Student Trend Analysis for Foreign Education Employing Machine Learning: A Case Study from ‘Disha Consultants’, Gujarat, India

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Abstract
For many years, there has been literature on study abroad, student mobility, and international student exchange; however, the scope & depth of this work has expanded dramatically in the recent two decades. Most of this research in comparative education studies is rarely published in its primary publications. This study report aims to give a complete overview of the trends and difficulties surrounding international student recruiting and assist institutional leaders & administrators in making informed choices and effectively setting priorities. We have performed EDA testing, a thorough analysis that helps discover data distribution. It is essential for all domains because it exposes trends, patterns, and relationships that are not immediately apparent. EDA is the most effective approach to finding outliers, but it might lead us wrong if not done correctly. We demonstrated that our research gives a suitable pragmatic answer for future International study patterns among students by conducting thorough trend analysis of varying detailed data obtained from various sources.

Keywords Foreign education · Machine learning · Trend

1 Introduction
Mobility of students and faculty are becoming more popular in higher education across the country. Many learning options open up when one studies in a distinct regional,
linguistic, & cultural location. Even though international education is becoming more active, research on higher education, staff, student mobility, and international student exchange is routinely published in the top comparative education journals. Although students have a variety of possibilities for studying abroad, they face tough competition when choosing educational institutions and destinations. Furthermore, given the competitive climate, Higher Education Institution (HEIs) must establish a strategic plan to recruit a growing number of foreign students [1, 2].

The study abroad policy is one of the national policies directing the development of high-level talents as well as the implementation of the national talent strategy. The study abroad strategy directly influences the training of international talent, which has a substantial impact on the development of young people. The previous study has concentrated on the impact of policies on foreign and international students and the impact of international students’ group characteristics on youth development research. As a learning institution, the COVID-19 has had a considerable impact. As a result, higher education, particularly for students who plan to study abroad, has suffered a substantial setback. However, there have been significant changes in the way education is now delivered; one fundamental component that has remained constant is the desire of educators and students to continue. However, students who want to study abroad should bear in mind that the foreign study experience has altered as a result of COVID-19, and there are new market trends that they should acquaint themselves with & prepare for [3].

Moreover, the IBEF revealed that 8 lakh Indian students registered in institutions worldwide in 2019, but that figure was expected to drop significantly in 2020. According to the Times of India, there was a 55% drop in the number of persons who choose to study overseas, with just 2,61,406 students traveling instead of 8 lakhs in 2019. However, they claim that 2021 will see a more significant number of applications worldwide. According to India’s Ministry of External Affairs, 71,000 students have already left for higher study. It is commonly known that, despite COVID-19, students continue to want to study abroad [4]. With all of the chaos surrounding them, students have developed the idea that they should spend one semester or a year abroad and afterward return to university. Students who pick this option have many EdTech instructors to choose from. According to a University Hub survey, students desired mixed learning – a mix of offline and online approaches. As a result, universities in the United Kingdom, Australia, Canada, the United States, Dubai, and other popular international destinations have partnered with EdTech platforms to enact this approach. This study paper aims to give complete knowledge of the trends and difficulties linked to foreign student recruitment using available literature and assist institutional leaders & administrators in making informed choices and effectively setting priorities.

2 Literature Review

The study abroad policy has supported the development of geniuses studying abroad and facilitated the growth of our study abroad program. This research [5] examines the development of China since the reform & opening up of the policy of studying
overseas and the phenomena of international students, as well as the overall and structural features of students. The existing literature found that in 1979, the number of students studying overseas exceeded 1000, although the growth rate reduced to 107%. Return rates for international students were 29% in 1978. Studying abroad and international students have changed our country’s policies. The number of Chinese students has expanded significantly because of reform and openness policy, yet they still lag behind the major nations in Europe, America, East Asia, and the Pacific. In 2006, China accepted 36,386 students from the mainland or 1% of all students. Hence it is concluded that the importance of the foreign study on younger people’s entrepreneurship, education, & culture is growing day by day. The issue of evaluating the foreign experience accurately has to be examined more.

