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ARTIFICIAL INTELLIGENCE AS A STRENGTHENING TOOL AT GRADUATION, MEASURING THE QUALITY OF STUDENTS OF THE DEGREE IN TOURISM AT THE ROSARIO CASTELLANOS UNIVERSITY

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Abstract: In the current educational context, the search for effective strategies to improve the graduation and graduation rates of Higher Education Institutions (HEIs) has become a need for priority attention, since taking into consideration, the responsibility that universities have to provide a quality education that contributes to the personal and professional development of its students, in light of which the National Association of Universities and Higher Education Institutions (ANUIES, 2023) indicates that one of the main challenges faced by these institutions is the decrease in graduation rates. graduation, which not only affects students, but also society as a whole, given this direct relationship between higher education and improved quality of life. Artificial Intelligence (AI) has emerged as an innovative tool that can address these challenges effectively and efficiently through the implementation of advanced technologies such as decision trees, making it possible to identify patterns in the academic performance of students, allowing a personalized monitoring that encourages autonomous and self-directed learning focused on the needs of each student. Therefore, this research focuses on the Bachelor of Tourism (LTUR) at the Rosario Castellanos University (URC), where the behavior of the degree indices is analyzed from a quantitative approach and the context of this educational institution is analyzed qualitatively, as well as the composition of the educational program of the degree under study to form the structure of the AI tool that will improve graduation rates and measure the educational quality of LTUR students at the URC.

Keywords: Rosario Castellanos University, Artificial Intelligence, Graduation, Educational quality, Bachelor of Tourism

INTRODUCTION

Higher Education Institutions (HEIs) have the function of contributing to the improvement of personal improvement through the granting of university degrees, confirming highly specialized education and training (Morales & Echeverría, Ivonne, 2022), however, to achieve effective and efficient its fundamental objective of improving its educational quality, universities face great challenges, among which the difficulty in achieving high graduation rates stands out, which has become a priority according to the National Association of Universities and Higher Education Institutions (ANUIES)., 2023).

The universities must align their efforts with those of the fourth Sustainable Development Goal (SDG), which seeks to "Ensure inclusive, equitable, quality education and promote lifelong learning opportunities for all (United Nations, 2015); Therefore, this research focuses on the analysis of the benefits of the Implementation of Artificial Intelligence (AI) that through decision trees to strengthen upon graduation, measurement of the quality of the students of the Bachelor of Tourism (LTUR) of the Rosario Castellanos University (URC) and its importance lies in the need to evaluate and improve the quality of the teaching-learning process of the LTUR students of the URC, through the proposal of an AI tool that It will allow the institution not only to remain at the forefront of technological innovation, but also to contribute significantly to the measurement and continuous improvement of educational quality through the implementation of AI that, with the use of decision trees, could facilitate personalized monitoring. to students, improve efficiency in the management of academic processes, as well as increase graduation and graduation rates; for which the following question is raised below.

HOW CAN THE IMPLEMENTATION OF AN AI TOOL IMPROVE GRADUATION RATES AND MEASURE THE EDUCATIONAL QUALITY OF URC LTUR STUDENTS?

ARTIFICIAL INTELLIGENCE IN EDUCATION

The constructivist theory of Piaget and Vygotsky indicates that learning is not obtained passively but actively and allows the student to be placed at the center of their training, the development of skills, competencies and knowledge, promoting autonomous learning in students, which which can be achieved through the use of facilitating tools such as the AI case, which UNESCO (2021) assures that they allow innovation in teaching-learning practices and accelerate progress towards achieving the fourth SDG "Ensure inclusive, equitable and sustainable education." of quality and promote lifelong learning opportunities for all (United Nations, 2015) allows protecting well-being and guaranteeing access to continuous learning and aspires to the mobilization of resources to provide solutions appropriate to the context to provide education to distance that leverage high-, low- and no-tech approaches (UNESCO, 2020).

Currently there are applications and pages that implement AI for educational purposes such as: Chat GPT, Perflexity, Parafrasear.org, SlidesAI, Redactame, Quillbot, Tome.app, Grammarly, Quizlet, among many others; some of them allow the writing of essays, documents, presentations, summaries, acquisition of knowledge, etc.; questioning the functionality and ethical use of these, generating debate among education actors in this regard since while it is true that there are some that limit the generation of competencies and skills in students, there are also some others that adhere to the 5 transversal recommendations generated in the Beijing UNESCO Consensus held from March 16 to 18, 2019, which are: promote equitable and inclusive use of AI in education; an AI that respects gender equality and favors gender equality; ensure ethical, transparent and verifiable use of education data and algorithms; monitoring, evaluation and research (UNESCO, 2021).

