits at the top of the regional list with 4 619 105 total citations. The next-ranked institution, the University of Belgrade, follows at 2 490 515, a gap of more than 2.1 million citations. Ljubljana follows at 2 082 950, 407 565 behind Belgrade. The University of Split appears at fourth with 1 810 012 citations. Croatia places the University of Rijeka at sixth and the University of Osijek at tenth in the regional ranking. By count, four Croatian institutions appear in the regional top 12; by aggregate volume, those four together hold more total citations than the institutions of any other Western Balkan country in the same band.

Two features of this regional ranking deserve attention. The first is the size of Zagreb's lead. The institution has been operating since 1669 and is the country's flagship by scale, faculty count, and disciplinary breadth. Its citation volume is consistent with that scale. The second is the position of Split. The university is small relative to Zagreb, with roughly one fifth the faculty count, yet its citation volume places it fourth across the entire Western Balkan region. The relationship between institutional size and citation output is therefore not linear, and the efficiency analysis in subsection 4.3 makes the non-linearity more visible.

4.2 Croatian Universities in the ARBU Framework

The Croatian national ranking covers 31 institutions, including universities, the Croatian Academy of Sciences and Arts, and a long tail of polytechnics, specialized colleges, and smaller higher education institutions. Table 3 presents the top 15 by total citations. The remaining 16 institutions all sit below 9000 citations and are listed in the ARBU database (ARBU, 2025).

Table 3. Top 15 Croatian institutions by total citations (ARBU, 30 June 2025)

#	University	Professors	Total Citations	Citations per Professor
1	University of Zagreb	6363	4 619 105	725.93
2	University of Split	1155	1 810 012	1567.11
3	University of Rijeka	1253	667 801	532.96
4	University of Osijek	1074	470 925	438.48
5	University of Zadar	522	127 149	243.58
6	Catholic University of Croatia	129	81 610	632.64
7	University North	227	74 705	329.10
8	University of Pula	206	69 451	337.14
9	University of Dubrovnik	137	45 708	333.64
10	University of Slavonski Brod	89	18 602	209.01
11	Polytechnic of Zagreb	104	17 452	167.81
12	Zagreb School of Economics and Management	67	15 052	224.66
13	Libertas University	53	13 781	260.02
14	Croatian Academy of Sciences and Arts	58	13 477	232.36
15	Polytechnic in Karlovac	51	9218	180.75

The distribution of citation output across the Croatian system is striking. The University of Zagreb alone, with 4 619 105 citations, holds 57 percent of all Croatian citations recorded in ARBU. Adding the next four institutions, Split, Rijeka, Osijek, and Zadar, raises the cumulative share to 95 percent. The other 26 institutions on the ranking, while present in the dataset, contribute the residual 5 percent between them. To put this in proportion: an entire system of polytechnics, specialized colleges, and smaller universities, 26 of them in total, contributes one twentieth of the country's citation output.

The gaps between adjacent institutions widen sharply once the top five are crossed. Zagreb produces 2.5 times the citations of Split. Split produces 2.7 times the citations of Rijeka. Rijeka produces 1.4 times the citations of Osijek. Osijek produces 3.7 times the citations of Zadar. The Catholic University of Croatia, ranked sixth nationally, holds 81 610 citations,

which is less than two percent of Zagreb's total.

The shape of this distribution is best described in tiers. Tier 1 contains Zagreb alone, with citation volume in the millions and a wide gap to anything below it. Tier 2 contains Split, also in the millions but 2.5 times smaller. Tier 3 contains Rijeka and Osijek, both in the hundreds of thousands. Tier 4 contains Zadar at 127 149 citations, alongside a long tail of 26 institutions each below 100 000 citations, with the bottom 14 each registering fewer than 5000 citations across their entire faculty rosters. The tier structure is not a measurement artifact. It is clearest in the volume ranking presented here; the efficiency ranking (subsection 4.3) and the field-level breakdowns (subsection 4.4) reorder the institutions below the top. It is a structural feature of Croatian higher education.

4.3 Efficiency Ranking of Croatian Universities

Switching from total citations to citations per professor produces a different ordering. Table 4 presents the top 15 Croatian institutions by rank coefficient.