Based on the globalization of higher learning in today’s era, the highly competitive education market, the present research intends to investigate the variables influencing students’ choice of countries to pursue their higher education. The researchers [6] used a mixed-method technique like Explanatory & exploratory design to obtain data from international students studying in the United Kingdom (UK) & Germany. The qualitative phase highlighted six topics as highly relevant factors in students’ decision to study abroad: scholastic, societal, personal, economic, career, & marketing. According to empirical findings, students in both regions consider academic reputation a significant factor in choosing a place for HEI. Furthermore, international students in Germany were found to be more pleased with their selection of country than students in the United Kingdom.

The primary goal of this research [4] was not to uncover specific answers to internationalizing a certain program/department/faculty, but rather to create an understanding and move ahead with internationalizing the institution as a whole as stepping more towards the ASEAN economic community (AEC). The researchers used a qualitative technique like interview using a non-probability sampling strategy to gather data from twenty individuals, seventeen of whom are in the senior management of an institution of higher education, through semi-structured interviews. One member is a former director of the Southeast Asian Ministers of Education Organization (SEAMEO), while the other two are specialists from Thai universities. In addition, throughout the analytical work, codes, categories, and topics were generated. Hence this study’s participants identified a number of critical tactics and techniques for internationalizing institutions of higher learning. These are-

(i) Infrastructure management, Curriculum development.
(ii) Human Resource Development (HRD) strategies, corporate social responsibility (CSR) strategies, influential projects, seek accreditation for our curricula.
(iii) Foreign language skills, international programs.
(iv) Marketing plans and Public Relations (PR).
(v) Scholarships.
(vi) Exchange staff and students.

Many institutions are becoming more strategic & deliberate in their recruiting efforts due to a new climate of funding constraints and increased competition. The goal of
this study report [3] is to give a full overview of the trends & difficulties surrounding international student recruiting and assist institutional leaders & administrators in making informed choices and effectively setting priorities. Hence International students would be able to choose diverse destinations, participate in English language programs, and study at the Bachelor’s level. International students will perceive better job possibilities as the United States (US) economy improves. The UK’s strict immigration restrictions will likely redirect traffic to places like the US, Australia, and Canada. International student recruiting is an increasingly important component of many universities’ financial health. A systematic, methodical, and educated approach to recruiting will help institutions maximize their potential.

2.1 Comparitive Study
| References | Variables | Objective | Level | Dataset | Algorithm | Minimum Accuracy | Maximum Accuracy | Output |
|------------|-----------|-----------|-------|---------|-----------|-----------------|-----------------|--------|
| [7]        | In which country maximum number of students take admission | To predict foreign trend for higher education | US, UK, Canada, Australia & New York | 210 | Decision Tree, Neural Network, Naïve Bayes Classifier | Neural Network-62.50% | Naïve Bayes-83.65% | US, UK & Canada have been most populous country for study |
| [8]        | Post study Placement opportunity in Country | To analyse the trend in students mobility towards foreign education | Safety, Socio-political climate, cost of living & culture in various countries | 522 | Artificial Neural Network, Support Vector Machine, Logistic Regression | SVM– 51.2% | Logistic Regression-81.1% | US has the most placement opportunity after the degree |
| [9]        | Top reasons to Study Abroad | To determine the students trends towards international education | Higher Quality Teaching, Achieve career Goals, Experience new culture, to have an adventure, to develop their personal growth | 300 | Message Passing Neural Network, Artificial Neural Network | ANN-70.4% | MPNN-95% | Students should have on-campus learning experience in their location of choice in order to achieve their experiential goals, such as "to encounter a new culture/lifestyle" and "to get an adventure." |
| References | Variables                  | Objective                                                                                   | Level                     | Dataset | Algorithm                        | Minimum Accuracy | Maximum Accuracy | Output                                                                                     |
|------------|----------------------------|--------------------------------------------------------------------------------------------|---------------------------|---------|-----------------------------------|------------------|------------------|--------------------------------------------------------------------------------------------|
| [10]       | Courses of their Choice    | To understand the reason of student mobility for higher education                          | MS, ME Masters, Diploma, Master of Science | 412     | Artificial Neural Network, Support Vector Machine, Logistic Regression | 84%              | 93%              | Master of Science found to be the main reason for student mobility towards international education |
3 Methodology

