INT217: Introduction to Data Science

Project: Excel Dashboard on Internet Service Offers Dataset

Lovely Professional University, Phagwara

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Project Duration: Semester 5 August – December 2022

DECLARATION

I, Ritu Priya Singh, student of Lovely Professional University pursuing BTech CSE from School of Computer Science and Engineering, Punjab, hereby declare that all the information provided in this project report is based on my own analysis and is genuine.

Date: 9th Nov 2022 Signature

Singh

Registration No.: 12001595 Name of the Student

Ritu Priya Singh

ACKNOWLEDGEMENT

I would like to thank Ms. Sameeksha Khare Ma’am for her support and guidance in completing our project on the topic “Internet Service Offers Dataset”. It was a great learning experience for me in this semester.

Ritu Priya Singh

12001595

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Introduction

This project (i.e., Dashboard) is developed to analyse the data of Internet Service Offers Dataset across dozens of US cities.

Dashboard Objectives:

1. To analyse the total Price of Internet Service & population with respect to Cities.
2. To analyse the technologies with respect to fastest speed price.
3. To analyse the count of upload speed and download speed with respect to packages.
4. To analyse the speed unit according to the population.
5. To analyse the average of latitude and longitude.
6. To analyse the average income with respect to cities.

SOURCE OF DATASET

Link: https://www.kaggle.com/datasets/michaelbryantds/internet-speeds-and-prices

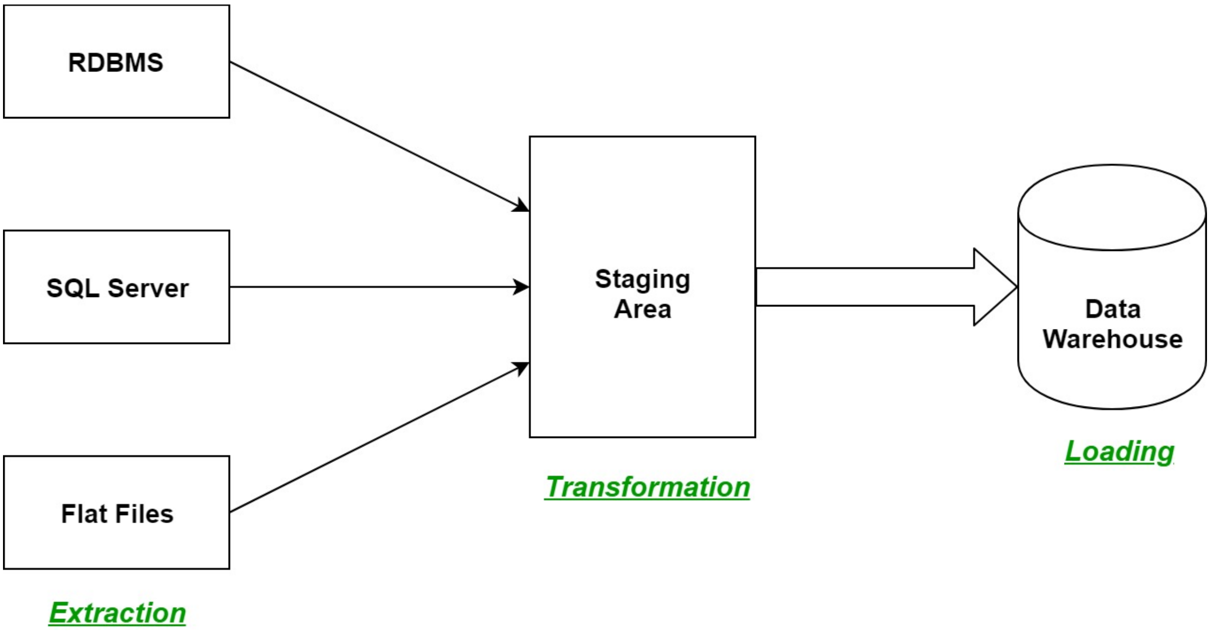
I choose my dataset from Kaggle.com as it is one of the best websites where different types of datasets are available for free and I have got one of the informative datasets for my project based on the Internet Service Offers.

About Kaggle:

Kaggle is an online community platform for data scientists and machine learning enthusiasts. Kaggle allows users to collaborate with other users, find and publish datasets, use GPU integrated notebooks, and compete with other data scientists to solve data science challenges. The aim of this online platform (founded in 2010 by Anthony Goldbloom and Jeremy Howard and acquired by Google in 2017) is to help professionals and learners reach their goals in their data science journey with the powerful tools and resources it provides. As of today (2021), there are over 8 million registered users on Kaggle.