DECISION TREES

Decision trees are a graphic and analytical representation of the possible results of a series of decisions related to each other (Fundación Carlos Slim, 2024). Their structure is composed of decision nodes represented by a box that indicate decisions that must be made; probability nodes represented by circles that reflect multiple results on the main topic (Fundación Carlos Slim, 2024) branches where these "represent the paths that lead to decision making and its consequences (Hernández Castelán, Ortega Ramírez, & Portilla Tirado, 2016) in addition to being the existing connections between decisions and events and finally the nodes of results represented by triangles that are the consequences of the decisions or events chosen (Fundación Carlos Slim, 2024); Therefore, according to Díaz, Meleán and Marín (2021) they indicate that given their structure, they are useful tools for analyzing complex data and making informed decisions through data mining, allowing facts and data relationships to be described, with little human intervention., since it is capable of finding patterns, determining, storing, reusing and establishing rules, which information is presented to the end user for decision making.

ROSARIO CASTELLANOS UNIVERSITY (URC)

The Rosario Castellanos University (URC) has 7 Academic Units: Azcapotzalco, Coyoacán, Gustavo A. Madero, Justo Sierra, Magdalena Contreras, Casco de Santo

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Tomás and Distance Degree Degrees; 6 sub-headquarters in coordination with the network of Pilares, Euzkadi, Familia Juárez Maza, Oceanía, Herrerías, Olímpica Casa de Cultura, Tierra Unida (Universidad Rosario Castellanos, 2024), its educational offer is made up of 3 Higher University Technical Programs, 23 bachelor's programs, 6 specialties, 7 master's degrees and 3 doctorates (Rosario Castellanos University, 2023)[b].

Its Educational Models are: Dual Hybrid, Hybrid In-Person and Hybrid Distance, its approach is based on the resolution of prototypical problems, with regard to its educational population it is known according to its numeralia of the first quarter of the year 2024, the URC had a total enrollment of 46,304 students (29,262 women and 17,042 men), 45,254 of them in Bachelor's degrees (28,659 women and 16,595 men), 1,050 Post-graduation students (603 women and 447 men) and a total of 3,457 undergraduate and Post-graduation students (1,250 men and 2,207 women) 3,160 bachelor's degree graduates (1,118 men and 2,042 women) 2,814 in-person-hybrid degree graduates (966 men and 1,848 women) 305 distance-hybrid degree graduates (136 men and 169 women) 41 bachelor's degree graduates from the 3-2-3 program (16 men and 25 women) 255 Post-graduation students (115 men and 140 women) 42 graduates from the Higher University Technician programs (17 men and 25 women); (Universidad Rosario Castellanos, 2024) it is finally known that there have been 1,229 definitive withdrawals from training programs.

Bachelor's degree (416 men and 813 women) (Rosario Castellanos University, 2024).[c]

BACHELOR OF TOURISM (LTUR)

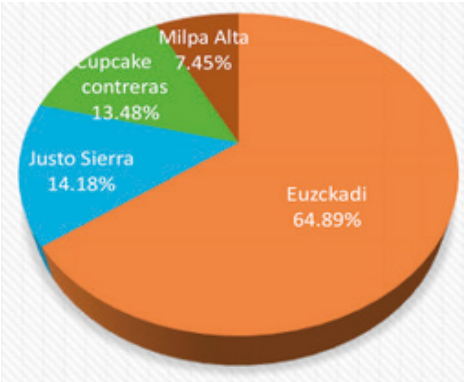
The Bachelor of Tourism (LTUR) of the URC of the dual hybrid modality and hybrid presence program, aims to train professionals who know and clearly understand how the elements that make up Tourism operate (Companies, Institutions, etc.), and who live that reality closely, for its incorporation in a flexible way towards the environment, dynamically contributing fresh and original ideas to the tourism sector, with the capacity for Analysis for the best Decision Making that a professional in this field requires (Institute of Higher Studies from Mexico City Rosario Castellanos, 2020)[b].

On the other hand, as can be seen in table 1 and graph 1, in the first semester of 2024 LTUR has a population of 282 students, 183 in the Euzkadi Academic Sub-Headquarters (64.89%), 40 in the Justo Sierra Headquarters (14.18%), 21 in the Tierra Unida Magdalena Contreras Sub-Headquarters (13.48%) and 21 in the Milpa Alta Sub-Headquarters (7.45%).

Distribution by headquarters	Number of students
Euskadi	183
Justo Sierra	40
Magdalena contreras	38
Milpa Alta	21
Total	**282**

