The development of the LGBT+ University Inclusion Index and its application to Italian universities

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Abstract

This paper outlines an index of LGBT+ inclusion for Universities. The index has a twofold aim: to help tertiary education institutions to assess their degree of inclusiveness, and to detect the level of LGBT+ inclusion in tertiary education. Starting from the existing LGBT+ inclusion indices like the Campus Pride Index and LGBT+ Inclusive Education Index, the LGBT+ inclusive university index refers to an extended set of indicators and is based on Fuzzy rule-based systems of the Mamdani-Assilian type to measure inclusiveness.

Best practices in LGBTI+ inclusion, implemented by Italian universities and identified in this study, are highlighted with the aim of suggesting and recommending guidelines helpful to fighting homo-bi-transphobic discrimination in higher education institutions.

Keywords

Fuzzy rule-based systems; Mamdani-Assilian; LGBT+ University Inclusion Index; monotonicity.

1. Introduction

This paper investigates the capacity of universities to favour LGBT+ inclusion in academic life and is intended to contribute to the growing literature on the evaluation of the degree of inclusiveness of higher education institutions. Evaluating the degree of LGBTQI+ inclusion can also contribute to strengthening diversity in tertiary education institutions with multifaceted benefits on the learning environment, the students' learning experience and the prevention of stereotypes, cultural awareness and political participation with positive spillover effects on society [1][2].

In order to measure LGBT+ inclusion, we selected a set of indicators and elaborated a model by using fuzzy rule-based systems of the Mamdani-Assilian type [3][4] that will allow each university to assess its degree of LGBT+ inclusiveness. We then applied the model to measure the degree of LGBT+ inclusion of Italian universities. The choice of Italian universities is related both to their long historical tradition and their established place in the cultural life of the country (see e.g. the University of Bologna, founded in the eleventh century) and to the recent implementation of policies to enhance LGBT+ inclusion. Moreover, the Italian system is based mainly on public Universities, and University rankings have been published in the media for many years. However, in University rankings the LGBT+ inclusion dimension is overlooked.

To fill this gap, we carried out a survey of the 58 Italian public universities to identify the practices implemented to facilitate LGBT+ inclusion. The survey was carried out in March and April 2019 collecting the indicators to measure LGBT+ inclusiveness in universities with the support of six LGBT+ (or allied) student unions and in line with other relevant LGBT+ inclusion indices: Campus Pride Index and LGBT+ Inclusive Education Index [5][6][7]. The response rate was 100 per cent and

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data-processing started in May 2019. Fuzzy rule-based systems of the Mamdani-Assilian type [3][4] were adopted to develop the LGBT+ Inclusive University Index and to construct the first national ranking of public universities with regards to the level of LGBT+ inclusion. Finally, best practices in terms of the inclusion of sexual minorities, implemented by Italian universities and identified in this study, will be highlighted with the aim of suggesting and recommending guidelines to counter homotransphobic behaviour.

2. The fuzzy rule-based system

Fuzzy rule-based systems of the Mamdani-Assilian type [3] [4] were adopted to develop the LGBT+ Inclusive University Index and to draw up the first national ranking of public universities relating to the level of LGBT+ inclusion. The system identifies the fuzzy logic inference flow from the input variables to the output variables. The fuzzification in the input interfaces translates crisp inputs into fuzzy values. The fuzzy inference takes place in rule blocks that contain the linguistic control rules. The outputs of these rule blocks are linguistic variables. The final defuzzification in the output translates fuzzy variables into crisp numbers. Figure 1 shows the structure of the fuzzy rule-based system including the input interface, the rule blocks and the output interface. The connecting lines symbolise the data flow.