ETL PROCESS

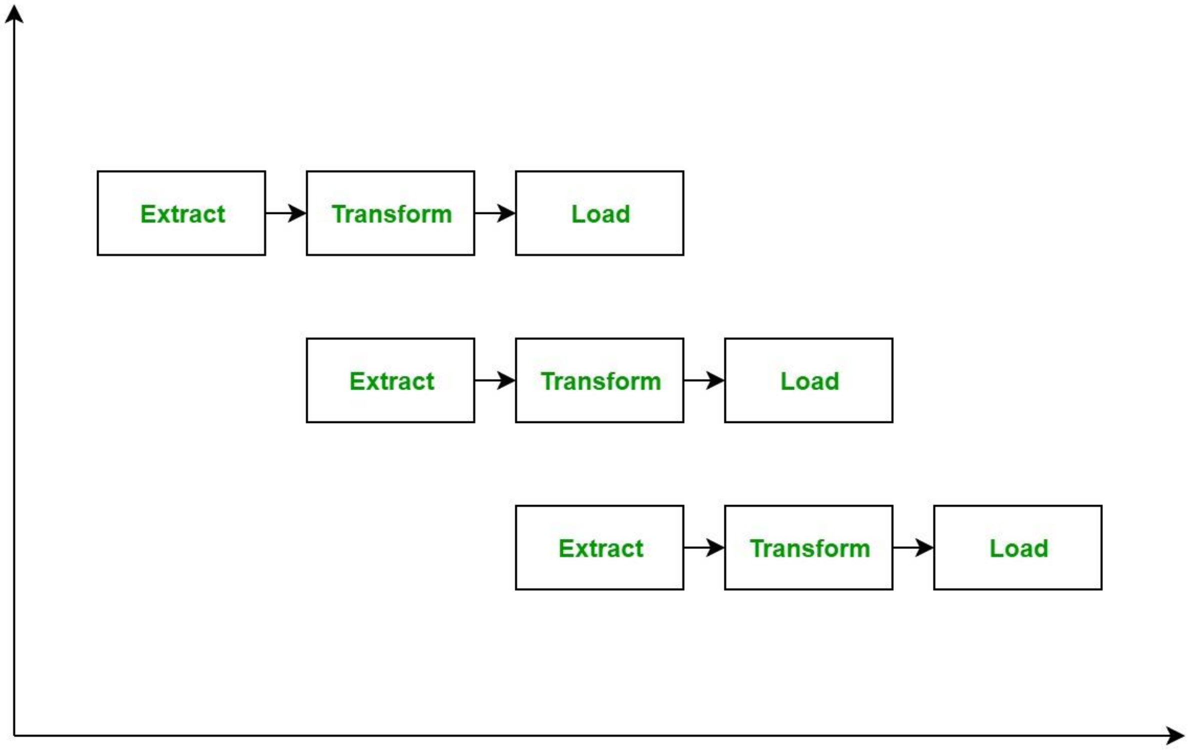
ETL is a process in Data Warehousing and it stands for Extract, Transform and Load. It is a process in which an ETL tool extracts the data from various data source systems, transforms it in the staging area, and then finally, loads it into the Data Warehouse system.



- ## Extraction:
  - The first step of the ETL process is extraction. In this step, data from various source systems is extracted which can be in various formats like relational databases, No SQL, XML, and flat files into the staging area. It is important to extract the data from various source systems and store it into the staging area first and not directly into the data warehouse because the extracted data is in various formats and can be corrupted also. Hence loading it directly into the data warehouse may damage it and rollback will be much more difficult. Therefore, this is one of the most important steps of ETL process.
- ## Transformation:
  - The second step of the ETL process is transformation. In this step, a set of rules or functions are applied on the extracted data to convert it into a single standard format.
  - Filtering – loading only certain attributes into the data warehouse.
  - Cleaning – filling up the NULL values with some default values, mapping U.S.A, United States, and America into USA, etc.
  - Joining – joining multiple attributes into one.
  - Splitting – splitting a single attribute into multiple attributes.
  - Sorting – sorting tuples on the basis of some attribute (generally key-attribute).

- **Loading:**
    - The third and final step of the ETL process is loading. In this step, the transformed data is finally loaded into the data warehouse. Sometimes the data is updated by loading into the data warehouse very frequently and sometimes it is done after longer but regular intervals. The rate and period of loading solely depends on the requirements and varies from system to system.

ETL process can also use the pipelining concept i.e., as soon as some data is extracted, it can transform and during that period some new data can be extracted. And while the transformed data is being loaded into the data warehouse, the already extracted data can be transformed. The block diagram of the pipelining of ETL process is shown below:

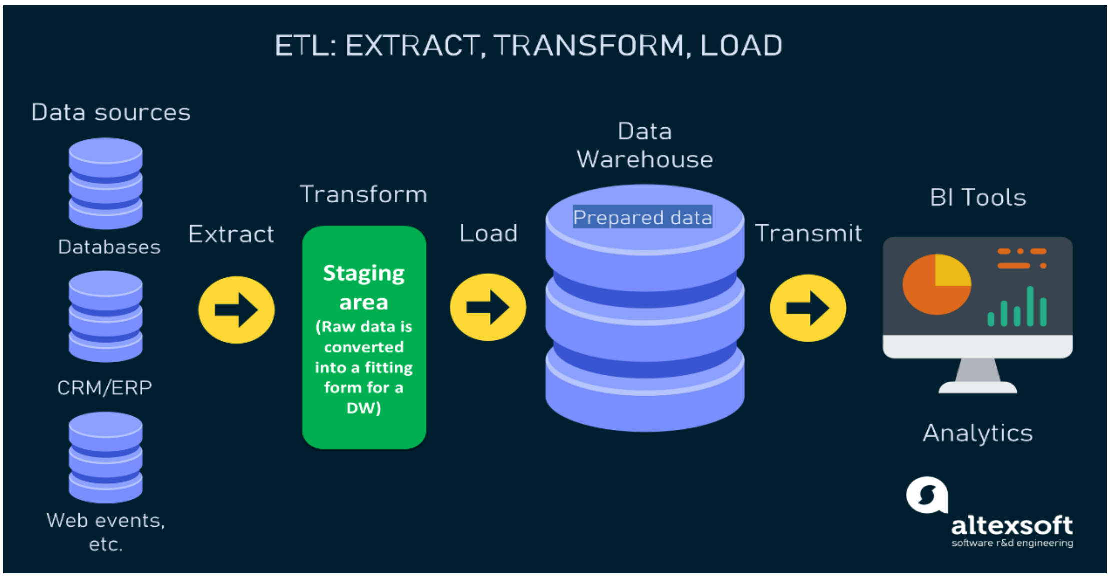


ETL Tools: Most commonly used ETL tools are Hevo, Sybase, Oracle Warehouse builder, CloverETL, and MarkLogic.

Data Warehouses: Most commonly used Data Warehouses are Snowflake, Redshift, BigQuery, and Firebolt.

The benefits and challenges of ETL:

ETL solutions improve quality by performing data cleansing prior to loading the data to a different repository. A time-consuming batch operation, ETL is recommended more often for creating smaller target data repositories that require less frequent updating, while other data integration methods—including ELT (extract, load, transform), change data capture (CDC), and data virtualization—are used to integrate increasingly larger volumes of data that changes or real-time data streams.