Table 1 Distribution of the LTUR student population

Source: Author Information



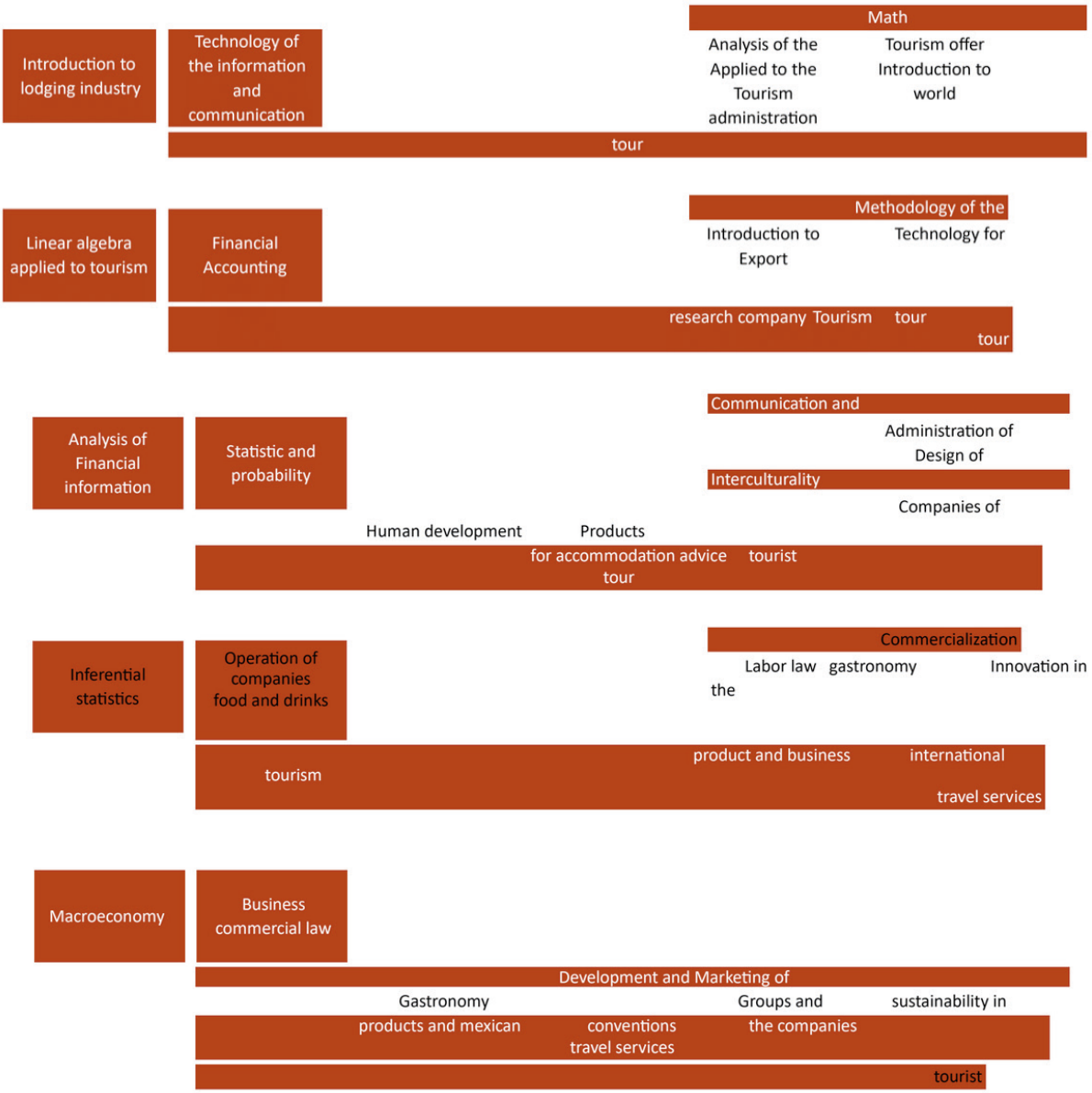
Graph 1 Distribution of the LTUR Student Population by Campus

Source: elaborated by the author

BACHELOR'S PROGRAM IN TOURISM (LTUR) 2020

The 2020 LTUR program of the URC is made up of a total of 47 subjects (see graph 2) organized in blocks of 6 for semesters 1 to 7 and 5 for semester 8, the subjects of this degree are divided into 4 axes or areas: administrative mathematics, tourism business, social communication and IRC common subjects (graph 3) where CA nomenclature refers to the character of the signature, being OB (Mandatory) and OP (Optional Mandatory by Choice); HD identifies the hours of teaching, in-person and/or virtual; IT requires independent work hours; EP reflects the hours of professional work stays; and CR that shows the credit load.

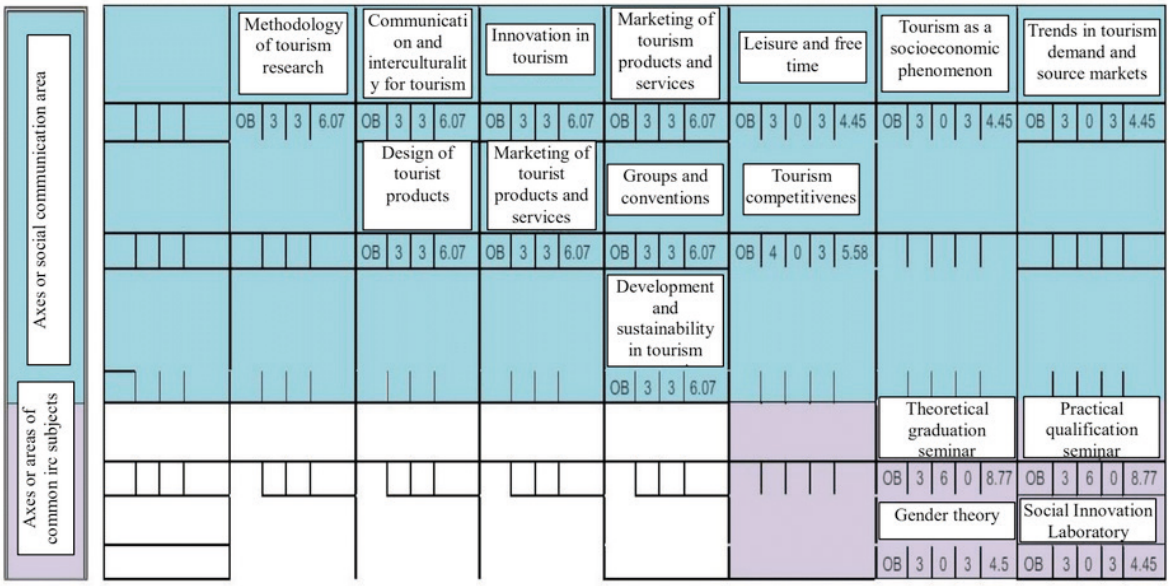
In the LTUR 2020 program, students must obtain a total of 317.22 credits, 277.62 of them from subjects, 9.60 from social and 30.00 from degrees.



