MSBA and MBA Program Choices
by TurboRank Inc.

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1 Background & Mission Statement & Mission objectives

1.1 Background

For this project, one of the first steps we had to take was to create a brand name for the project. Our team decided to go with the name 'TurboRank Inc'. The name rank in our brand name should give the audience an idea of what our project is about. TurboRank Inc. is a consulting company that provides rankings and other factors influencing these rankings for MSBA and MBA programs specifically.

The first step that our team took was to gather data manually. We gathered data for top 40 MSBA rankings for 2021 from QS World University rankings and the TOP 20 MSBA rankings from TFE Times for 2021. With the MBA course, we gathered information from Bloomberg and QS World University Rankings where we gathered data of the top 10 universities before University of Maryland's ranking and the 10 program rankings after University of Maryland's ranking. We gathered information for 2021 and 2019 data as those were the years that provided us with the information we needed to provide our client Smith School with accurate information. The reason why we couldn't gather information on MBA for 2020 rankings was because of COVID 19, many schools had waivers where students didn't need to write a lot of tests to apply for the program. The reason why we didn't gather information for 2020 and

2019 for MSBA programs was because there was not much information on their rankings in 2020 for the same reason as the MBA. In this screenshot provided below we show an example of Data collected for the MBA program from QS and how different factors such as the rptAlumiOutcome affects these rankings. We will attach this excel when submitting our final suite.

In addition, the main users for our projects were, firstly, the dean of MSBA and MBA programs across different institutions. The dean for the MSBA/MBA program at the Smith School might be curious about the different factors that affect these rankings as well as the different core courses provided by these programs. Secondly, prospective students who plan to pursue an MBA/MSBA program in the U.S, our project can help them know important factors such as the program's required undergraduate GPA, their mean GRE score so it helps the student properly prepare thoroughly for these exams in order to get admission into the school. Lastly, this project is also for researchers who are looking for information about ranking for these programs across the U.S.

1.2 Mission Statement

To help our team, we had to set some mission statements along with some objectives to help us answer the right questions to help our clients. The following are our mission statements:

1) To help prospective students, who intend to take MSBA/MBA in the U.S., to choose the most suitable program(s) based on their needs (e.g: rankings, tuition, test scores, etc.)
1) To help deans of MSBA/MBA in the U.S. universities to know about the overall situation of the program, especially the rankings of the program and related factors influences the rankings
2) To help the researchers who conduct related research to get the information of MSBA/MBA programs in U.S. universities quickly.

1.3 Mission Objectives Turned Into Business Transactions

The next step on our project is converting our mission objectives into SQL statements to help us answer questions for our client when it comes to the historical programs rankings for these different programs. Below is the list of our mission objectives turned into business transactions.

1) What are the different institutions that rank the Robert H. Smith MSBA program through the years?
2) Which MSBA programs has an alumni outcome with 100% of alumni being responsive and involved?
3) What are the different rankings for MSBA programs with the top 4 employment rate?
4) Which university has a higher score of diversity?
5) What are the MSBA programs with mean GMAT score less than or equal to 700 and mean undergraduate GPA less than or equal to 3.5?
6) What are the details of the top five MBA programs in each ranking source in 2021?
7) What are the scores of selective students of the MSBA program and the corresponding program ranking in QS?

8) What is the number of core courses that each program provides and how many credits of these courses in total?
9) Which MSBA programs provide the data mining course?
10) What are the top ten programs with the highest international student rate?
11) What are the program and its university 2021 QS ranking of all programs that are more than 18 months?
12) Which program' s average undergraduate GPA is not more than 3.5 in 2021, and its TOEFL, GRE requirement?
13) What is the program information of the highest ROI MBA program?
14) What are the average tuition,starting salary and ROI score of QS World University Ranking for MBA in descending order?
15) What is the mean starting salary and tuition for MSBA in ascending order?
16) What is the Diversity/Employability/AlumniOutcome scores of top 4 ranking MBA programs from QS in 2021?
17) What is the average undergraduate GPA of the top 10 programs with the highest GMAT score in 2021?
18) Which universities provide a MSBA program with duration of no more than one-year and tuition of no more than $55000?