Analysis of Dataset

Dataset contains:

- Number of columns: 27
- Number of rows: 432304

Dataset after cleaning:

- Number of columns: 19
- Number of rows: 432304

Columns contain:

1. Major City
2. State
3. Latitude
4. Longitude
5. Provider: The internet service provider
6. Speed down: Cheapest advertised download speed for the address
7. Speed up: Cheapest advertised upload speed for the address
8. Speed unit: The unit of speed is in Mbps
9. Price: The cost in USD of the cheapest advertised internet plan
10. Technology: The kind of technology (fiber or non-fiber) used to serve the cheapest internet plan
11. Package: The name of the cheapest internet plan
12. Fastest speed down: The download speed of the fastest package
13. Fastest speed price: The upload speed of the fastest internet package
14. Redlining grade: The redlining grade, merged from Mapping Inequality based on the latitude and longitude of the address
15. Ppl per square mile: People per square mile is used to determine population density

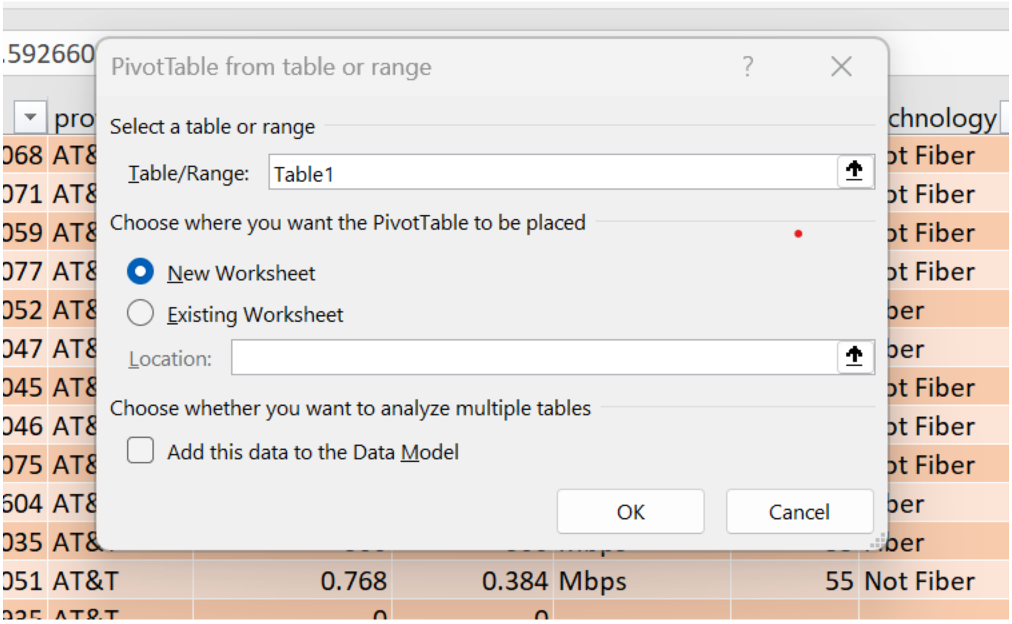
16. N Providers: The number of other wired competitors in the addresses
17. Income dollars below median: City median household income – median household income
18. Internet perc broadband: The percentage of the population that is already subscribed to broadband
19. Median household income

Specific Requirement:

- MS Excel
- Pivot Table
- Slicer
- Power Point

Steps to Creating the Pivot Table:

- Select a cell in the dataset.
- Go to Insert> Pivot Table
-



PivotTable from table or range

Select a table or range

Table/Range: Table1

Choose where you want the PivotTable to be placed

● New Worksheet

○ Existing Worksheet

Location:

Choose whether you want to analyze multiple tables

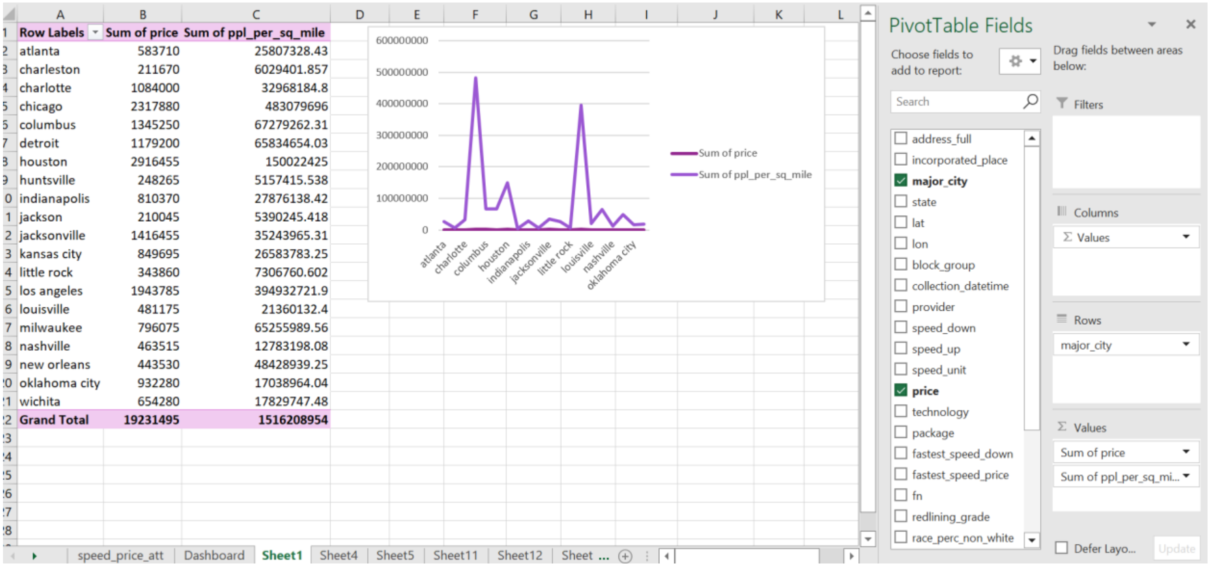
□ Add this data to the Data Model

OK Cancel

- Select New Worksheet.
- Provide table name or leave it as default.
- Click on OK.

To analyse the total Price of Internet Service & population with respect to Cities:

- This table contains the sum of the price of cheapest internet plan which is in US Dollar.
- Process of creating Line Chart using this Pivot Table.
    - Create Pivot Table> Select major_city as rows> Select price & ppl_per_sq_mile in the Values section.
    - Go to Insert> Select Line chart in the Charts section.