Graph 2 Curriculum of the Bachelor's Degree in Tourism

Source: own elaboration based on the Institute of Higher Studies of Mexico City Rosario Castellanos (2020)

Formative Area	1 Semester	2 Semester	3 Semester	4 Semester	5 Semester	6 Semester	7 Semester	8 Semester
Axes or administrative mathematical area	Introduction to Accounting OB 3 3 6.07	Linear algebra applied to tourism OB 3 3 6.07	Financial information analysis OB 3 3 6.07	Inferential statistics OB 3 3 6.07	Macroeconomy OB 3 3 6.07	Tourist economy OB 3 0 3 4.45		Costs and budgets OB 4 0 3 5.58
	Mathematics applied to tourism management OB 3 3 6.07	Financial Accounting OB 3 3 6.07	Financial Accounting OB 3 3 6.07			Operative administration OB 4 0 3 5.58	Evaluation of tourism projects OB 4 0 3 5.58	
		Introduction to the OB 3 3 6.07						
Axes or tourist business areas	Introduction to the hospitality industry OB 3 3 6.07		Administration of accommodation companies OB 3 3 6.07	Operation of food and beverage companies OB 3 3 6.07		Human factor management OB 3 0 3 4.45		
	Information and communication technologies OB 3 3 6.07	Technology for tourism OB 3 3 6.07	Human development OB 3 3 6.07	Corporate labor law OB 3 3 6.07	Corporate commercial law OB 3 3 6.07	Quality processes OB 4 0 3 5.58	Strategic management of companies OB 4 0 3 5.58	Organizational audit OB 3 0 3 4.45
	Tourism analysis OB 3 3 6.07	Tourist export OB 3 3 6.07					Emotional intelligence OB 3 0 3 4.45	Emotional intelligence in the company OB 3 0 3 4.45
	World tourism offer OB 3 3 6.07			International gastronomy OB 3 3 6.07	Mexican gastronomy OB 3 3 6.07			



Graph 3 Curriculum map of the LTUR Study Plan

Soruce: Institute of Higher Studies of Mexico City Rosario Castellanos (2020)

Institutions and schools 2020			Tuition 2021			Graduation 2020			Title 2020			Professional certificates in 2019	
		Crecimiento 2019-2020			Crecimiento 2020-2021			Crecimiento 2019-2020			Crecimiento 2019-2020		
Institutions	4,134	5.14%	Total	5,069,111	1.24%	Total	892,912	4.34%	Total	569,128	8.19 %	Total	378,134
Schools	6,632	4.65%	Men	2,354,782	-0.96%	Men	396,133	0.96%	Men	249,912	4.18%		
			Women	2,714,329	3.23%	Women	496,779	7.21%	Women	319,216	11.55 %		
			with Disabilities	59,749	22.83%	with Disabilities	6,960	-2.93%	with Disabilities	3,717	22.79 %		
			Speakers of indigenous language	61,182	4.82%								

Table 2 Statistics on Higher Education in Mexico (Undergraduate and Post-graduation)

Source: Ministry of Public Education (sf)

ANALYSIS AND RESULTS

GRADUATION AND QUALIFICATION FROM HIGHER EDUCATION INSTITUTIONS

For the Integrated Higher Education Information System (SIIES) in Mexico, there are 10,766 schools in Institutions, with a total enrollment of 5,069,111 students (2,714,329 women and 2,354,788 men), in relation to graduation in 2020, a total of 892,912 was achieved (496,779 women and 396,133 men), the 2020 graduation was 569,128, of which there are 319,216 women and 249,912 men (table 2), so considering the previous information it can be inferred that 17.6% of the enrollment (9.8% women and 7.8% men) only 11.2% manage to graduate and graduate (6.3% women and 4.9% men). hex

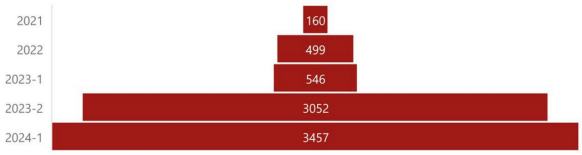
In the case of universities in Mexico City, the National Association of Universities and Higher Education Institutions (ANUIES) reported in 2021-2022 an enrollment of 727,898 University and Technological Degree students, 374,303 are women and 353,595 men; income was 140,565 (74,728 women and

65,837); In relation to discharges, it has a total of 93,941 of which 50,369 women and 43,572 men (ANUIES, 2023); It can be inferred that 21.98% enter annually (11.81% women and 10.16% men) and only 15.74% graduate (8.55% women and 7.20% men).