2 ER diagram & Data source & Relation

In the ER diagram, we have five entities in toal, including RankInstitution, University, Program. ProgramInformation, and Course. One University provides different business master programs while one program only belongs to one university, so there is a one-to-many relationship between University and Program. For the programs, since some information about them changes every year while some does not, we put the changing information in a new entity named ProgramInformation to avoid redundancy, which is a weak entity depending on Program. One program updates its information every year while one program information in each year exactly corresponds to one program, so there is a one-to-many relationship between Program and ProgramInformation. Based on the program information, rank institutions evaluate the performance of business master programs in some aspects, give the scores in each aspect, and finally decide their rankings. We put the program ranking and these scores as attributes of the relationship between ProgramInformation and RankInstitution. Since one institution evaluates the programs' ranking by different information every year, and one program information may be used by different institutions, there exists many-to-many relationship between ProgramInformation and RankInstitution. Also, most institutions rank universities every year, and the relationship between them is many-to-many. Some institutions like Bloomberg only rank business schools and business programs but not universities, so one

rank institution may be to 0 university. Lastly, considering some of our users are prospective students, who may want to know the courses each program provides, we also have an entity named Course to provide such information. The relationship between Program and Course is many-to-many.
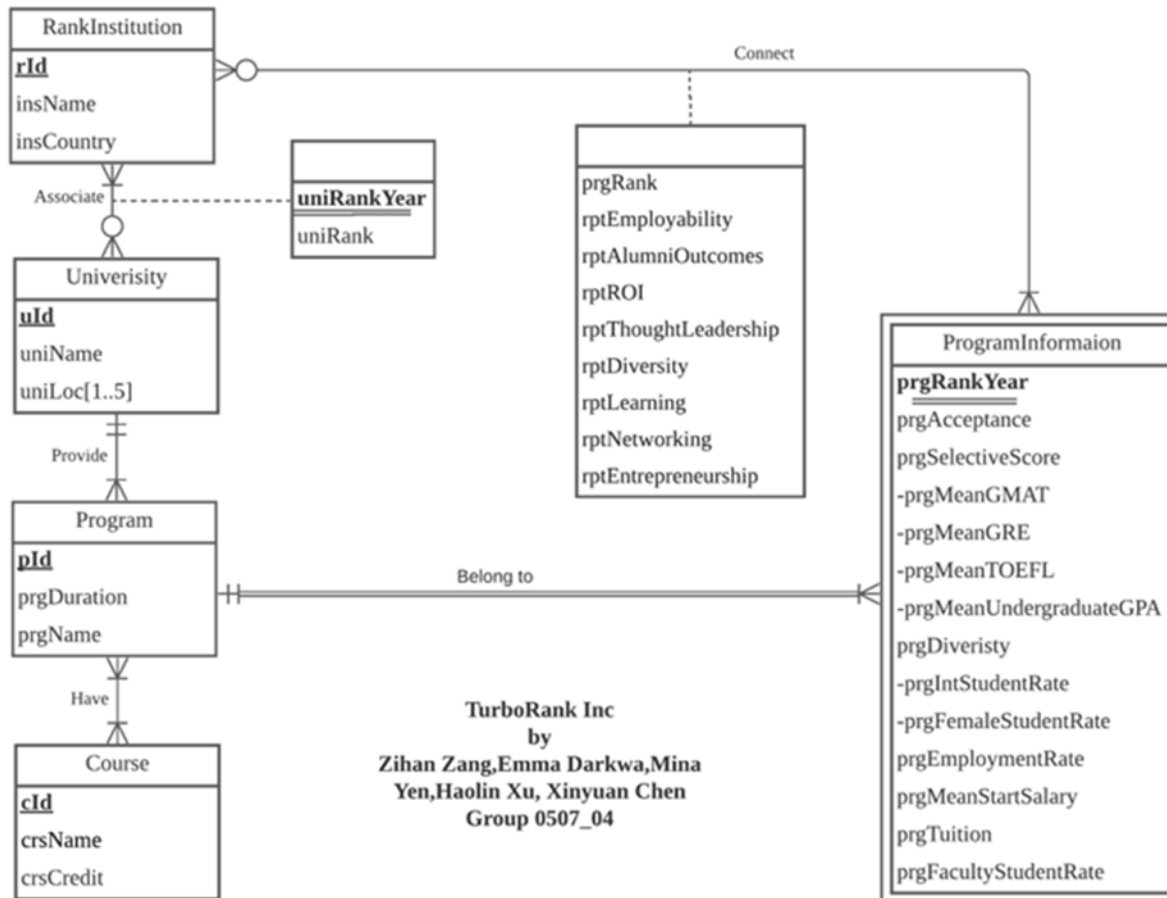
All the ranking information, including program rankings, university rankings and scores, is from the website of Bloomberg, QS, and TFE Times. The information of the programs are collected from the official website of these programs and other websites shown in reference.