Table 4. Top 15 Croatian institutions by rank coefficient (citations per professor, ARBU, 30 June 2025)

#	University	Rank Coef.	Professors	Total Citations
1	University of Split	1567.11	1155	1 810 012
2	University of Zagreb	725.93	6363	4 619 105
3	Catholic University of Croatia	632.64	129	81 610
4	University of Rijeka	532.96	1253	667 801
5	University of Osijek	438.48	1074	470 925
6	University of Pula	337.14	206	69 451
7	University of Dubrovnik	333.64	137	45 708
8	University North	329.10	227	74 705
9	Libertas University	260.02	53	13 781
10	University of Zadar	243.58	522	127 149
11	Croatian Academy of Sciences and Arts	232.36	58	13 477
12	Zagreb School of Economics and Management	224.66	67	15 052

#	University	Rank Coef.	Professors	Total Citations
13	RIT University	210.19	21	4414
14	University of Slavonski Brod	209.01	89	18 602
15	Polytechnic in Karlovac	180.75	51	9218

Several reorderings stand out. The University of Split moves from second on the volume ranking to first on the efficiency ranking, with a rank coefficient of 1567.11 against Zagreb's 725.93. Zagreb, despite its dominance on volume, drops to second on efficiency. The Catholic University of Croatia, ranked sixth on volume, climbs to third on efficiency at 632.64, reflecting its small faculty size and concentrated medical-sciences output. Smaller and more specialized institutions populate the upper portion of the efficiency ranking generally. The largest Croatian institutions by faculty count, Zagreb and Rijeka, sit lower on efficiency than they do on volume.

Split's efficiency lead warrants a methodological note. The University of Split has participated in CERN research since 1993, through the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) and the Faculty of Science (PMF), with a group that had grown to approximately 20 scientists by 2019. According to figures given by the rector in 2019, work arising from cooperation with CERN accounted for about 35 percent of all citations to University of Split publications indexed in Web of Science (Dalmatinski portal, 2019). Of the 25 most-cited Croatian researchers in the present analysis (Table 6), at least seven are authors in large CERN collaborations with a Split affiliation (INSPIRE, 2026): Ivica Puljak (rank 1), Nikola Godinović (rank 2), Marko Kovac (rank 3), Mile Dželalija (rank 8), and Toni Ščulac (rank 9) in the CMS collaboration, and Sven Gotovac (rank 10) and Linda Vicković (rank 12) in the ALICE collaboration. Publications from the CMS, ATLAS, and ALICE collaborations at CERN are hyper-authored, in the term introduced by Cronin (2001), with author lists that can run to several thousand names (Hirv, 2019). These publications generate substantial citation volumes that contribute to institutional totals while reflecting collaboration scale rather than individual research contribution alone. Section 3.3 acknowledges this issue. The phenomenon is real and bears noting because Split's efficiency leadership in the Croatian rankings owes a meaningful share of its magnitude to this single, externally anchored research collaboration.

The bottom of the efficiency ranking matches the bottom of the volume ranking. Most of the 26 Croatian institutions outside the leading five contribute little on both measures: their research output is low in volume and low per professor. The efficiency analysis reorders the leading institutions and lifts the Catholic University of Croatia, but leaves the rest of the long tail in place.

4.4 Croatian Universities by Academic Field

The seven ARBU academic fields allow a disaggregated view of Croatian institutional output.

Tables 5a through 5g present the top three Croatian institutions in each field by total citations. Analytical observations follow the tables.

Table 5a. Top three Croatian institutions in Natural Sciences (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	1 135 954
2	University of Split	470 317
3	University of Osijek	109 504

Table 5b. Top three Croatian institutions in Engineering and Technology (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	958 952
2	University of Split	798 815
3	University of Osijek	106 089

Table 5c. Top three Croatian institutions in Medical Sciences (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	1 678 513
2	University of Split	424 346
3	University of Rijeka	333 654

Table 5d. Top three Croatian institutions in Agriculture and Forestry (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	173 503
2	University of Osijek	36 797
3	University of Rijeka	2735

Table 5e. Top three Croatian institutions in Social Sciences (ARBU, 30 June 2025)

#	University	Total Citations
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#	University	Total Citations
1	University of Zagreb	217 716
2	University of Zadar	36 628
3	University North	23 950

Table 5f. Top three Croatian institutions in Humanities and Arts (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	231 815
2	University of Split	46 975
3	University of Rijeka	35 929

Table 5g. Top three Croatian institutions in Economics, Business and Organizational Sciences (ARBU, 30 June 2025)

#	University	Total Citations
1	University of Zagreb	222 652
2	University of Rijeka	67 209
3	University of Split	50 009

Several observations emerge from the field-by-field data. First, the University of Zagreb leads Croatian output in every one of the seven fields, without exception. Its dominance varies in degree but not in direction. In Agriculture and Forestry, Zagreb holds roughly 80 percent of total Croatian citations in the field. In Medical Sciences, the share is around 62 percent. In Engineering and Technology, Zagreb's share narrows considerably because Split sits within the same order of magnitude, with 798 815 citations against Zagreb's 958 952. Engineering and Technology is the only field where any second-placed Croatian institution comes close to challenging Zagreb on volume.