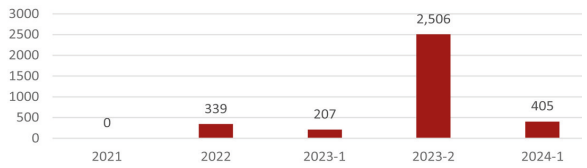
Given the national and Mexico City statistics, it is important to take relevant actions to promote graduation and qualifications in universities, in order to fulfill its objective of contributing to the improvement of people's living conditions through granting of university degrees, confirming the receipt of highly specialized education and training (Morales & Echeverría, Ivonne, 2022).

GRADUATES AND DEGREES AT THE URC

Considering the data obtained from the numeralia from 2021 to 2024 published on the institutional page (Universidad Rosario Castellanos, 2024), it is known that in 2021 the URC graduated its first 160 students and currently the URC has a total of 3,457 graduates (see graph 4), in graph 5, the annual evolution of these can be seen separately, obtaining that from 2021 to 2022 there was a growth of 5.8%, while for 2023-1 there was a drop at 6% of graduation, however, the highest percentage of graduates occurs in the second semester of 2023 with 72.5% and a decrease for the first quarter of 2024 with 11.7%.

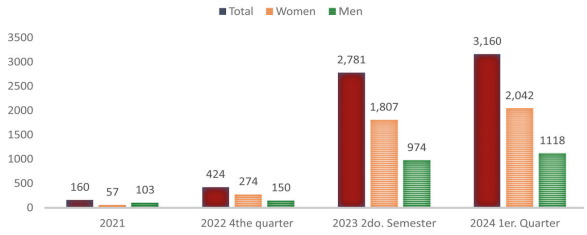


Graph 4 Total URC graduates 2021-2024
Source: Own elaboration based on URC numeralia (2024)[d]



Graph 5 Segregation of URC graduates 2021 to 2024
Source: Own elaboration based on URC numeralia (2024)[d]

In relation to bachelor's degrees, a total of 3,160 graduates are obtained, and it can be highlighted that, except for the year 2021, the rest of the periods the URC has graduated mainly women with a total of 65% of the total graduates by 2024-1 (see graph 6).



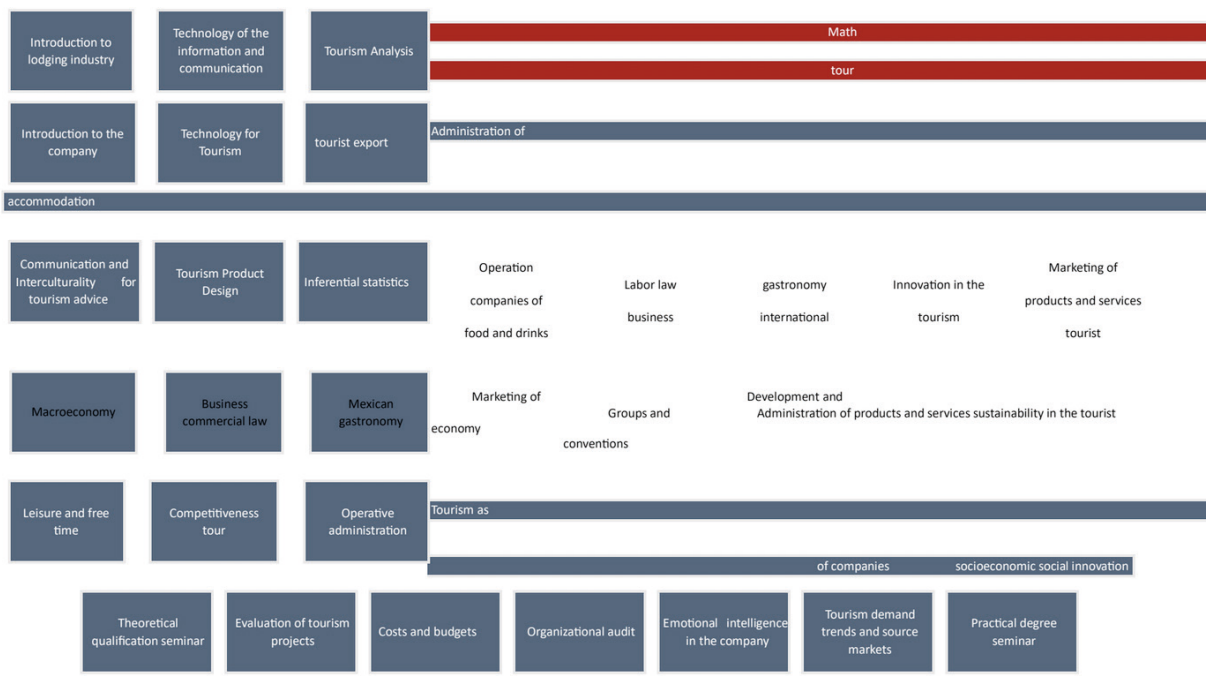
Graph 6 Total graduations from URC degree programs
Source: Own elaboration based on URC numeralia (2024)[d]