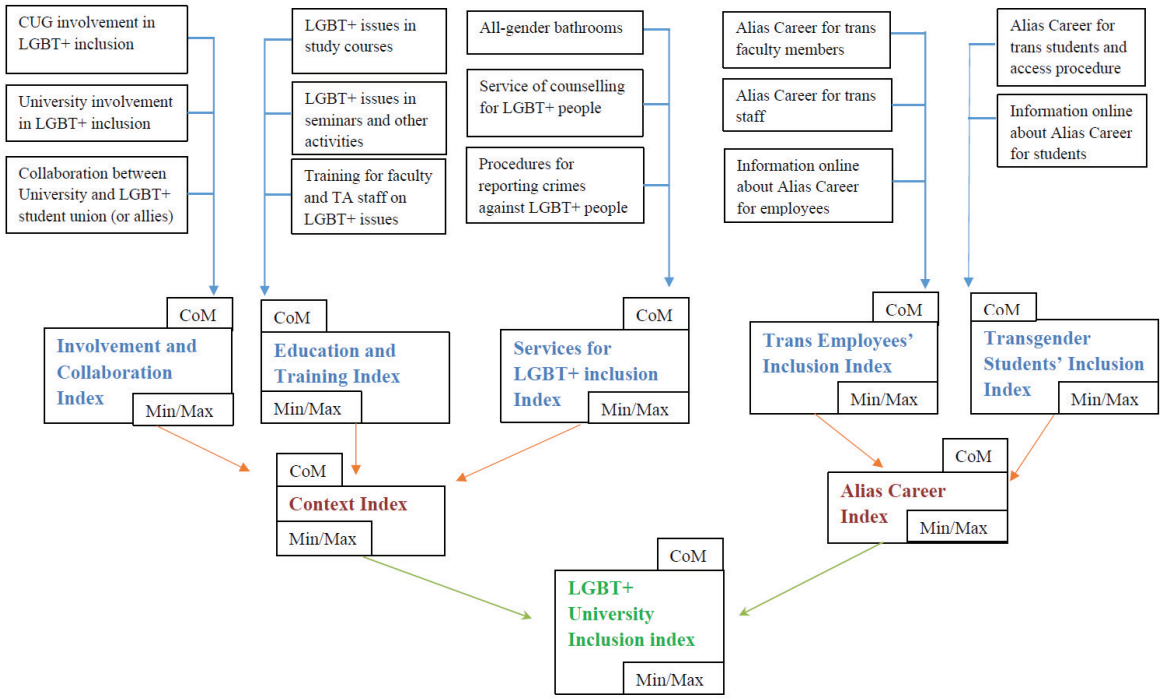

Figure 1: System layout of LGBT+ University inclusion index

The data used in the analysis is a questionnaire consisting of 14 questions relating to two main issues: the context and the Alias Career in each university in the academic year 2018-2019. The survey of the Equal Opportunities Bodies of 58 Italian public universities was carried out in March-April 2019. The questions in the survey were answered on a scale from 1 to 4, with 1 corresponding to the minimum level of inclusion and 4 to the maximum, to enable respondents to easily understand the ordinal scale. We defined the Base Variable Range of our initial inputs with values from 1 to 4. The only exception was for the Bathrooms and Crime Reporting variables that are defined on a scale of 0-1, representing non-availability or availability, respectively. Linguistic variables are used to translate real values into linguistic values.

All the inputs (with the exception of Bathrooms and Crime Reporting variables that are dichotomous) are described by three linguistic attributes: low, medium, high. Each input variable of the fuzzy rule-based system is described by three triangular fuzzy numbers representing the values low, medium and high. On a scale from 1 to 4 we chose the low triangular fuzzy number to be represented

by the triplet (1, 1, 2.5), the medium triangular fuzzy number to be represented by the triplet (1, 2.5, 4), and the high triangular fuzzy number to be represented by the triplet (2.5, 4, 4). It is important to point out that these values are useful for determining the membership values (ranging from 0 to 1) of each input in our fuzzy system. Answers are coded in an equidistant way on the membership scale (0, 1/2, 2/3, 1) and represents a similar improvement in the criterion. The individual answers are designed in such a way as to contribute to marginal improvement in the same way and are able to generate weights in a transparent manner. Whenever we go up one step in the scale we also go up one step in the criterion improvement. Moreover, when one variable is improved by one step, the final ranking of the University improves. The initial values 1, 2, 3, 4 are never used in the system. The cardinal scale used provides for the same distance among the elements.

For the binary variables *Bathrooms* and *Crime Reporting*:

If they are not present then the membership degree is 1 in "false" and 0 in "true" i.e. "not present" is associated with the vector (1, 0);

If they are present then the membership degree is 0 in "false" and 1 in "true" i.e. "present" is associated with the vector (0, 1).

The first level of intermediate variables is described by five linguistic attributes: low, medium_low, medium, medium_high, high. The second level of intermediate variables is described by seven linguistic attributes: very_low, low, medium_low, medium, medium_high, high, very_high. The LGBT+ University Inclusion Index is described by nine linguistic attributes.