A significant amount of data is visually evaluated in Exploratory data analysis (EDA) to find meaningful insights. The strategy has been used in a wide variety of situations, and it helps, and it helps the managers to make educated decisions. Every year, the number of Indian students who go abroad to pursue higher education increases. Many Indians want to study or work abroad, and this is one of their most cherished ambitions [11, 12]. Foreign education is seen as more prestigious and sophisticated since it provides students with a more extensive range of options. In this regard, statistics on the number of Indian students studying abroad are essential to the growth and expansion of the country. All stakeholders may learn a great deal from this data if they look at it properly. The EDA method is used to visually assess a student’s interest in attending a foreign university in this situation. [13, 14] With the help of EDA, this article makes conclusions regarding student interest based on data that is visually examined. It is usually preferable to investigate and compare the outcomes of each data set utilizing several exploratory strategies. This process tries to analyze the dataset, find missing values and outliers, and acquire a feel of the narrative it tells using visual and quantitative tools. It recommends the next logical steps, questions, or study ideas for the project [15].

The students’ data was extracted from an anonymized copy of the dataset consisting of 1378 entries with seven different meaningful variables. We received the data from the source in Comma-Separated Values (CSV) format. Students’ last names, degrees, countries, universities, and branches were included in these tables, as shown in Table 1. Our data processing duties at this point included visualizing the distribution of attribute values and discovering correlations between characteristics.

- There are various open-source libraries present in Python, like NumPy, pandas, matplotlib, seaborn, and so on, with which we analyze data and get valuable insights. Along with these libraries, I’ll be utilizing Jupyter Notebook.
- Once the import of libraries, step two is to load data into the data frame. We will use the pandas package to import the data into the data frame. It accepts various file types, including Comma Separated Values (.csv), Excel (.xlsx,.xls), and others.
- To read the dataset, either place it in the same folder & read it directly, or specify the path to the data file where the dataset is placed when reading the data.
- Next, we examine the data kinds and the quick overview of all the variables in the data. It takes into account the quantity of non-null entries present. The info() method prints a brief overview of a DataFrame. This function returns data about a DataFrame, such as an index and column dtypes, non-null values, and memory utilization.
- Next, the number of students intake according to the season using the value_counts() function that returns a series representing the counts of the DataFrame’s unique rows. A MultiIndex with one level for each input column will be returned. Rows with any non-numeric values are excluded from the final output by default. The resultant series will be arranged in decreasing order, with the most often occurring rows at the top of the list.
The pie chart is similar to the countplot, but it provides extra information about the % occurrence of each category in data, indicating which category is receiving how much weightage in records. We will look at the season column to see what proportion of students apply for admission to abroad colleges in a particular season and no. of students preferring which country for the higher studies using the seaborn library.

Countplot is essentially a frequency count plot in the shape of a bar graph. Each category’s count is shown in a distinct bar. It is the same visual form of the value counts function when we use pandas’ value counts function on any column. Because our data-target variable survives and is categorical, we can display a countplot of it. We have shown a count plot graph of no. of students taking admission in which season—and also comparing the no. of students by country and season in a single graph.

Heatmap is a visual depiction of the crosstab function. It simply displays how much of one category is present in relation to another in the dataset. Using this, the EDA shows no. of students taking admission according to season and which country they prefer most. Along with no. of students prefer degree in which country.

4 Result and Discussion

4.1 Process Flow of EDA

Figure 1 depicts the general procedure of applying EDA to a variety of datasets. Categorical data and numerical-continuous or discrete data are the primary subdivisions. Following that, plots such as histograms may be produced using continuous data, while a box plot can be displayed using both categorical and continuous data.

4.2 Which Intake Season Chose by Students to Took Admission in Foreign Institute

Most foreign institutions offer three entrance intakes each year for all courses and classes. The fall semester starts in September and finishes in December, while the spring semester begins in January & ends in May, and the summer season starts in June & ends in September [13]. Our analysis shows that 844 students prefer the Fall

| Sr | Column in dataset |
|----|-------------------|
| 1  | Intake            |
| 2  | Season            |
| 3  | Year              |
| 4  | Country           |
| 5  | FinalUniversity   |
| 6  | Degree            |
| 7  | Major             |

Table 1 Dataset variables (Columns)
season, 491 chose the spring season, and only 43 people prefer summer, which is very few, as demonstrated by the below Table 2.

Universities admit students in three separate intakes instead of just one for two main reasons. To begin with, it is hard to accommodate so many students in a single semester. Most foreign colleges get thousands of applications each year, so admitting so many students at once would undoubtedly be challenging. This is why the input division exists.