ARTIFICIAL INTELLIGENCE TOOL PROPOSAL

Considering the context of operation of the IRC, with the data obtained from the instrument applied to the LTUR Students, as well as the needs detected by ANUIES and the opportunities identified by the United Nations and UNESCO for innovation and promotion of compliance with the fourth SDG, it is proposed to generate an AI tool to strengthen the graduation, qualification and quality measurement of LTUR graduates from the URC through the implementation of decision trees and supported by continuous and individualized adaptive microlearning, where each node of The decision will be made up of each of the 47 subjects that make

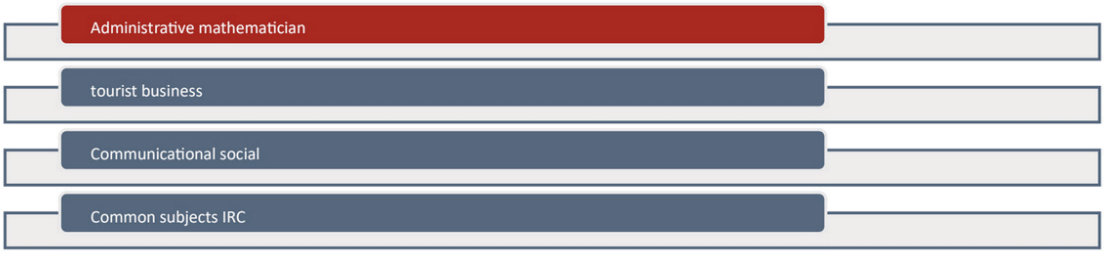
up the LTUR program, where the branches that emerge from these nodes are the themes and subtopics of each subject formulated in CENEVAL-type questions based on the 6 levels of Bloom's taxonomy (remember, understand, apply, analyze, evaluate and create), which will allow the tool to identify deficiencies and predict knowledge gaps, ensuring an efficient individualized and self-directed learning process through the support of multimedia resources, which autogenerates personalized training sessions to repair those knowledge gaps; that encourages interaction with peers and instructors, incorporating Social Learning (SA), which monitors, analyzes and improves performance in real time.

The above may be applicable for students who have subjects pending accreditation, such as mathematics applied to tourism administration (graph 7), for those who require support by area of knowledge, for example, the integrated administrative mathematical area (graph 8). by subjects: Introduction to accounting (1st semester), Applied Mathematics to tourism administration (1st semester), Linear algebra applied to Tourism (2nd semester), Financial accounting (2nd semester), Introduction to business (2nd semester) Analysis of financial information (3rd semester), Statistics and probability (3rd semester) Inferential statistics (4th semester), Macroeconomics (5th semester), Tourism economics (6th semester) Operations management (6th semester). semester) Evaluation of tourism projects (7th semester) Costs and budgets (8th semester) as represented in graph 9, as well as for students who require reinforcement of a full semester (graphs 10 to 17), for those who already have the total number of credits taken to measure and evaluate the knowledge, skills, attitudes and values of the graduates and for those who wish to obtain the degree through this graduation proposal (graph 18).



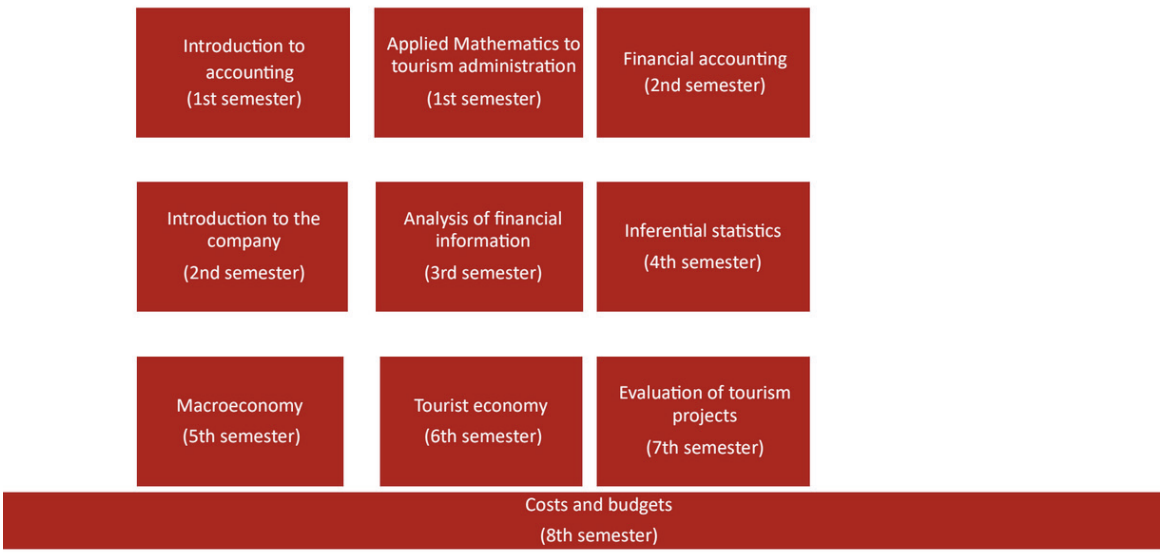
Graph 7 Reinforcement by subject of the LTUR 2020 Program