Then, we transformed the ER diagram into relations. To map regular entities to relations, we only kept the simple component attributes for composite attributes such as prgDiversity, and we created a new relation named UniversityLoc for multivalued attribute UniLoc. For the weak entity ProgramInformation, we created a separate relation named ProgramInformation with a primary key composed of the partial identifier of weak entity(prgRankYear) and primary key of strong entity(pId). For one-to-many relationships, we inserted the primary key on the one side relation into the many side relation as a foreign key. For many-to-many relationships, we created new relations for them. Finally, we created nine relations in total.

3 Create SQL Table

3.1 Create and Drop Table

In the database we have created a total of nine tables: [TurboRank.RankInstitution], [TurboRank.University], [TurboRank.UniversityLoc], [TurboRank.Program], [TurboRank.ProgramInformation], [TurboRank.Course], [TurboRank.Have], [TurboRank.Associate], [TurboRank.Connect]. The principle of creating tables is to create tables without foreign keys before creating those with foreign keys, to create those with fewer foreign keys before creating those with more foreign keys, and to place closely linked tables together for later checking. Then, at the beginning of the code, we delete tables in the reverse order in which they were created.

```
dbo.TurboRank.Associate          DROP TABLE IF EXISTS [TurboRank.Connect];
dbo.TurboRank.Connect            DROP TABLE IF EXISTS [TurboRank.Associate];
dbo.TurboRank.Course             DROP TABLE IF EXISTS [TurboRank.Have];
dbo.TurboRank.Have               DROP TABLE IF EXISTS [TurboRank.Course];
dbo.TurboRank.Program            DROP TABLE IF EXISTS [TurboRank.ProgramInformation];
dbo.TurboRank.ProgramInformation DROP TABLE IF EXISTS [TurboRank.Program];
dbo.TurboRank.RankInstitution    DROP TABLE IF EXISTS [TurboRank.UniversityLoc];
dbo.TurboRank.University          DROP TABLE IF EXISTS [TurboRank.University];
dbo.TurboRank.UniversityLoc      DROP TABLE IF EXISTS [TurboRank.RankInstitution];
```

3.2 Data type

Our choice of each data type is well thought out. The database contains three types of IDs, university IDs, project IDs and course IDs, and to make it easy to determine the properties of the IDs, we prefixed all IDs with the corresponding initial letter, for example, the letter P before the project ID. Given that we included no more than 100 projects and schools and no more than 1000 courses, we used CHAR 3 and CHAR 4 respectively. We use one decimal to store the duration of the program and the credits of the course, two decimal to store the average score for each category, and three decimal to store some percentages, such as the international student ratio. We use VARCHAR for all names. In particular, some institutions publish vague rankings for lower ranked universities, such as "700-800", so we use VARCHAR here as well.

3.2 Insert Data

Finally, we used the INSERT statement to enter the data, which took a lot of time due to the amount of data we had. In the future we can use EXCEL or Python to do a bulk import.

4 Business Transactions and User Applications.

We completed a total of 18 select statements and then selected five of them to create Tableau charts.