The rule blocks contain the control strategy of a fuzzy rule-based system. The 'if' part of the rule describes the situation for which the rules are designed. The 'then' part of the rule describes the response of the fuzzy system in this situation. The degree of support (DoS) is used to weight each rule according to its importance.

The processing of the rules starts with calculating the 'if' part. The operator type of the rule block determines which method is used. We choose the MIN operator of aggregation for the 'if' part and the MAX operator of aggregation for the 'then' part to enable all firing rules to be evaluated. Furthermore, we adopt the Centre of Maximum (CoM) method for the defuzzification, resulting in the 'best compromise' method.

3. Results

We applied our Fuzzy rule-based systems of the Mamdani-Assilian type [3][4] to 58 Italian public universities. In Table 1 we report the final ranking. For each University, we also show the evaluation of the two intermediate outputs (Context and Alias Career) and on each intermediate variable (Services, Education and Involvement for the Context dimension and Students' Alias Career and Employees Alias Career for the Alias Career dimension. In this way, each dimension and intermediate output can be evaluated. The last column shows the LGBT+ University Inclusion Index ranking.

We are aware of the need to be careful in the interpretation of the results of the multi-layer fuzzy rule-based system. Given the lack of mathematical results on monotonicity for hierarchical models, we follow as far as possible the guidelines for non-hierarchical models (such as verifying the smoothness and the monotonicity of the fuzzy rule-based system). However, our findings are consistent with our experiential knowledge of the national university scenario.

The last five universities in Table 1, highlighted in red, are those that do not have any protection for LGBT+ inclusion (Catanzaro, Cassino, Reggio Calabria, Teramo, Molise). On the other hand, the University of Verona tops the ranking thanks to the Alias Career index. In fact, it has a Non-disclosure Agreement and publicises the Alias Career on the university website (Alias Career Inclusivity Index: 100/100). Moreover, thanks to the work of the Research Centre PoliTeSse of Politics and Theories of Sexuality, seminars, conferences and workshops on LGBT+ issues are regularly held, often with the collaboration of LGBT+ associations, and a counselling service for LGBT+ people is present. Currently no all-gender bathrooms are available and no staff training courses on LGBT+ inclusion are held (Context Index: 55.56/100).

The University of Basilicata was the first university in Italy to adopt a Non-disclosure Agreement on 18 May 2019, and like the University of Verona, it has a score of 100/100 in the Alias Career Index.