Source: own elaboration based on the Institute of Higher Studies of Mexico City Rosario Castellanos (2020)



Graph 8 Reinforcement by knowledge area of the LTUR 2020 program

Source: elaborated by the author



Graph 9 Subjects in the area of administrative mathematical knowledge

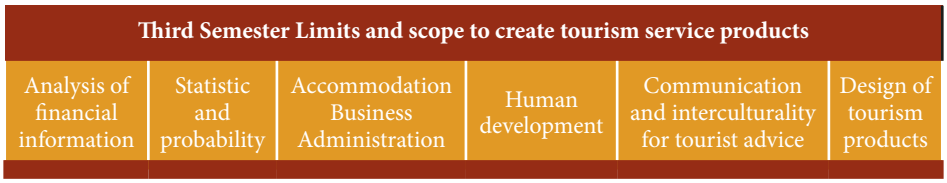
Source: elaborated by the author

Graph 10 Subjects of the First Semester of the LTUR 2020 Program

Source: elaborated by the author

Graph 11 Subjects of the Second Semester of the LTUR 2020 Program

Source: elaborated by the author



Graph 12 Subjects of the Third Semester of the LTUR 2020 Program

Source: elaborated by the author

Graph 13 Subjects of the Fourth Semester of the LTUR 2020 Program

Source: elaborated by the author

Graph 14 Fifth semester subjects of the LTUR 2020 Program

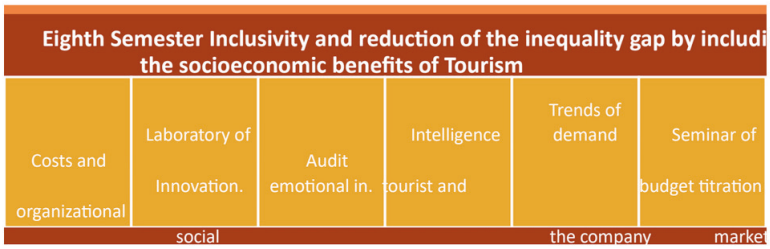
Source: elaborated by the author

Graph 15 Subjects of the Sixth Semester of the LTUR 2020 Program

Source: elaborated by the author

Graph 16 Subjects of the Seventh Semester of the LTUR 2020 Program

Source: elaborated by the author



Graph 17 Subjects of the Eighth Semester of the LTUR 2020 Program

Source: elaborated by the author

Graph 18 Comprehensive reinforcement for quality measurement and graduation for the LTUR Program

Source: own elaboration based on the Institute of Higher Studies of Mexico City Rosario Castellanos (2020)

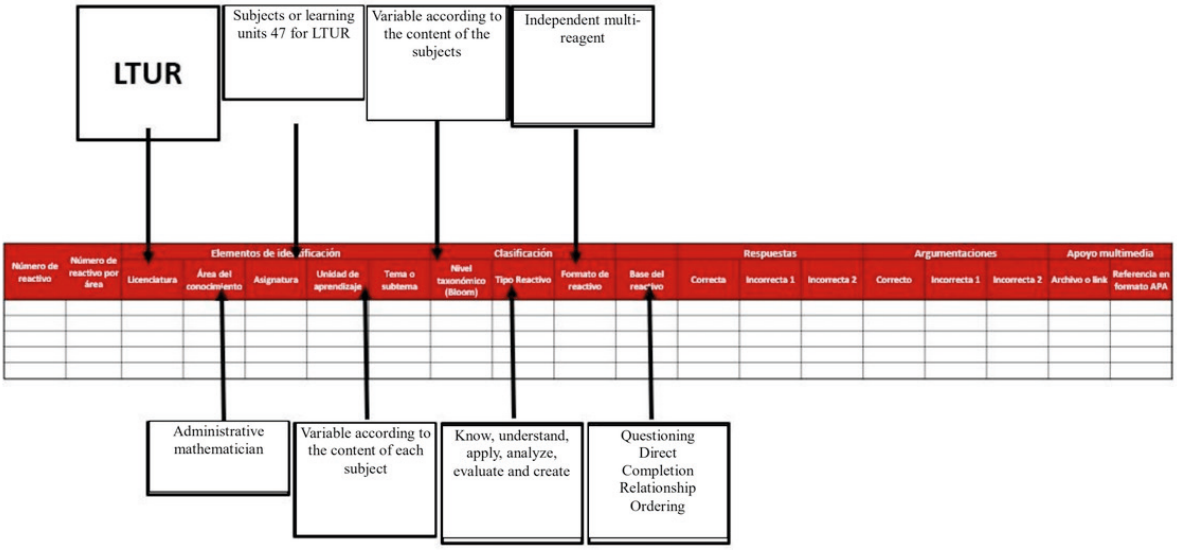
In a database structured as a spreadsheet in the Excel program, the reagents will be concentrated in a Ceneval-type format (table 3), which will be completed considering the identification elements of the reagent: Bachelor's degree, area of knowledge, subject (graph 19), learning unit, topic or subtopic; in addition to considering the classification in relation to the type of reagent it contemplates: taxonomic level, type and format of reagent; Subsequently, the base of the reagent is integrated, followed by the answers 1 correct and 2 incorrect, as well as the arguments for the answers, and finally a multimedia file is integrated (graph 19).