Second, the four other institutions in the leading group, Split, Rijeka, Osijek, and Zadar, distribute the second and third positions across the seven fields with some regularity. Split is consistently second in fields where physics, engineering, and biomedical research are prominent. Rijeka is second in Economics and third in Medical Sciences and in Humanities and Arts. Osijek appears in the top three or top four across most fields, reflecting its multidisciplinary character as a regional university. Zadar is second in Social Sciences but does not reach the top three in the science-aligned fields. A few specialized institutions surface within single fields where their focus aligns: the Catholic University of Croatia in Medical Sciences, University North in Social Sciences.

Third, the long tail of 26 institutions outside the leading five becomes even more invisible at the field level than at the aggregate level. In several fields, particularly Agriculture and Forestry (18 institutions), Medical Sciences (11), and Natural Sciences (9), multiple long-tail institutions register zero citations. This is partly a function of disciplinary specialization: a polytechnic focused on textile design will not register medical sciences citations regardless of how productive it is in its own field. But the broader pattern remains. Across the seven fields, the leading five institutions hold 28 of the 35 top-five places; in six fields at least one other institution enters the top five, and the rest are barely visible. The institutional concentration documented at the aggregate level in subsection 4.2 holds across the disciplinary breakdown.

5. Results - Croatian Researchers

5.1 Researchers' Ranking in the National Context

Section 4 examined Croatian higher education at the institutional level. This section narrows the unit of analysis to individual researchers, asking who the most-cited Croatian academics are, where they sit institutionally, and which fields they work in. The dataset is the ARBU top 50 Croatian researchers, of which the top 25 are presented in Table 6.

Table 6. Top 25 most-cited Croatian researchers (ARBU, 30 June 2025)

#	Researcher	University	Field	Citation Points
1	Ivica Puljak	University of Split	Engineering and Technology	100.00
2	Nikola Godinović	University of Split	Engineering and Technology	97.95
3	Marko Kovac	University of Split	Natural Sciences	80.10
4	Tomislav Ševa	University of Zagreb	Natural Sciences	46.02
5	Zeljko Reiner	University of Zagreb	Medical Sciences	43.44
6	Ozren Polašek	University of Split	Medical Sciences	42.59
7	Mirko Planinic	University of Zagreb	Natural Sciences	42.49
8	Mile Dželalija	University of Split	Natural Sciences	34.87
9	Toni Šćulac	University of Split	Natural Sciences	34.31
10	Sven Gotovac	University of Split	Engineering and Technology	31.71

#	Researcher	University	Field	Citation Points
11	Nikola Poljak	University of Zagreb	Natural Sciences	31.07
12	Linda Vicković	University of Split	Engineering and Technology	29.15
13	Mario Šekerija	University of Zagreb	Medical Sciences	26.66
14	Saša Mićanović	University of Rijeka	Natural Sciences	18.09
15	Maja Cikes	University of Zagreb	Medical Sciences	16.25
16	Mate Car	Catholic University of Croatia	Medical Sciences	13.40
17	Filip Erhardt	University of Zagreb	Natural Sciences	12.90
18	Ivana Kolcic	University of Split	Medical Sciences	12.31
19	Vernesa Smolcic	University of Zagreb	Natural Sciences	11.75
20	Marjeta Misigoj-Durakovic	University of Zagreb	Medical Sciences	11.45
21	Antonija Utrobicic	University of Zagreb	Natural Sciences	11.10
22	Maroje Sorić	University of Zagreb	Medical Sciences	11.04
23	Ana Marusic	University of Split	Medical Sciences	10.86
24	Josip Pečarić	University of Zagreb	Engineering and Technology	10.45
25	Petra Poropat	University North	Social Sciences	9.35

In the Croatia-only frame, citation point scores are normalized against the leading Croatian researcher, who scores 100. The top three positions are held by Ivica Puljak (Engineering and Technology, score 100), Nikola Godinović (Engineering and Technology, score 97.95), and Marko Kovac (Natural Sciences, score 80.10). All three are affiliated with the University of Split. The fourth position is held by Tomislav Ševa at the University of Zagreb in Natural Sciences, with a score of 46.02, less than half of the leader's score. The drop from third to fourth place is the steepest gap on the entire list.