4.1 Completed data source in Tableau:
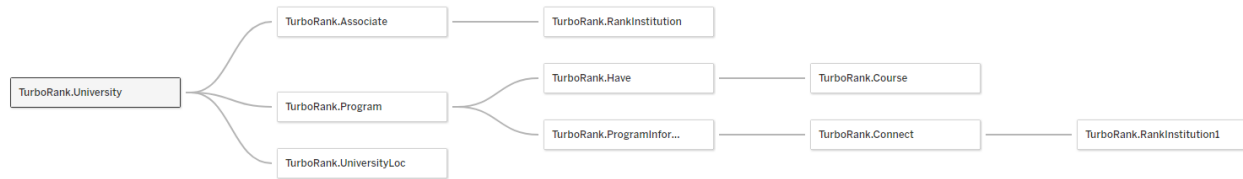
4.2.1 Business Transaction 1

Our first business transaction targets the international student who wants to pursue a career after studying MBA program. To get the insight for our target audience, we first filter the top 4 MBA programs from QS ranking 2021 in our data by using "TOP(4)" in SELECT and setting the "rId" as well as r01 and "prgRankYear" as 2021. Then, we select the diversity, employability and alumni outcome scores in SELECT. By reading the diversity score, as the blue part on the Tableau sheet, students can know whether that program accepts lots of international students or not. The employability and alumni outcome score, as the yellow and purple part on the sheet, also help students have an image of how good the program helps students find jobs and get higher salaries after graduation.

For our insight, we noticed that Indiana University has a very high Employability score, which means students who graduate from that program have higher probability to find a job. However, their diversity score is very low, so it might be hard for international students to get in the program.

```sql
SELECT DISTINCT TOP(4) u.uniName, p.prgName, c.prgRank, c.rptDiversity, c.rptEmployability, c.rptAlumniOutcomes
  FROM [TurboRank.University] u, [TurboRank.Program] p, [TurboRank.Connect] c, [TurboRank.RankInstitution] r
  WHERE u.uId = p.uId AND p.pId = c.pId AND c.prgRankYear = 2021 AND r.rId = 'r01' AND r.rId=c.rId
        AND (p.prgName LIKE '%Administration%')
  ORDER BY c.prgRank
```

	uniName	prgName	prgRank	rptDiversity	rptEmployability	rptAlumniOutcomes
1	Cornell University	Master of Business Administration	15	67.60	63.60	71.10
2	The University of Texas at Austin	Master of Business Administration	17	61.80	66.30	63.60
3	Carnegie Mellon University	Master of Business Administration	18	60.50	62.80	65.30
4	Indiana University in Bloomington	Master of Business Administration	19	49.60	73.30	56.40

Query executed successfully.   doitsqlx.rhsmith.umd.edu,97... BUDT703_Student_295 (193) BUDT703_Project_0507_04 00:00:00 4 rows

What is the Diversity/Employability/AlumniOutcome scores of top 4 ranking MBA programs from QS in 2021?
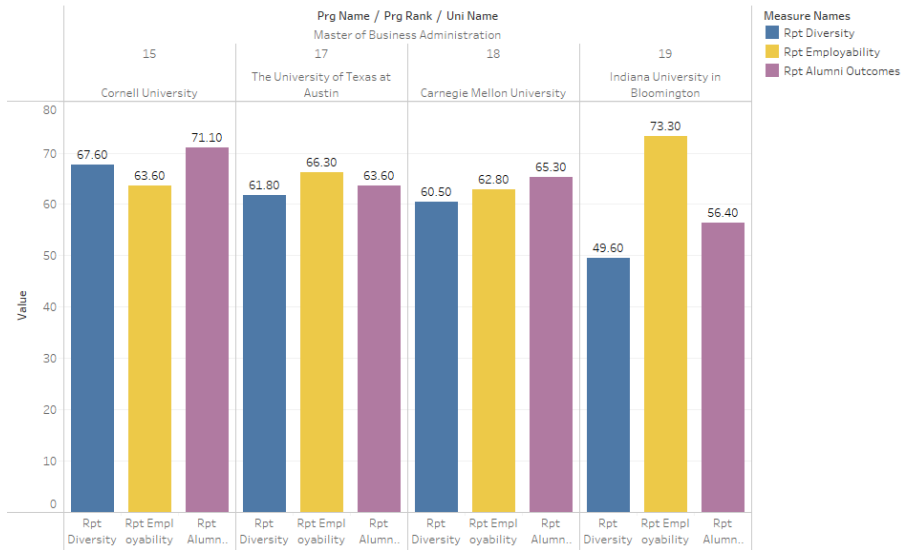
4.2.2 Business Transaction 2