Row Labels	Sum of price	Sum of ppl_per_sq_mile
atlanta	583710	25807328.43
charleston	211670	6029401.857
charlotte	1084000	32968184.8
chicago	2317880	483079696
columbus	1345250	67279262.31
detroit	1179200	65834654.03
houston	2916455	150022425
huntsville	248265	5157415.538
indianapolis	810370	27876138.42
jackson	210045	5390245.418
jacksonville	1416455	35243965.31
kansas city	849695	26583783.25
little rock	343860	7306760.602
los angeles	1943785	394932721.9
louisville	481175	21360132.4
milwaukee	796075	65255989.56
nashville	463515	12783198.08
new orleans	443530	48428939.25
oklahoma city	932280	17038964.04
wichita	654280	17829747.48
Grand Total	**19231495**	**1516208954**

PivotTable Fields

Choose fields to add to report:

□ address_full
□ incorporated_place
☑ major_city
□ state
□ lat
□ lon
□ block_group
□ collection_datetime
□ provider
□ speed_down
□ speed_up
□ speed_unit
☑ price
□ technology
□ package
□ fastest_speed_down
□ fastest_speed_price
□ fn
□ redlining_grade
□ race_perc_non_white

Drag fields between areas below:

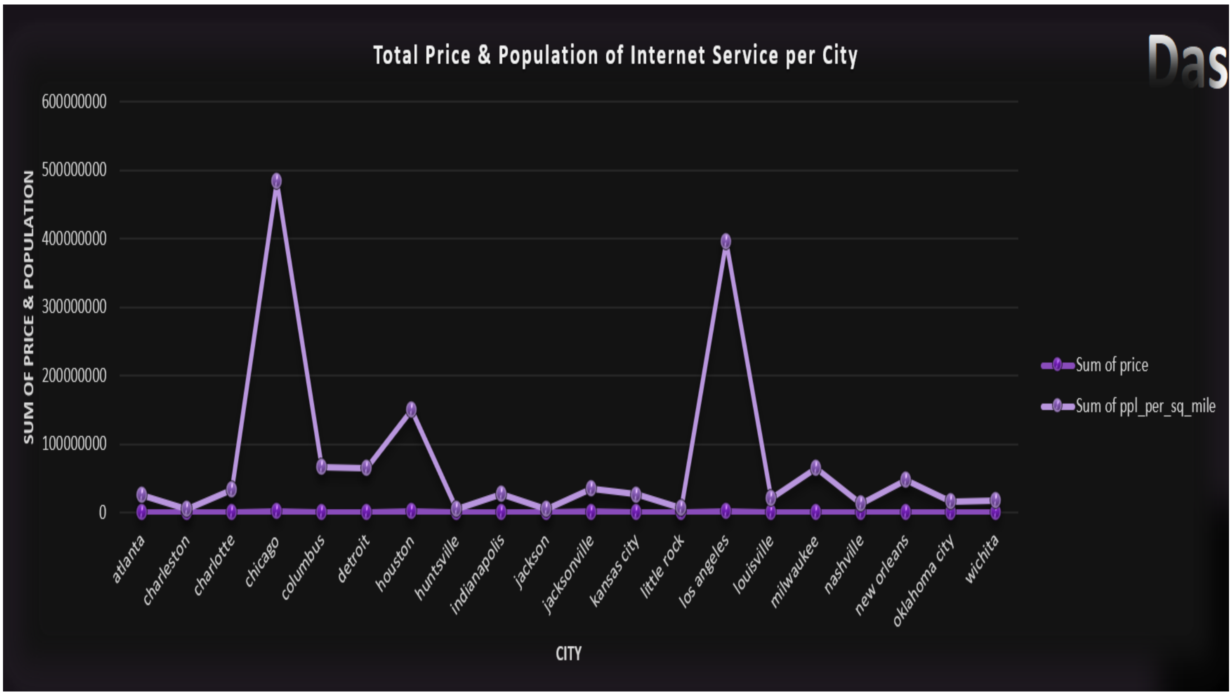
Filters

Columns: Σ Values

Rows: major_city

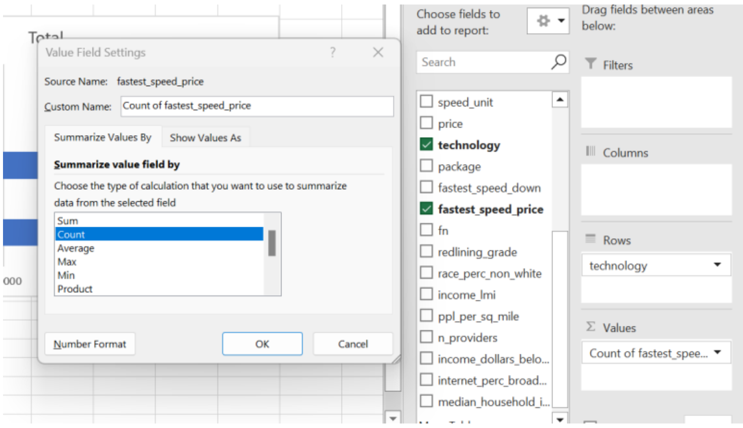
Values: Sum of price; Sum of ppl_per_sq_mi...

□ Defer Layo... Update



To analyse the technologies with respect to fastest speed price:

- Create Pivot Table> Select Technology as rows> fastest_speed_price as values.



Value Field Settings

Source Name: fastest_speed_price

Custom Name: Count of fastest_speed_price

Summarize Values By | Show Values As

Summarize value field by

Choose the type of calculation that you want to use to summarize data from the selected field

Sum
Count
Average
Max
Min
Product

Number Format | OK | Cancel

Choose fields to add to report:

Search

- ☐ speed_unit
- ☐ price
- ☑ **technology**
- ☐ package
- ☐ fastest_speed_down
- ☑ **fastest_speed_price**
- ☐ fn
- ☐ redlining_grade
- ☐ race_perc_non_white
- ☐ income_lmi
- ☐ ppl_per_sq_mile
- ☐ n_providers
- ☐ income_dollars_belo...
- ☐ internet_perc_broad...
- ☐ median_household_i...