Second, there might be several causes why so many students would not have the opportunity to apply for the Fall season. As a result, institutions welcome students who were unable to apply during the Fall semester. In essence, more students apply for the Fall Intake, resulting in larger class sizes for the Fall semester.

No. of students who choose different intake seasons is also represented by pie chart (Fig. 2) which shows 61.25% opt for the fall season, 35.63% students chose Spring season and only 3.12% students chose summer season.

The graph also depicts the same thing shown by the pie chart and table drawn using the count plot() function, shown in Fig. 3. The countplot() function displays the number of observations for each category bin as a bar graph.
4.3 The Country Chosen by Student to Study Abroad

From our analysis, we find that 71.26% of students chose the United States of America (USA) to study over Canada, shown by using a pie chart in Fig. 4.

The country in which a student pursue higher education is essential in influencing their career. Most international students choose to study in the United States of America (USA) instead of Canada for a variety of reasons, including:
4.4 Admission Requirements in the United States and Canada

- Common admission exam results are frequently recognised by universities in the United States. There are just a handful of colleges that need a Graduate Record Examination (GRE) and Scholastic Assessment Test (SAT) score for entrance. Students must submit a reference letter, Curriculum Vitae (CV), and Statement of Purpose (SOP) along with the exam results.
- In Canada, the procedure is more difficult since students must first secure study permission. The permission is only provided to students who desire to remain longer than six months as part of their university course. This authorization letter will protect students’ stay in Canada & serve as an advantage in their visa application. To apply for a study permit in various Canadian provinces, the student must first get an acceptance letter from the Canadian government.

4.5 Top Courses in the United States and Canada

- In comparison to Canada, the United States offers a broader range of courses, including MBA, Engineering, IT, Ph.D., and allied fields, etc. comparison to Canada.

4.6 Employment Options in the United States and Canada

- In the United States, students can work on campus for up to 20 h a week. This allows students to participate in a few internship programs or pursue Curricular Practical Training (CPT). Internships & Curricular Practical Training (CPT) provide students with university work that is not just of their interest but also linked to their education. All US educational institutions go to great lengths to assist students in honing their talents, establishing their Curriculum Vitae (CV), and finding a suitable career for themselves. College organizations offer a variety of extracurricular activities to students to give them real-world employment experience. The goals of presenting this past experience are to enable them to put their talents to work in a practical setting while also providing essential insights for a job interview [16–18].
- In contrast, pupils get less attention in Canada, making them prone to low-paying positions like nurse practitioner, program analyst, teacher, pharmacists, money advisor, and construction manager.

4.7 Most Preferred University and Degree by Student

The Table 3 below shows the top 10 universities students prefer for higher studies, which is displayed using value count() & head() functions.

It shows that most students chose the University of Windsor for study. The student choice can range for many reasons. It might be the beauty of Windsor that can also be the reason. It is a quiet little town. They do have a casino, which mainly attracts visitors from Michigan. That is the high point. However, the Detroit riverfront has several activities throughout the summer semester.
Table 3  Students inclination towards university preference

| Final university                                      | Intake |
|-------------------------------------------------------|--------|
| University of Windsor                                 | 99     |
| Northeastern University                               | 89     |
| Arizona State University                              | 63     |
| San José State University                             | 60     |
| University of Texas, Arlington                       | 51     |
| University of Texas at Dallas                         | 44     |
| Stevens Institute of Technology                       | 40     |
| Dalhousie University                                  | 34     |
| Mohawk College                                        | 28     |
| North Carolina State University                       | 22     |

Fig. 5  Top 10 schools/University count plot

The University’s campus has most of the facilities expected of a Canadian institution. Comparisons to the University of Toronto are not appropriate here. In terms of co-curricular activities, campus life is excellent. International students make up the majority of the student population.

From above Fig. 5, North Carolina State University 10th rank with 22 counts of students for the considered academic year. The reason for this might be because few individuals outside of the Southeast and North Carolina are aware of NC State’s superb academic and research programs, professors, & facilities.

The below Table 4 and Fig. 6 shows most preferred course by the student is Master of Science because of reason-

- Grad school may give an individual more self-awareness and responsibility.
- In today’s competitive employment environment, having an international credential might provide a student with an edge [19–21].