Below the top three, the score distribution flattens considerably. The tenth-ranked researcher scores 31.71. The list extends down to the mid-9 range at position 25. The shape of the distribution, a small number of high-volume contributors followed by a long descending tail, is characteristic of citation-based rankings generally. The Croatian top 25 reproduces this

shape clearly.

5.1.1 Institutional Contribution

Two institutions dominate the Croatian top 25 list. Of the 25 leading researchers, 22 are affiliated with either the University of Zagreb (12 researchers) or the University of Split (10 researchers). The remaining three positions are held by single researchers at the University of Rijeka (Saša Mićanović), the Catholic University of Croatia (Mate Car), and University North (Petra Poropat). Table 7 summarizes the institutional distribution.

Table 7. Institutional contribution to the top 25 Croatian researchers (ARBU, 30 June 2025)

University	Researchers in top 25	Share of top 25
University of Zagreb	12	48.0%
University of Split	10	40.0%
University of Rijeka	1	4.0%
Catholic University of Croatia	1	4.0%
University North	1	4.0%
Total	25	100.0%

The institutional concentration documented in Section 4 reproduces sharply at the individual researcher level, and tightens further. Five institutions held 95 percent of national citation volume; two institutions hold 88 percent of the elite individual researchers. The 26 institutions outside the leading five at the institutional level account for almost no representation among the elite researchers. The single appearance of the Catholic University of Croatia, with Mate Car at position 16, illustrates a pattern that recurs at the smaller institutions: they can occasionally produce a competitive individual researcher, but they cannot easily build research depth across multiple researchers within the same institution.

5.1.2 Dominant Scientific Fields

Three fields account for 24 of the 25 positions in the Croatian top 25. Natural Sciences contributes 10 researchers, Medical Sciences contributes 9, and Engineering and Technology contributes 5. The 25th position, held by Petra Poropat at University North, is the only Social Sciences entry. The remaining three ARBU fields, Humanities and Arts, Agriculture and Forestry, and Economics, Business and Organizational Sciences, do not appear in the top 25 at all, and of the three only Economics appears in the broader top 50 list (Marina Dabic at Zagreb, position 42).

Table 8. Field distribution of the top 25 Croatian researchers (ARBU, 30 June 2025)

Field	Researchers in top 25	Share of top 25
Natural Sciences	10	40.0%
Medical Sciences	9	36.0%
Engineering and Technology	5	20.0%
Social Sciences	1	4.0%
Agriculture and Forestry	0	0.0%
Humanities and Arts	0	0.0%
Economics, Business and Organizational Sciences	0	0.0%
Total	25	100.0%

This field distribution is broadly consistent with patterns documented in citation-based rankings internationally. Medical sciences and natural sciences typically generate higher citation volumes than humanities or social sciences, partly because the fields themselves are larger and partly because of disciplinary citation conventions. The strong representation of Engineering and Technology in the Croatian top 25 owes much to the international physics collaborations involving researchers at the University of Split, several of whom appear among the top 25. The absence of Agriculture and Forestry from the top 25, despite Croatia maintaining a substantial agricultural research base centered at Zagreb, likely reflects citation conventions in the field rather than a weakness in the underlying research effort.

5.2 Croatian Researchers in the Regional Context

Broadening the comparison to the Western Balkan region as a whole produces an even more concentrated picture for Croatia. Across the regional top 25 most-cited researchers, Croatia holds 13 positions, more than any other country. Table 9 presents the country-level distribution, and Table 10 lists the regional top 25 in full.