Drag fields between areas below:

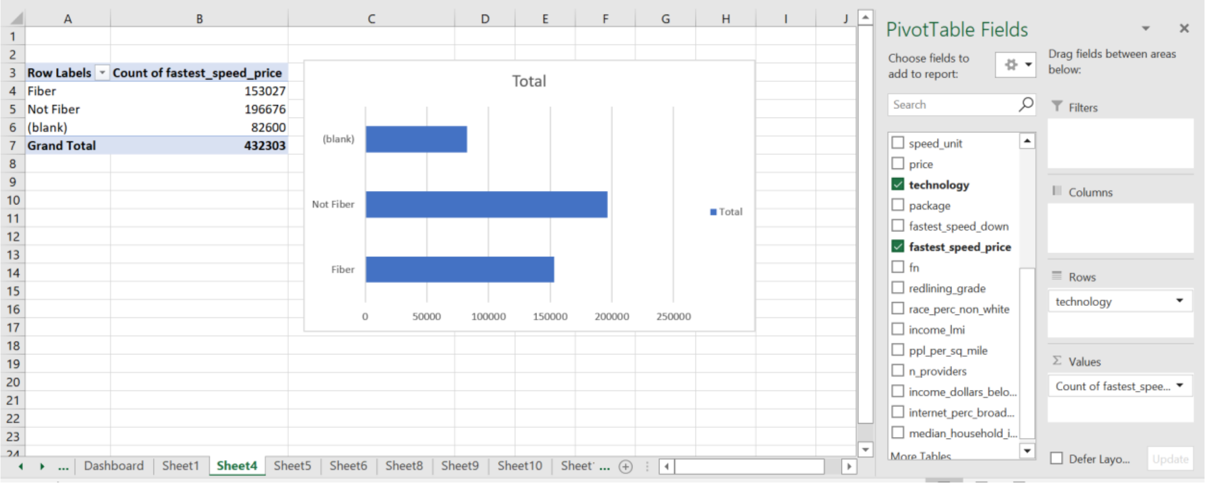
Filters

Columns

Rows: technology

Values: Count of fastest_spee...

- Click on Values section> Value field settings> select Count option > OK.
- Go to Insert> Select 2D bar chart type> OK.



Row Labels	Count of fastest_speed_price
Fiber	153027
Not Fiber	196676
(blank)	82600
Grand Total	**432303**

PivotTable Fields

Choose fields to add to report:

Search

- ☐ speed_unit
- ☐ price
- ☑ **technology**
- ☐ package
- ☐ fastest_speed_down
- ☑ **fastest_speed_price**
- ☐ fn
- ☐ redlining_grade
- ☐ race_perc_non_white
- ☐ income_lmi
- ☐ ppl_per_sq_mile
- ☐ n_providers
- ☐ income_dollars_belo...
- ☐ internet_perc_broad...
- ☐ median_household_i...

More Tables...

Drag fields between areas below:

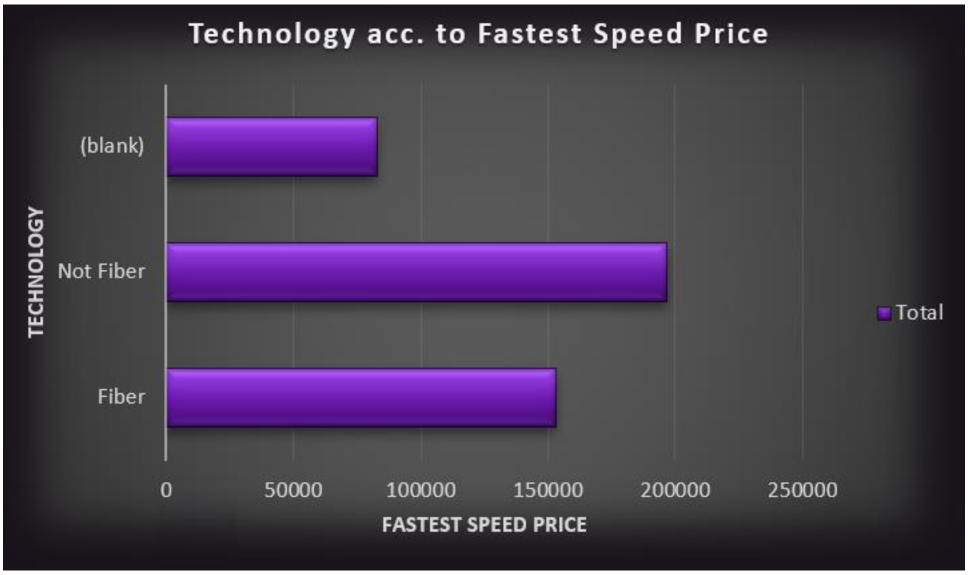
Filters

Columns

Rows: technology

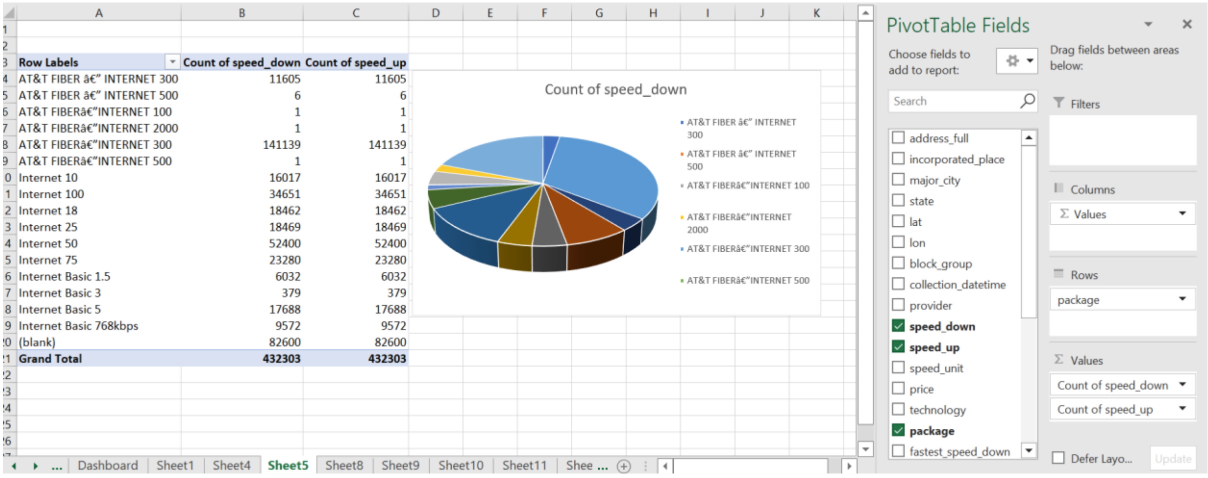
Values: Count of fastest_spee...