Next, we compare the number of students who take admission in which season in a particular country using a graph.
| Final university                  | Intake |
|----------------------------------|--------|
| Master of Science                | 775    |
| ME                               | 158    |
| Masters                          | 113    |
| Diploma                          | 51     |
| Bachelor of Science              | 49     |
| Master                           | 43     |
| MS                               | 42     |
| PG                               | 21     |
| BSc                              | 16     |
| MBA                              | 13     |

Figure 7 shows that most students take admission to USA University in the fall semester, whereas very few students prefer admission to a Canadian university in the summer season. The fall is a popular time for students interested in studying abroad because of the large number of institutions that open their doors for Fall admission [22].

Additionally, students who enroll in the spring intake are not eligible for an immediate summer internship because they must complete at least nine months of full-time academics. Internships are available to students who begin the course in January, while those who start in September (fall season) are eligible for the internship opportunity [23]. It is also shown in Fig. 8 using a heat map graph in which data is presented in this two-dimensional visual representation with values encoded in color. It provides an easy, wise perspective of information. Each cell in the table may have a numerical and logical value that defines its color using a color palette [24].

Next, in Fig. 9, we have shown the number of students who choose which degree in
a particular season of a particular country using a heatmap graph that shows students pursuing ME degree is maximum for Canada followed by diploma, Master and MS. Whereas in the USA students prefer MS degree followed by other masters degrees and bachelors of science.

Our analysis found that more students took admission in 2021 than in 2019 (as shown in Fig. 10), and only a few took admission in 2020, the primary reason being COVID-19 and the international travel ban. It also shows that very few students prefer the summer season, which is directed by the graph.

Several students were forced to postpone their intentions to study abroad last year because of the coronavirus outbreak. Experts believe that getting into overseas institutions will be much more difficult this year since individuals who did not last year would apply in 2021 with new candidates [25, 26].
5 Conclusion

We could conclude from our research that EDA is a thorough analysis that helps discover data distribution. It is vital for all domains because it exposes trends, patterns, and relationships that are not immediately apparent. EDA is the most effective approach to finding outliers, but it might lead us wrong if not done correctly [27].

Our analysis revealed that:

(i) Students take admission in the spring, summer, and fall semesters because it is hard to accommodate all the students in a single semester, and most people choose the fall semester.
(ii) Multiple courses are available for students like MS, ME, diploma, etc., to choose for study in abroad universities. However, most people go for MS courses because having an international credential might give a student an advantage in today’s competitive employment environment.

(iii) There are several universities abroad to study. However, according to available data, most students prefer Windsor University; it may depend on students’ choices. North Carolina University is 10th chosen by students.

(iv) A comparison is made between two countries, the USA and Canada, where students go abroad to study. It shows that 71.26% of students prefer the USA to study because study and residential procedure in the USA is easy compared to Canada.

(v) The number of admission in 2020 dipped or faced severity due to COVID-19 and the international travel ban.