Table 9. Country distribution of the regional top 25 most-cited researchers (ARBU, 30 June 2025)

Country	Researchers in regional top 25	Share
Croatia	13	52.0%
Serbia	5	20.0%
Slovenia	3	12.0%

Country	Researchers regional top 25	in Share
Kosovo	2	8.0%
Bosnia and Herzegovina	1	4.0%
Albania	1	4.0%
Montenegro	0	0.0%
North Macedonia	0	0.0%
Total	25	100.0%

Table 10. Regional top 25 most-cited researchers in the Western Balkans (ARBU, 30 June 2025)

#	Researcher	Country	University	Field	Citation Points
1	Marko Mikuz	Slovenia	Jozef Stefan International Postgraduate School	Uncategorized	100.00
2	Ivica Puljak	Croatia	University of Split	Engineering and Technology	91.92
3	Nikola Godinović	Croatia	University of Split	Engineering and Technology	90.03
4	Marko Kovac	Croatia	University of Split	Natural Sciences	73.62
5	Mihajlo Jakovljevic	Serbia	University of Kragujevac	Economics, Business and Organizational Sciences	53.51
6	Gani Bajraktari	Kosovo	University of Pristina	Medical Sciences	44.90
7	Petar Seferovic	Serbia	University of Belgrade	Medical Sciences	44.37

#	Researcher	Country	University	Field	Citation Points
8	Tomislav Ševa	Croatia	University of Zagreb	Natural Sciences	42.30
9	Zeljko Reiner	Croatia	University of Zagreb	Medical Sciences	39.93
10	Ozren Polašek	Croatia	University of Split	Medical Sciences	39.15
11	Mirko Planinic	Croatia	University of Zagreb	Natural Sciences	39.05
12	Shpëtim Hasallari	Kosovo	University of Applied Sciences	Economics, Business and Organizational Sciences	32.70
13	Mile Dželalija	Croatia	University of Split	Natural Sciences	32.05
14	Toni Šćulac	Croatia	University of Split	Natural Sciences	31.54
15	Samo Stanic	Slovenia	University of Nova Gorica	Natural Sciences	30.14
16	Sven Gotovac	Croatia	University of Split	Engineering and Technology	29.14
17	Nikola Poljak	Croatia	University of Zagreb	Natural Sciences	28.55
18	Linda Vicković	Croatia	University of Split	Engineering and Technology	26.80
19	Milena Ilic	Serbia	University of Kragujevac	Medical Sciences	26.29
20	Olja Dordic	Bosnia and Herzegovina	University of Banja Luka	Natural Sciences	25.50
21	Mario Šekerija	Croatia	University of	Medical	24.51

#	Researcher	Country	University	Field	Citation Points
			Zagreb	Sciences	
22	Silva Tafaj	Albania	University of Medicine of Tirana	Medical Sciences	23.13
23	Eleonora Dubljanin	Serbia	University of Belgrade	Medical Sciences	22.67
24	Irena Ilic	Serbia	University of Belgrade	Medical Sciences	21.51
25	Danilo Zavrtanik	Slovenia	University of Nova Gorica	Natural Sciences	20.73

Croatia's 13 positions out of 25 amount to slightly more than half the regional elite tier. Serbia comes second with five positions, Slovenia third with three. Two Western Balkan countries, North Macedonia and Montenegro, do not place any researcher in the regional top 25. Croatian dominance also concentrates toward the top of the list. Croatian researchers hold three of the regional top five positions, six of the top ten, and nine of the top fifteen. The deeper into the elite tier the comparison goes, the more Croatian the list becomes.

Before turning to the Croatian patterns specifically, the regional leader at position 1 deserves brief attention. Marko Mikuz of the Jozef Stefan International Postgraduate School was in 2016 head of the Department of Experimental Particle Physics at the Jozef Stefan Institute in Ljubljana and led Slovenia's ATLAS group at CERN, the parallel experiment to CMS at the Large Hadron Collider. According to a 2016 interview with Mikuz, Slovenia has participated in CERN research since the mid-1970s, and the Slovenian CERN group had produced about 800 scientific articles with about 20 000 citations by March 2015, and about 100 more articles with about 4000 more citations by the time of the interview (Cvjetović, 2016). The hyperauthorship phenomenon documented in subsection 4.3 in connection with the University of Split applies in the same way to Mikuz and his Slovenian colleagues at the top of the regional ranking. The pattern is regional rather than country-specific. Where a Western Balkan institution participates in ATLAS, CMS, or ALICE at CERN, its lead researchers benefit from the same citation amplification, and the regional ranking reflects this concentration in physics-aligned institutions.

Three further patterns are worth flagging within the Croatian contingent of the regional top 25:

1. All 13 Croatian researchers in the regional top 25 are affiliated with either the University of Split (8 researchers) or the University of Zagreb (5 researchers). Not a single researcher from Rijeka, Osijek, Zadar, the Catholic University of Croatia, University North, or any other Croatian institution appears at this level. The institutional spread,

which was already concentrated at five institutions in the country-level top 25, narrows further to two at the regional elite level.