Table 1

LGBT+ University Inclusion Index – Ranking 2018/2019

Universities	Services index	Education index	Involment index	CONTEXT index	Trans Students Inclusion index	Trans Employees Inclusion index	ALIAS CAREER index	LGBT+ incusion index
Verona	75.00	58.33	58.33	55.56	100.00	100.00	100.00	66.67
Basilicata	75.00	16.67	83.33	55.56	100.00	100.00	100.00	66.67
Napoli Federico II	25.00	100.00	50.00	66.67	39.81	31.25	33.98	58.33
Torino	50.00	75.00	68.75	72.22	50.00	0.00	33.33	54.17
Pisa	75.00	50.00	75.00	66.67	44.14	0.00	29.43	51.34
Padova	50.00	16.67	91.67	61.11	50.00	0.00	33.33	50.00
Perugia	0.00	41.67	83.33	50.00	66.67	0.00	44.44	50.00
Calabria	75.00	75.00	68.75	72.22	0.00	0.00	0.00	50.00
Milano Bicocca	50.00	58.33	31.25	50.00	44.14	31.25	39.74	50.00
Trento	50.00	50.00	68.75	56.67	44.14	0.00	29.43	50.00
Salento	50.00	25.00	100.00	66.67	0.00	0.00	0.00	50.00
Bologna	75.00	66.67	50.00	61.11	44.14	0.00	29.43	47.07
Ferrara	50.00	33.33	50.00	45.83	50.00	41.67	44.44	46.87
Roma La Sapienza	75.00	16.67	50.00	44.44	44.14	0.00	29.43	45.83
Modena e Reggio Emilia	75.00	16.67	50.00	44.44	50.00	0.00	33.33	45.83
Bergamo	75.00	58.33	31.25	50.00	50.00	0.00	33.33	45.83
Camerino	50.00	16.67	50.00	33.33	50.00	75.00	66.67	45.83
Venezia IUAV	0.00	25.00	50.00	27.78	93.38	58.33	76.23	45.83
Bari	50.00	41.67	68.75	50.00	39.81	0.00	26.54	42.30
Cagliari	75.00	16.67	66.67	44.44	35.77	0.00	23.84	42.30
Salerno	16.67	50.00	68.75	50.00	35.77	0.00	23.84	42.30
Brescia	75.00	31.25	50.00	50.00	39.81	0.00	26.54	42.30
Milano	75.00	16.67	66.67	44.44	35.77	0.00	23.84	42.30
Siena	25.00	33.33	33.33	38.89	50.00	0.00	33.33	41.67
Udine	75.00	16.67	31.25	37.50	44.14	0.00	29.43	40.62
Torino	50.00	0.00	68.75	38.89	39.81	31.25	33.98	38.84
Firenze	16.67	16.67	66.67	37.50	35.77	0.00	23.84	36.89
Palermo	16.67	50.00	31.25	37.50	39.81	0.00	26.54	36.89
Urbino Carlo Bo	75.00	16.67	31.25	37.50	39.81	0.00	26.54	36.89
Pavia	50.00	16.67	50.00	33.33	35.77	0.00	23.84	34.18
Trieste	50.00	16.67	50.00	33.33	35.77	31.25	33.98	34.18
Venezia Cà Foscari	50.00	25.00	16.67	27.78	50.00	0.00	33.33	33.33
Insubria	16.67	0.00	50.00	27.78	44.14	41.67	44.44	33.33
Milano	50.00	16.67	41.67	27.78	35.77	31.25	33.98	29.80
Parma	50.00	31.25	16.67	27.78	35.77	0.00	23.84	29.80
Genova	50.00	16.67	31.25	27.78	39.81	0.00	26.54	29.80
Roma 2 Tor Vergata	75.00	0.00	16.67	27.78	39.81	0.00	26.54	29.80
Napoli L'Orientale	50.00	16.67	16.67	27.78	39.81	0.00	26.54	29.80
Bari	50.00	0.00	33.33	22.22	39.81	31.25	33.98	29.80
Chieti e Pescara	50.00	33.33	33.33	38.89	0.00	0.00	0.00	29.16
Sassari	50.00	0.00	33.33	22.22	39.81	0.00	26.54	26.34
Macerata	16.67	16.67	31.25	20.83	39.81	0.00	26.54	25.49
Marche	16.67	0.00	0.00	0.00	50.00	0.00	33.33	25.00
Messina	50.00	0.00	16.67	16.67	39.81	0.00	26.54	22.07
Catania	50.00	16.67	16.67	27.78	0.00	0.00	0.00	20.83
Piemonte Orientale	50.00	33.33	16.67	27.78	0.00	0.00	0.00	20.83
Tuscia	50.00	25.00	16.67	27.78	0.00	0.00	0.00	20.83
L'Aquila	16.67	0.00	16.67	11.11	35.77	0.00	23.84	17.88
Roma Tre	16.67	25.00	0.00	16.67	0.00	0.00	0.00	12.50
Foggia	50.00	16.67	0.00	16.67	0.00	0.00	0.00	12.50
Napoli Parthenope	0.00	16.67	0.00	11.11	0.00	0.00	0.00	8.33
Sannio	0.00	16.67	0.00	11.11	0.00	0.00	0.00	8.33
Campania Vanvitelli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Catanzaro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cassino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teramo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reggio Calabria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molise	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

It achieves the same overall score as the University of Verona in the Context Index, a higher score in involvement and a lower one for education.

In the third place we find the University Federico II Naples, characterised by a high score in Education and Employee Training thanks to the only PhD in Italy specialising in Gender Studies, an important list of seminars and projects on LGBT+ issues held in the academic year 2018/2019, and an obligatory training course for all technical and administrative staff on the promotion of the culture of diversity. University Federico II Naples is, however, lacking in the provision of services such as all-gender bathrooms and in the establishment of a reporting procedure for crimes against the LGBT+ community, as well as in the introduction of the Non-disclosure Agreement.

Universities with a score equal to "0" in Employee Alias Career are those that provide access to the Alias Career only for students. This is shown in the fourth position in the ranking in the case of the University of Turin. The analysis allowed us to identify a wide range of good or best practices in the inclusion of LGBT+ leading to a better position in the ranking as shown in Table 1. They regard specific curricula on gender studies (such as the Gemma Master, a pilot project in the field of Women´s Studies and Gender Studies with the participation of a number of universities supported by the European Commission) or dedicated courses (such as the course on history of homosexuality taught at the Department of Art, Music and the Performing Arts at the University of Turin). Best practices also involve the teaching of courses to promote diversity devoted to managerial and technical-administrative staff (such as the mandatory online training course held in 2018 in the University of Naples and in the University of Calabria on how to counter sexism and homophobia) and conferences and seminars on the subject. Other actions include counselling services, online platforms or networking to promote the culture of diversity.