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References

1. Shi Y (2022) Advances in big data analytics
2. Olson D, Shi Y (2007) Introduction to business data mining. McGraw, Hill/Irwin
3. Prazeres L (2013) International and intra-national student mobility: trends, motivations and identity. Geogr Compass 7:804–820. https://doi.org/10.1111/gec3.12080
4. Jung D-J (2021) A study on the university’s community engagement and formulation of social capital: focused on the case of a higher education institution in Northern Thailand. Korean Comp Educ Soc 31:127–153. https://doi.org/10.20306/kces.2021.31.3.127
5. Zhang L (2020) Analysis on the innovative ways of employment and entrepreneurship guidance in higher vocational colleges under the education of “three all-round education.” Adv High Educ. https://doi.org/10.18686/ahe.v4i10.2942
6. Abbas J, Alturki U, Habib M et al (2021) Factors affecting students in the selection of country for higher education: a comparative analysis of international students in Germany and the UK. Sustainability 13:10065. https://doi.org/10.3390/su131810065
7. ĐurđevićBabić I (2017) Machine learning methods in predicting the student academic motivation. Croat Op Res Rev 8:443–461. https://doi.org/10.17535/crorr.2017.0028
8. Delen D (2010) A comparative analysis of machine learning techniques for student retention management. Decis Support Syst 49:498–506. https://doi.org/10.1016/j.dss.2010.06.003
9. Alshanqiti A, Namoun A (2020) Predicting student performance and its influential factors using hybrid regression and multi-label classification. IEEE Access 8:203827–203844. https://doi.org/10.1109/ACCESS.2020.3036572
10. Waheed H, Hassan S-U, Aljohani NR et al (2020) Predicting academic performance of students from VLE big data using deep learning models. Comput Human Behav 104:106189. https://doi.org/10.1016/j.chb.2019.106189
11. Nagaria J, Senthil Velan S (2020) Utilizing exploratory data analysis for the prediction of campus placement for educational institutions. In: 2020 11th international conference on computing, communication and networking technologies, ICCCN'T 2020. Institute of electrical and electronics engineers inc
12. Kshirsagar A, Shah M (2021) Anatomized study of security solutions for multimedia: deep learning-enabled authentication, cryptography and information hiding. In: Ansari IA, Bajaj V (eds) Advanced Security Solutions for Multimedia. IOP Publishing. https://doi.org/10.1088/978-0-7503-3735-9ch7
13. Shyna K (2021) Covid effect: admission in foreign universities likely to be tough in 2021 | Education News,The Indian Express. In: The Indian Express. https://indianexpress.com/article/education/study-abroad/covid-effect-admission-in-foreign-universities-likely-to-be-tough-in-2021-7184025/. Accessed 1 Dec 2021
14. Kshirsagar A (2018) Bio-remediation: use of nature in a technical way to fight pollution in the long run. ResearchGate. https://doi.org/10.13140/RG.2.2.26906.70088
15. Alexandru P (2021) Why study a master’s abroad - top 4 pros and cons - mastersportal.com. https://www.mastersportal.com/articles/382/why-study-a-masters-abroad-top-4-pros-and-cons/. Accessed 1 Dec 2021
16. Team Leverage Edu (2021) Spring vs winter vs fall vs summer intakes-leverage edu. In: Leverage Edu. https://leverageedu.com/blog/spring-vs-winter-vs-fall-vs-summer-intakes/. Accessed 1 Dec 2021
17. Solanki P, Baldaniya D, Jogani D et al (2021) Artificial intelligence: new age of transformation in petroleum upstream. Pet Res. https://doi.org/10.1016/j.ptrs.2021.07.002
18. Tien JM (2017) Internet of things, real-time decision making, and artificial intelligence. Ann Data Sci 4:149–178. https://doi.org/10.1007/s40745-017-0112-5
19. Srishti Chatterjee (2021) Which intake season to choose: fall or spring? | Study Abroad. https://studyabroad.shiksha.com/which-intake-season-to-choose-fall-or-spring-articlepage-822. Accessed 1 Dec 2021
20. Chaajer P, Kshirsagar A, Shah M (2021) A comprehensive study of artificial neural network (ANN) and support vector machines (SVM) and long short-term memory (LSTM) on stock forecasting. Decis Anal
21. Kumar BS, Ravi V, Miglani R (2021) Predicting Indian stock market using the psycho-linguistic features of financial news. Ann Data Sci 8:517–558. https://doi.org/10.1007/s40745-020-00272-2
22. Mittal S (2020) An exploratory data analysis of COVID-19 in India. Int J Eng Res. https://doi.org/10.17577/IJERTV9IS040550
23. Swetha L (2020) Exploratory data analysis: baby steps—towards ai—the world’s leading ai and technology publication. In: Towar. AI. https://towardsai.net/p/data-analysis/exploratory-data-analysis-in-python-ebdf643a331f. Accessed 1 Dec 2021
24. Raghav A (2021) Exploratory data analysis using data visualization techniques! - analytics Vidhya. In: Anal. Vidhya. https://www.analyticsvidhya.com/blog/2021/06/exploratory-data-analysis-using-data-visualization-techniques/. Accessed 1 Dec 2021
25. Manoroma Yadav Introduction to Exploratory Data Analysis (EDA) in Python. In: 2020. https://www.mygreatlearning.com/blog/understanding-eda-in-python/. Accessed 1 Dec 2021
26. Khakharia A, Shah V, Jain S et al (2021) Outbreak prediction of COVID-19 for dense and populated countries using machine learning. Ann Data Sci 8:1–19. https://doi.org/10.1007/s40745-020-00314-9
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