The second business transaction is what is the average tuition, starting salary and ROI score of QS World University Ranking for MBA in descending order? For people who have a few years working experience and would like to pursue an MBA degree for career development, MBA degree is an investment for them, so return on investment would be one of the important factors when they choose universities to apply to. The SQL select statement calculates the average program tuition and mean starting salary over 2019 to 2021 as well as its average ROI score given by QS. We generated a bar chart to visualize the changes of mean starting salary when tuition changes. We selected the top ten highest tuition MBA programs and arranged them in descending order. From this graph, we can see that tuition and mean starting salary for MBA programs in most of the universities are positively correlated. However, the high ROI programs with a lower tuition but a relatively higher mean starting salary are exceptions in the graph.

```sql
SELECT DISTINCT TOP (10) u.uniName, p.prgName, AVG(i.prgTuition) AS 'Average tuition',
       AVG(i.prgMeanStartSalary) AS 'Average starting salary', AVG(c.rptROI) AS 'Average ROI'
FROM [TurboRank.University] u, [TurboRank.Program] p, [TurboRank.ProgramInformation] i,[TurboRank.Connect] c
WHERE u.uId = p.uId
   AND p.pId = i.pId
   AND p.pId = c.pId
   AND P.prgName = 'Master of Business Administration'
GROUP BY p.uId,p.pId, u.uniName, p.prgName
ORDER BY  AVG(i.prgTuition) DESC
```

	uniName	prgName	Average tuition	Average starting salary	Average ROI
1	Carnegie Mellon University	Master of Business Administration	144525.000000	131635.000000	92.433333
2	Cornell University	Master of Business Administration	132809.333333	133689.000000	85.433333
3	Rice University	Master of Business Administration	124539.000000	125015.333333	76.833333
4	Vanderbilt University	Master of Business Administration	123500.000000	122009.000000	81.266666
5	University of Florida	Master of Business Administration	122520.000000	109500.000000	88.400000
6	The University of Texas at Austin	Master of Business Administration	113381.333333	127390.666666	85.633333
7	University of Maryland	Master of Business Administration	113292.000000	106707.666666	60.933333

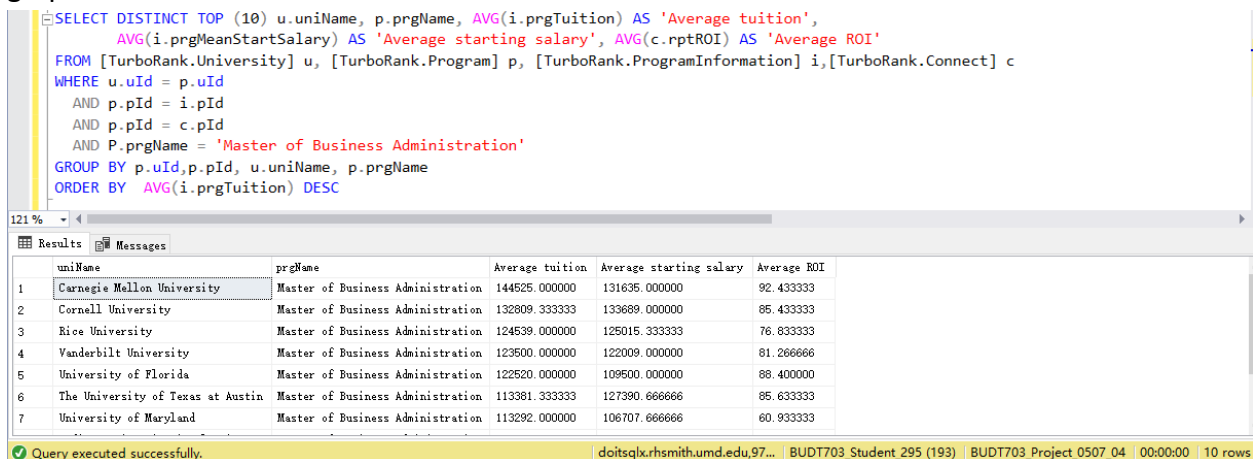Query executed successfully.   doitsqlx.rhsmith.umd.edu,97... BUDT703_Student_295 (193) BUDT703_Project_0507_04 00:00:00 10 rows

What is the average tuition,starting salary and ROI score of QS World University Ranking for MBA in descending order?