The proposed tool allows the generation of a platform where the student has 24/7 access and to optimize their learning, by being an active protagonist; marking a difference from traditional learning platforms. AI generates algorithms that eliminate content dominated by the student and only leave the topics that require study; while the URC obtains information such as: degree,

Número de reactivo	Número de reactivo por área	Elementos de identificación					Clasificación				Respuestas			Argumentaciones			Apoyo multimedia	
		Licenciatura	Área del conocimiento	Asignatura	Unidad de aprendizaje	Tema o subtema	Nivel taxonómico (Bloom)	Tipo Reactivo	Formato de reactivo	Base del reactivo	Correcta	Incorrecta 1	Incorrecta 2	Correcto	Incorrecta 1	Incorrecta 2	Archivo o link	Referencia en formato APA

Table 3 Reagent bank worksheet

Source: elaborated by the author



Graph 19 Reagent bank worksheet with specifications

Source: elaborated by the author

Bachelor's Degree	Registration	Student name	Email	Start date of the reinforcement program	Last access date of the reinforcement program	Type of reinforcement	Reinforcement program key	Number of reinforcement programs carried out	Number ofactive reinforcement programs	Number of inactive reinforcement programs	Number of reinforcement programs in critical state	Number of student sessions in the reinforcement system	Total student sessions in the reinforcement system	Correct interactions	Incorrect interactions	Average questions per day	Average questions per week	Average questions per month	Average questions per session

Table 4 Data from the application of the reinforcement program for LTUR

Source: elaborated by the author

enrollment, student name, email, start date of the reinforcement program, date of last access to the reinforcement program, type of reinforcement (subject, knowledge area, semester, measurement of quality and exit), key of the reinforcement program, number of reinforcement programs carried out, number of active reinforcement programs, number of inactive reinforcement programs, number of reinforcement programs in critical state, number of student sessions in the system of reinforcement, total student sessions in the reinforcement system, correct interactions, incorrect interactions, average number of questions per day, average number of questions per week, average number of questions per month and average number of questions per session; providing statistical data that will allow institutional authorities to make effective and efficient decisions (see table 4).

Likewise, this tool can be implemented as an innovative form of qualification based on knowledge obtained, which could contribute to reducing the problems of graduation and qualification from universities, especially from the URC; same that could be implemented to all URC degree programs.

CONCLUSION

The use of AI in education will not only allow the URC to stay at the forefront by implementing innovative and cutting-edge technological tools, but will also allow it to align with the SDGs, but also promotes inclusive and quality education. which fully meets its objectives of "training competent professionals, suitable for the application and generation of knowledge that provides them with the skills to solve problems, with critical thinking, ethical sense, entrepreneurial attitudes, innovation and creative capacity, which incorporate the scientific and technological advances for the development of Mexico City" and "Promote the development and use of information and communication technologies, to support student learning, expand their life skills and promote their insertion in the society" (Rosario Castellanos University, 2024[f]).

On the other hand, the implementation of AI, specifically through decision trees, has a high potential to significantly transform the educational landscape of the URC, since by addressing the challenges of universities with low graduation and degree rates, given that the tool proposed by this research can facilitate the autonomous learning of LTUR students with 24/7 access where the student optimizes their learning by being an active protagonist of it; marking a difference from traditional learning platforms since AI through decision trees using algorithms eliminates content dominated by the student and only leaves the topics that require study,

Furthermore, this AI tool is presented as an opportunity replicable to any of its 3 Higher University Technical Programs, 23 bachelor's programs, 6 specialties, 7 master's degrees and 3 doctorates (Universidad Rosario Castellanos, 2023)[b], in its different study modalities (Dual Hybrid, Hybrid In-Person and Hybrid Distance), which will also allow the educational entity to improve the efficiency of academic management given its ability to monitor and analyze academic performance in real time, which will provide teachers and administrators with valuable information for the decision making, thus improving the academic management of the URC.

Finally, the experience accumulated in the implementation of this AI tool can serve as a model for other universities that face similar challenges, promoting positive change in Higher Education in Mexico.

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