2. Within those two institutions, Split overtakes Zagreb at the regional elite level. Split has 8 researchers against Zagreb's 5. This is a striking reversal. At the country top 25 level, Zagreb leads Split by 12 to 10. At the institutional volume level, Zagreb exceeds Split by a factor of 2.5. At the regional elite level, the order flips. The Croatian leadership story therefore depends on the unit of analysis. Total citation volume puts Zagreb first decisively. Country-elite individual researchers put Zagreb first narrowly. Regional-elite individual researchers put Split first by a wide margin.
3. The field distribution within the Croatian regional contingent narrows compared to the Croatia-only top 25. Natural Sciences contributes 6, Engineering and Technology 4, Medical Sciences 3. Social Sciences, Humanities and Arts, Agriculture and Forestry, and Economics, Business and Organizational Sciences are absent. The single Social Sciences entry from the Croatian top 25, Petra Poropat at University North, does not reach the regional threshold, indicating that the regional elite tier sits at a higher score level than the country-only tier.

The combined picture from the regional comparison can be stated cleanly. Croatia leads the Western Balkans at the system level, contributing more institutions to the regional top 12 and more researchers to the regional top 25 than any other country. Within Croatia, the leadership rests on a small number of institutions. Within those institutions, on a smaller number of fields and researchers. Each narrowing of the unit of analysis tightens the concentration further. Croatian higher education has clear peaks of research excellence visible at the regional and partial international levels. Those peaks are housed in two institutions and three fields.

6. Conclusions

This paper examined the position of Croatian higher education in 2025 using ARBU as a citation-based regional ranking instrument. The analysis was structured around two questions. Where does Croatia stand relative to its Western Balkan peers, and what does the internal structure of the Croatian system look like once the lens moves below the three institutions ranked in the major international rankings?

On the first question, Croatia is the regional leader on aggregate measures available in ARBU. The country produces 41.0 percent of all Western Balkan citations, places four institutions in the regional top 12 (Zagreb at the top with more than 4.6 million citations, Split fourth, Rijeka sixth, Osijek tenth), and contributes 13 of the 25 most-cited researchers across the region. No other Western Balkan country matches these figures. The leadership is clear on total citation volume, but it comes with a precision worth keeping in view. Croatia leads on absolute volume, not on per-faculty intensity. Slovenia produces more than double Croatia's citations per professor, generating 22.2 percent of regional citations with only 8.6 percent of regional faculty. Croatian regional leadership rests on system size and the breadth of leading

institutions, not on per-capita research intensity.

On the second question, Croatian regional leadership rests on a narrow internal base. Five institutions, Zagreb, Split, Rijeka, Osijek, and Zadar, account for 95 percent of all Croatian citations recorded in the dataset. The other 26 ranked Croatian institutions, including the entire polytechnic system and a number of specialized colleges, contribute the residual 5 percent. The concentration is not a feature of any single dimension. It is visible in total citation volume and in the institutional affiliation patterns of the top 25 most-cited Croatian researchers, while the efficiency and field rankings reorder the institutions below the top. It tightens further at the regional elite level: of the 13 Croatian researchers in the Western Balkan top 25, all are based at either Split or Zagreb. At the elite level, Split overtakes Zagreb, reversing the volume ordering. The same shape of concentration appears one analytical level above as well. Within the Western Balkans as a whole, three countries (Croatia, Slovenia, Serbia) account for 84.5 percent of regional citations. The pattern is the same shape at different scales.

These findings have implications for Croatian higher education policy and for cross-country comparative work. The Croatian higher education system operates a tiered structure in practice, regardless of how formal classifications treat institutions. Three policy questions follow. The first is whether the long tail of small institutions adds value commensurate with the resources they consume, or whether some form of consolidation, specialization, or restructuring might better support the country's research output. The second is whether Croatia would benefit from formally recognizing the tier distinctions that already exist, allowing concentrated research investment to flow more deliberately toward the leading institutions. The third is whether Zagreb and Split, which already dominate the regional elite tier, could anchor cross-border research networks across the Western Balkans, building regional research depth that no single national system can produce alone.

For Croatia, the coordinate position is clear. The country leads the Western Balkans on volume, holds a narrow internal elite, and the two facts together describe the system more accurately than either does alone.

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