4.2.3 Business Transaction 3

In this business transaction we're looking to answer a question to one of our users which will be the deans of MSBA programs across different U.S institutions. There are many situations where they can be curious about the employment rate for different MSBA programs depending on their rankings. As a dean of a program, you want to be able to answer questions like these during a newspress. In this user application question we explore the answer to this question; "What are the different rankings for MSBA programs with the top 4 employment rate?" In this question, we use a correlated query to answer this.

```sql
SELECT  b.[TOP 4 Employmentrate],b.prgName,b.uniName,f.uId,f.uniRank
FROM(
    SELECT TOP(4) i.prgEmploymentRate AS 'TOP 4 Employmentrate',p.prgName,u.uniName,u.uId
    FROM [TurboRank.ProgramInformation] i, [TurboRank.Program] p, [TurboRank.University] u
    WHERE i.pId=p.pId AND p.uId=u.uId  AND p.prgName LIKE '%Analytics%'
    ORDER BY i.prgEmploymentRate DESC) b,(
    SELECT a.uniRank,a.uniRankYear,a.uId
    FROM [TurboRank.Associate] a, [TurboRank.University] u
    WHERE a.uId=u.uId) f
WHERE f.uid=b.uid
```

	TOP 4 Employmentrate	prgName	uniName	uId	uniRank
1	1.000	Master in Business Analytics	Emory University	u21	158
2	1.000	Master in Business Analytics	Emory University	u21	22
3	1.000	Master in Data Analytics & Business Computing	New York University	u30	35
4	1.000	Master in Data Analytics & Business Computing	New York University	u30	32
5	1.000	Master of Business Analytics	Massachusetts Institute of Technology	u11	1
6	1.000	Master of Business Analytics	Massachusetts Institute of Technology	u11	9
7	1.000	Master of Science in Business Analytics	University of California, Los Angeles	u12	36

Query executed successfully.   doitsqlx.rhsmith.umd.edu,97... | BUDT703_Student_295 (193) | BUDT703_Project_0507_04 | 00:00:00 | 8 rows

In this query, we created a new column called TOP 4 Employment Rate, the highest possible employment rate 1.00 or 100% for the top universities hence the results of the query represents that.
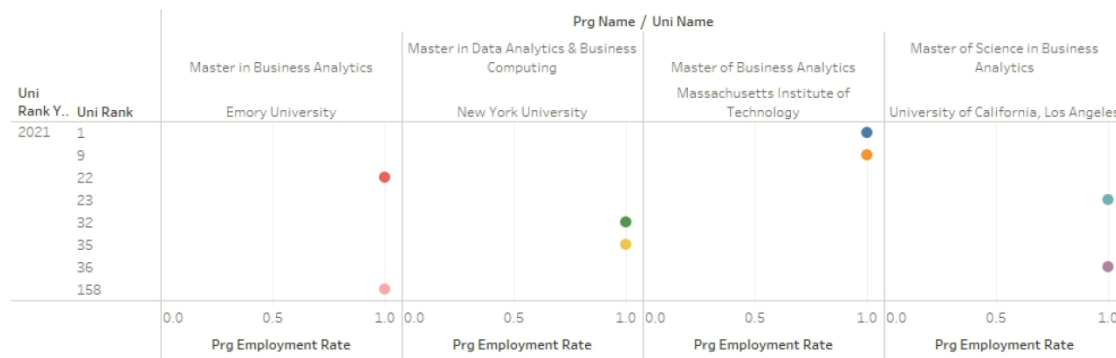
We can show these results to the dean where we can see that firstly MSBA has different names across different universities, even though these programs have different rankings from different insitiitutions (that is QS and US News) they have the same employment rate after pursuing the programs. Seeing that MSBA degrees are the most in demand across the U.S. and other countries, it is no surprise that the employment rate is at 100% for the top 4 no matter the ranking.