4. Conclusions and policy implications

In this paper we investigated the capacity of universities to favour LGBT+ inclusion in academic life. To this end we developed the first LGBT+ University Inclusion Index by using fuzzy rule-based systems of the Mamdani-Assilian type [3] [4] and used it to rank Italian Universities. The indicators were designed with the collaboration of six LGBT+ student unions, four experts, and the National Conference of Equal Opportunities Bodies of Italian Universities.

Fuzzy rule-based systems provided an excellent tool to monitor different dimensions of the LGBT+ inclusion: the Context and the Alias Career. These two dimensions were in turn split into sub-indices to provide an overview of the degree of inclusiveness in the various dimensions (Education and Employee Training, Involvement and Collaboration and Services for Context Index; Students' Alias Career-Access Criteria and Employees Alias Career for Alias Career Index).

In our analysis, related to the academic year 2018/2019, we found that the two Universities characterised by the maximum level of Alias Career inclusiveness, thanks to the adoption of the Non-disclosure Agreement are also the best: University of Verona and University of Basilicata.

In terms of policy implications, one of the main results of this study concerns the relevance of an operational anti-discriminatory plan involving all the identified dimensions rather than a single action: the introduction of the Alias Career, even if in its most inclusive version, is not sufficient in itself to guarantee inclusion for all sexual minorities. Evidence of this is to be found in the ranking of the Universities of Camerino (13) and Venice (18), despite their high scores in the Alias Career index.

The results recommend an inclusion strategy aimed at improving all the sub-dimensions identified in this study: education, research and curricula gender-oriented, training courses on LGBT+ issues for faculty members and for technical and administrative staff, collaboration with LGBT+ students unions or allies, involvement of sexual minority associations in the organisation of anti-discriminatory activities and events, the provision of different services to protect and support sexual minorities, including the introduction of the Non-disclosure Agreement and provision for the Alias Career. Moreover, in the definition of an intervention strategy aimed at LGBT+ inclusion, the collaboration of LGBT+ associations is crucial as well as the capacity to devise new services and innovative policies, maintaining a fluid and open-minded approach (the same approach that led to the new version of the Alias Career).

Finally, we strongly recommend the introduction of the LGBT+ University inclusion index in the evaluation of universities, such as the Biennial Report on the State of the University System and Research, produced by ANVUR (National Agency for the Evaluation of University and Research) and the Italian Universities Ranking of CENSIS. The incorporation into these rankings of the degree of inclusiveness of Universities will allow potential students to make informed choices. As a possible extension of this study, we plan to re-evaluate the degree of LGBT+ inclusion in the academic year 2019-2020, also taking account of the effects of the pandemic.

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6. References

[1] D.G. Smith, N.B. Schonfeld, The Benefits of Diversity: What the Research Tells Us, About Campus, 5 (2000) 16–23.
[2] S.M. Johnson, X.L. Lollar, Diversity policy in higher education: the impact of college students' exposure to diversity on cultural awareness and political participation. Journal of Education Policy, 17 (2002) 305-320.
[3] E.H. Mamdani, S. Assilian, Experiment in linguistic synthesis with a fuzzy logic controller. International Journal of Man-Machine Studies, 7 (1975) 1-13.
[4] E. Van Broekhoven, B. De Baets, Only smooth rule bases can generate monotone Mamdani-Assilian models under center-of-gravity defuzzification, IEEE Transactions on Fuzzy Systems, 17 (2009) 1157-1173.
[5] R. Ávila, LGBT+ inclusive education report, published by IGLYO (the International Lesbian, Gay, Bisexual, Transgender, Queer and Intersex Youth and Student Organisation). Chaussée de Boondael 6, Brussels B-1050, Belgium, 2018.
[6] J.C. Garvey, S. Rankin, G. Beemyn, S. Windmeyer, Improving the campus climate for LGBT+students using the Campus Pride Index, New Directions for Student Services, 159 (2017) 61-70.
[7] J.C. Garvey, J.L. Taylor, S. Rankin, An examination of campus climate for LGBT+community college students, Community College Journal of Research and Practice, 39 (2015) 527-541.