☐ Defer Layo... Update



To analyse the count of upload speed and download speed with respect to packages:

- Create Pivot table> select speed_up & speed_down in the values section> select package in the rows.
- Insert> Select 3D pie chart from the chart section> click OK.



Row Labels	Count of speed_down	Count of speed_up
AT&T FIBER â€” INTERNET 300	11605	11605
AT&T FIBER â€” INTERNET 500	6	6
AT&T FIBERâ€"INTERNET 100	1	1
AT&T FIBERâ€"INTERNET 2000	1	1
AT&T FIBERâ€"INTERNET 300	141139	141139
AT&T FIBERâ€"INTERNET 500	1	1
Internet 10	16017	16017
Internet 100	34651	34651
Internet 18	18462	18462
Internet 25	18469	18469
Internet 50	52400	52400
Internet 75	23280	23280
Internet Basic 1.5	6032	6032
Internet Basic 3	379	379
Internet Basic 5	17688	17688
Internet Basic 768kbps	9572	9572
(blank)	82600	82600
Grand Total	**432303**	**432303**

PivotTable Fields

Choose fields to add to report:

□ address_full
□ incorporated_place
□ major_city
□ state
□ lat
□ lon
□ block_group
□ collection_datetime
□ provider
☑ speed_down
☑ speed_up
□ speed_unit
□ price
□ technology
☑ package
□ fastest_speed_down

Drag fields between areas below:

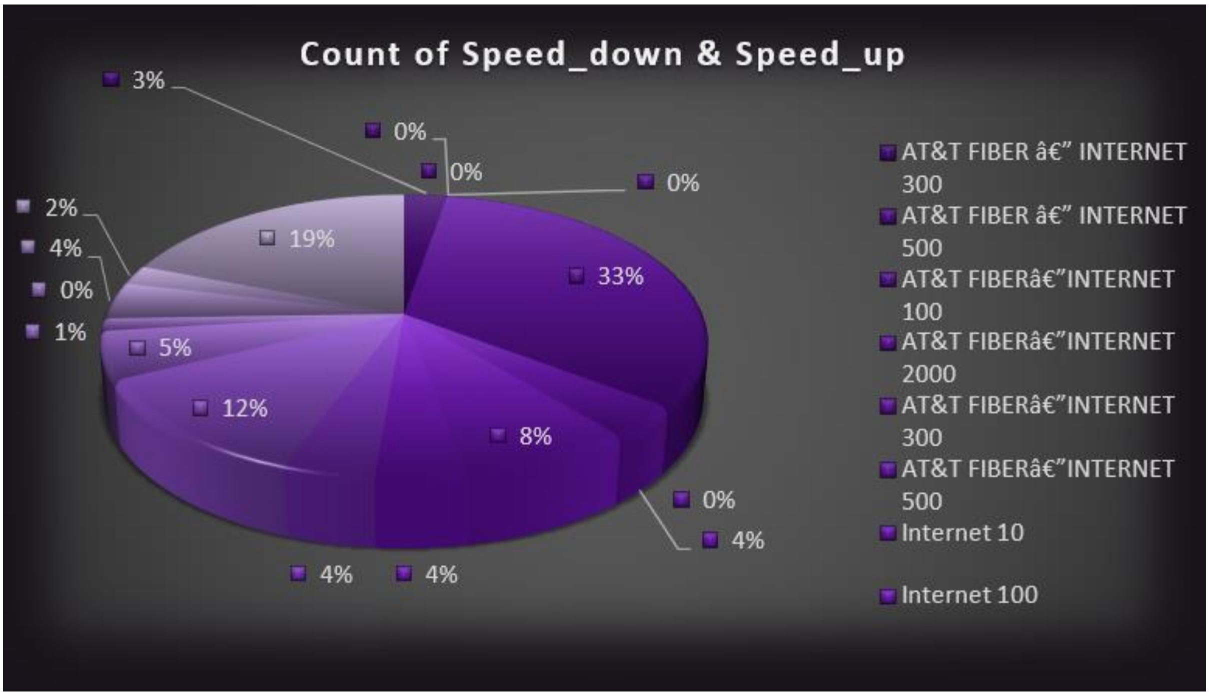
Filters

Columns: Σ Values

Rows: package

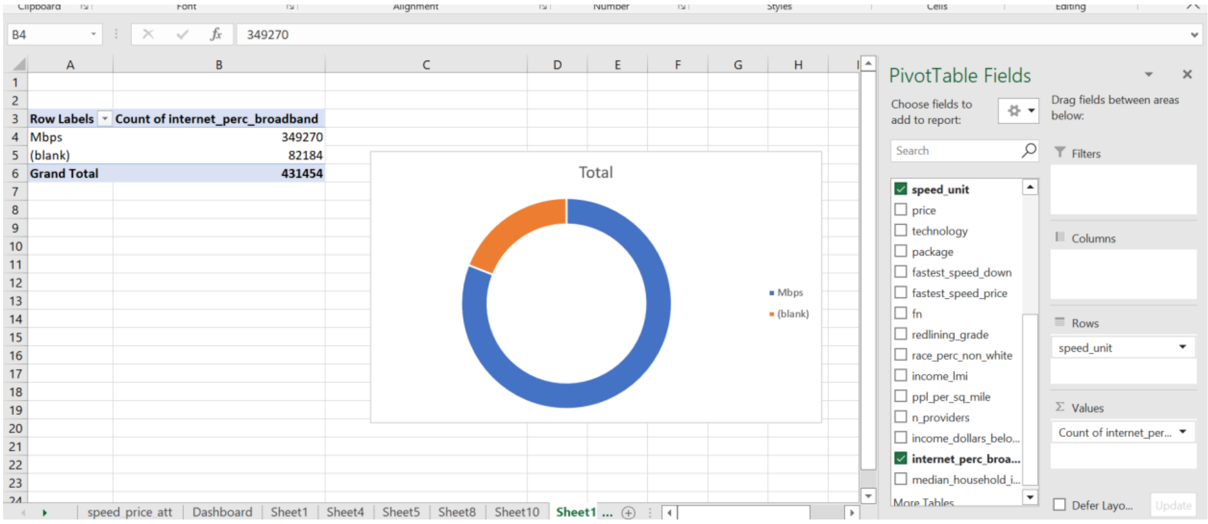
Values: Count of speed_down; Count of speed_up

□ Defer Layo...



To analyse the speed unit according to the population:

- Create Pivot Table> select speed_unit in the rows area> select internet_perc_broadband in the values area.
- Edit the values field settings> select count> Click OK.
- Select Donut chart from the chart section.
- Click OK.



B4 349270

Row Labels	Count of internet_perc_broadband
Mbps	349270
(blank)	82184
Grand Total	**431454**

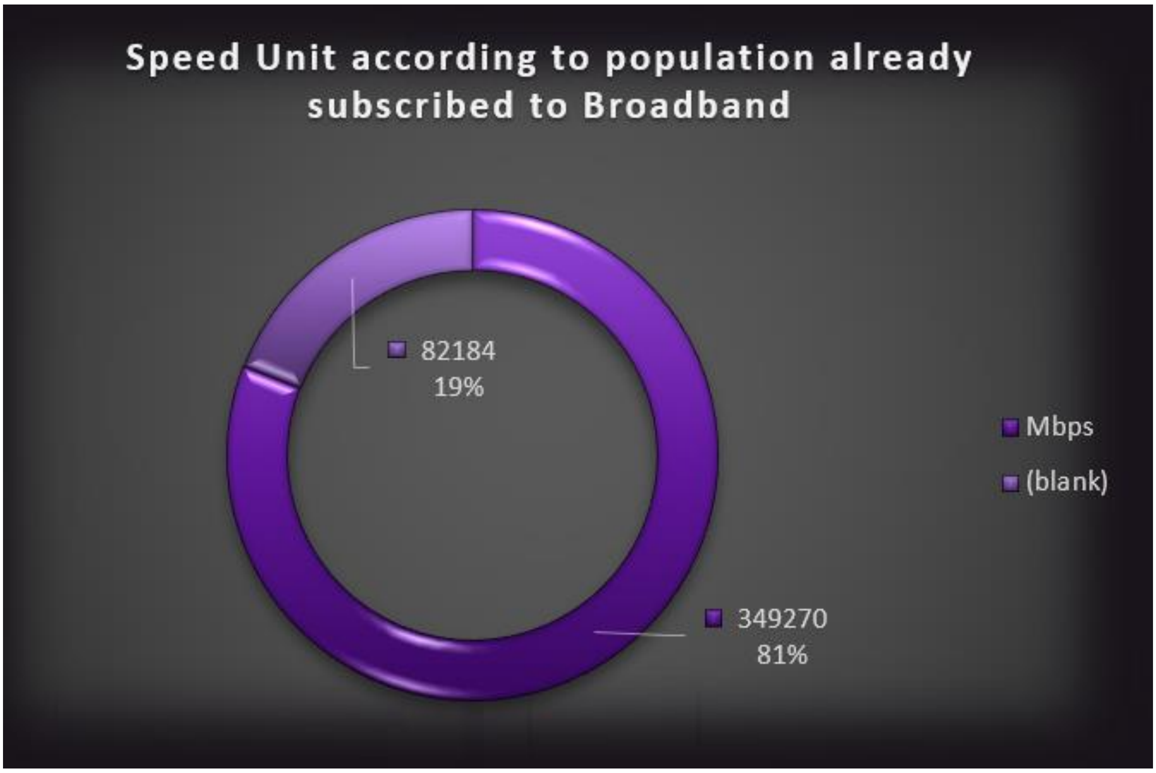
PivotTable Fields

Choose fields to add to report:

☑ speed_unit
☐ price
☐ technology
☐ package
☐ fastest_speed_down
☐ fastest_speed_price
☐ fn
☐ redlining_grade
☐ race_perc_non_white
☐ income_lmi
☐ ppl_per_sq_mile
☐ n_providers
☐ income_dollars_belo...
☑ internet_perc_broa...
☐ median_household_i...

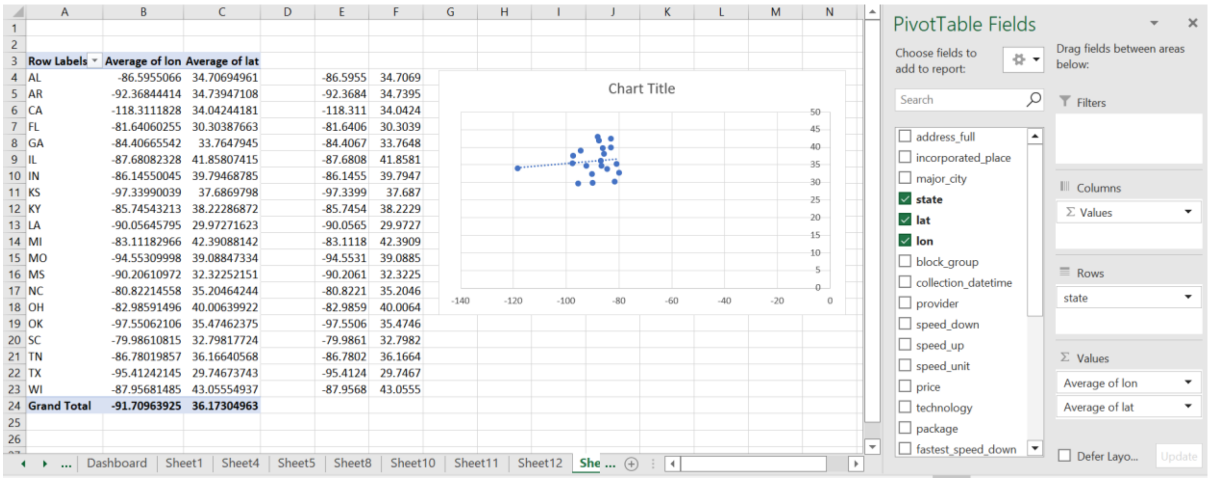
Rows: speed_unit

Values: Count of internet_per...