4.2.4 Business Transaction 4

The 4th business transaction is "What is the average undergraduate GPA of the top 10 programs with highest GMAT score in 2021?" Our database is not only for students applying to postgraduate studies, but also for some researchers. Some students always mention during the application process whether a high GMAT score can compensate for a disadvantageous GPA. We have selected the ten programs with the highest average GMAT scores in 2021 to look at their average GPA for admission. It is not the case that schools with higher GMATs require higher GPA. The University of Texas at Dallas, which has the ninth highest GMAT, has the second highest GPA of the ten programs. However, the programs with high GMAT requirements all have high GPAs overall. Students should not take any chances. With only 48 programs currently in our collection, we can assume that there is no significant positive correlation between school average GMAT and GPA based on this chart alone, but this conclusion still needs to be supported by more data. In the future we will include more information on schools, programs and scoring agencies. Researchers can also easily use our database to run regression analyses on school rankings, admissions GMAT, GPA and other factors.

```
SELECT TOP 10 u.uniName, p.prgName, i.prgMeanGMAT, i.prgMeanUndergradGPA
FROM [TurboRank.ProgramInformation] i,[TurboRank.Program] p, [TurboRank.University] u
WHERE i.prgRankYear = '2021'
AND p.uId = u.uId
AND p.pId = i.pId
ORDER BY i.prgMeanGMAT DESC
```

121% ▾ ◀

Results | Messages

	uniName	prgName	prgMeanGMAT	prgMeanUndergradGPA
1	Emory University	Master in Business Analytics	725.00	3.60
2	University of Southern California	Master of Science in Business Analytics	712.00	3.70
3	University of California, Los Angeles	Master of Science in Business Analytics	710.00	3.75
4	Cornell University	Master of Business Administration	710.00	3.34
5	New York University	Master in Data Analytics & Business Computing	710.00	3.60
6	University of California, Davis	Master of Science in Business Analytics	707.00	3.40
7	Rice University	Master of Business Administration	705.00	3.51

✓ Query executed successfully. | doitsqlx.rhsmith.umd.edu,97... | BUDT703_Student_295 (193) | BUDT703_Project_0507_04 | 00:00:00 | 10 rows

What is the average undergraduate GPA of the top 10 programs with highest GMAT score in 2021?

4.2.5 Business Transaction 5

In this business transaction, we explore "which universities provide a MSBA program with duration of no more than one-year and tuition of no more than $55000". For prospective students, some of them may care about the total expenses they spend during the program, including living expenses and tuition. The longer the program duration lasts, the higher the living expenses are. So, for someone who wants to save money, they prefer the programs with shorter duration and cheaper tuition. Supposed that there is a prospective student who intends to take a MSBA program of no more than one-year tuition and tuition of no more than $55000, we show all the MSBA programs which meet his/her requirements. Then we can see that there

are ten MSBA programs as the student likes. If he/she would like to spend as low as possible, the best choice for him/her can be SMU and OSU.

```sql
SELECT u.uniName, d.prgDuration AS 'Program Duration', d.prgTuition AS 'Program Tuition'
FROM (
    SELECT p.uId, p.prgDuration, i.prgTuition
    FROM [TurboRank.ProgramInformation] i, [TurboRank.Program] P
    WHERE i.pId = p.pId AND i.prgTuition <= 55000 AND p.prgName LIKE '%Analytics%' AND p.prgDuration <= 12 AND i.prgRankYear = '2021')
    [TurboRank.University] u
WHERE d.uId = u.uId
ORDER BY d.prgDuration |
```

121% ▾

Results | **Messages**

	uniName	Program Duration	Program Tuition
1	Southern Methodist University	9.0	43278.00
2	Arizona State University	9.0	53288.00
3	University of Notre Dame	10.0	54580.00
4	University of Arizona	10.0	44894.00
5	The Ohio State University	10.0	41585.00
6	The University of Texas at Austin	10.0	53000.00
7	Purdue University	11.0	50400.00

Query executed successfully. | doitsqlx.rhsmith.umd.edu,97... | BUDT703_Student_295 (193) | BUDT703_Project_0507_04 | 00:00:00 | 10 rows

Which universities provide a MSBA program with duration of no more than one-year and tuition of no more than $55000?
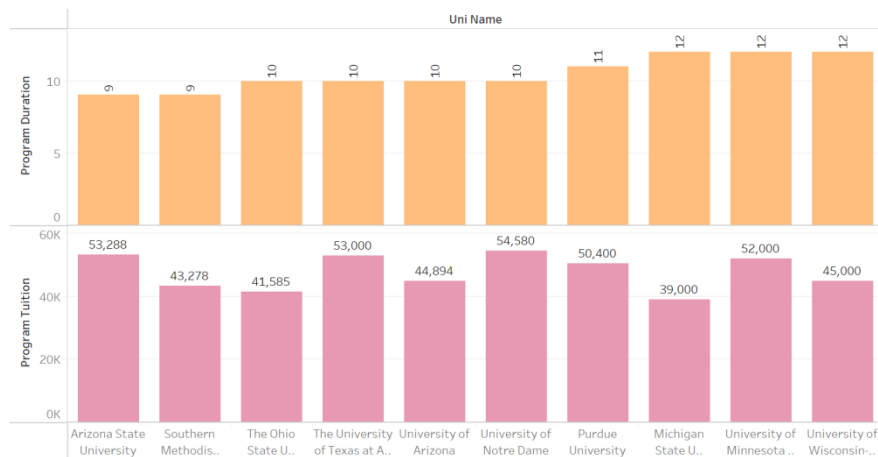
5 Test & Conclusion

We have 8 files for this project in total, they are:

       Project_0507_04_Readme.docx

       Project_0507_04_Proposal.docx

       Project_0507_04_ERD   (Lucidchart)

       Project_0507_04_{DDL}.sql

       Project_0507_04_{DML}.sql

       Project_0507_04_BusinessTransactions.twb

       Project_0507_04_Presenatation.ppt

       Project_0507_04_Data.xlsx

The link of ER-Diagram:

https://lucid.app/lucidchart/dc5d9ba5-6d0c-43aa-8cc8-d8851d01dc6a/edit?viewport_loc=3306%2C-51%2C2133%2C1065%2C0_0&invitationId=inv_dc23a49e-8afc-445e-b01a-86dff7ff71e3

To test our database project, you should "USE BUDT703_Project_0507_04". First, you should run the sql file "Project_0507_04_{DDL}.sql", which includes "drop table", "create table" and "insert data". Second, you can use the sql file"Project_0507_04_{DML}.sql " which includes all of our select statements to test "select from". You can check all the data we collected in the database as well as the excel file. Our completed data source of Tableau shows in the 4.1. The best software to run our files in will be the Microsoft Sql Server.

As TurboRank. Inc, our project has largely met our expectations. Students, deans and researchers all benefit from our database. In the future we will include more information about universities, programs and ranking institutions. We will also improve the way we insert data. In addition, we will consider including information on professors, university staff and student evaluations for the benefit of a wider range of users.

References

MBA:

> Bloomberg：
>
> https://www.bloomberg.com/business-schools/regions/us
>
> QS World University Rankings:
>
> https://www.topuniversities.com/university-rankings/mba-rankings/global/2021
>
> Average GMAT Score:
>
> https://www.oneyearmba.co.in/mba/mba-exams/gmat/average-gmat-scores/
>
> Average GRE Score:
>
> (2019): https://e-gmat.com/blogs/average-gre-scores-top-mba-programs-business-schools/
>
> (2020):
>
> https://greprepclub.com/forum/average-gre-scores-by-school-top-50-mba-programs-22116.html
>
> Employment rate:
>
> (2020)：
>
> https://www.usnews.com/education/best-graduate-schools/top-business-schools/slideshows/10-full-time-mba-programs-where-grads-find-jobs-fast?slide=47
>
> prgAccepta: +undergradGPA：
>
> (2021)：
>
> https://www.accepted.com/mba/selectivity-index
>
> Tuition:
>
> https://www.mba.today/guide/fees
>
> 2021 international student rate：
>
> https://www.usnews.com/best-graduate-schools/top-business-schools/international-students-rankings

MSBA:

> QS：
>
> https://www.qschina.cn/en/business-masters-rankings/2022
>
> TFE:
>
> https://tfetimes.com/best-business-analytics-program-rankings/

MSBA 2020 Employment Report of University of Minnesota:
https://business.wisc.edu/graduate/masters/business-analytics/admissions/class-profile/
https://carlsonschool.umn.edu/sites/carlsonschool.umn.edu/files/inline-files/MSBA%202020%20Employment%20Report.pdf

MSBA student information of University of Minnesota:
https://www.petersons.com/graduate-schools/university-of-minnesota-twin-cities-campus-carlson-school-of-management-master-of-science-in-business-analytics-program-master-of-science-in-business-analytics-program-000_10067681.aspx
https://broad.msu.edu/wp-content/uploads/2019/11/Handbook-2020.pdf