To analyse the average of latitude and longitude:

- Create Pivot table> select state in the rows> select the values of lat and lon in the columns area.
- In the values field> select the average of latitude and average of longitude.
- Click OK.
- Copy the values of latitude and longitude from the pivot table and paste it in another cell.
- Select one of the cells> go to insert> chart option> click on Scatter chart> click OK.



Row Labels	Average of lon	Average of lat		
AL	-86.5955066	34.70694961	-86.5955	34.7069
AR	-92.36844414	34.73947108	-92.3684	34.7395
CA	-118.3111828	34.04244181	-118.311	34.0424
FL	-81.64060255	30.30387663	-81.6406	30.3039
GA	-84.40665542	33.7647945	-84.4067	33.7648
IL	-87.68082328	41.85807415	-87.6808	41.8581
IN	-86.14550045	39.79468785	-86.1455	39.7947
KS	-97.33990039	37.6869798	-97.3399	37.687
KY	-85.74543213	38.22286872	-85.7454	38.2229
LA	-90.05645795	29.97271623	-90.0565	29.9727
MI	-83.11182966	42.39088142	-83.1118	42.3909
MO	-94.55309998	39.08847334	-94.5531	39.0885
MS	-90.20610972	32.32252151	-90.2061	32.3225
NC	-80.82214558	35.20464244	-80.8221	35.2046
OH	-82.98591496	40.00639922	-82.9859	40.0064
OK	-97.55062106	35.47462375	-97.5506	35.4746
SC	-79.98610815	32.79817724	-79.9861	32.7982
TN	-86.78019857	36.16640568	-86.7802	36.1664
TX	-95.41242145	29.74673743	-95.4124	29.7467
WI	-87.95681485	43.05554937	-87.9568	43.0555
Grand Total	**-91.70963925**	**36.17304963**		

PivotTable Fields

Choose fields to add to report:

□ address_full
□ incorporated_place
□ major_city
☑ state
☑ lat
☑ lon
□ block_group
□ collection_datetime
□ provider
□ speed_down
□ speed_up
□ speed_unit
□ price
□ technology
□ package
□ fastest_speed_down

Drag fields between areas below:

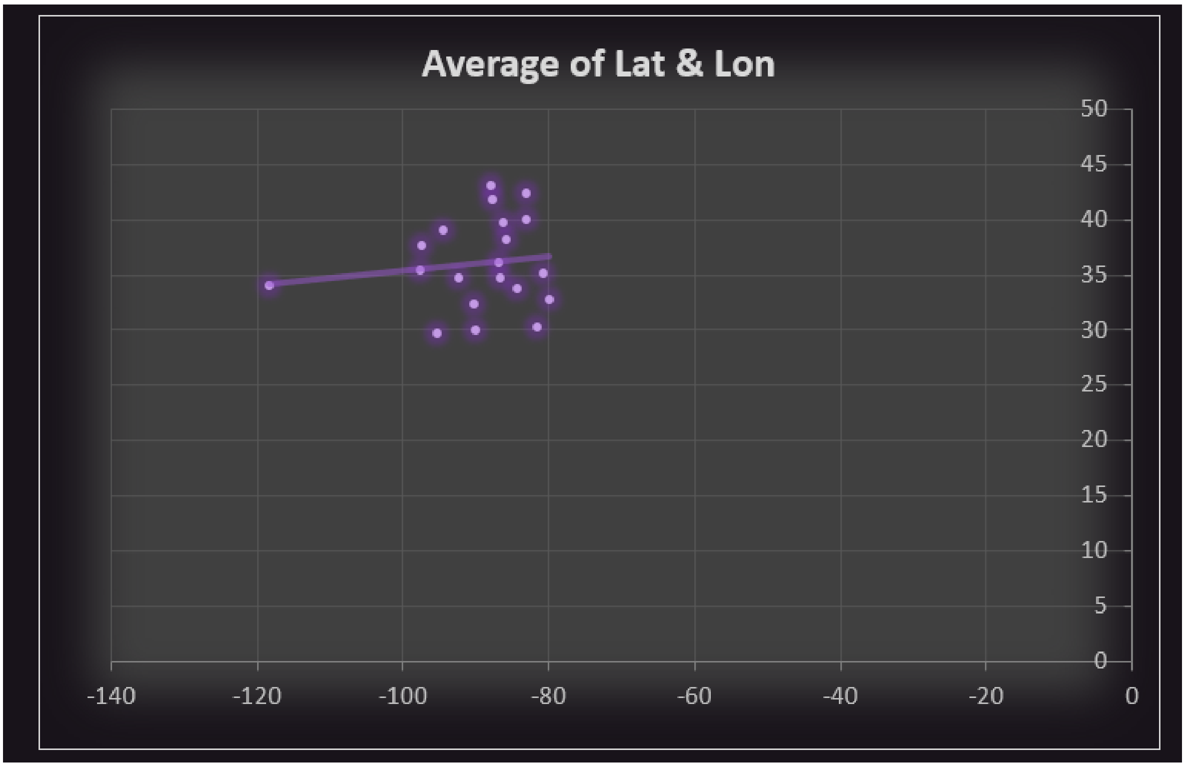
Filters

Columns: Σ Values

Rows: state

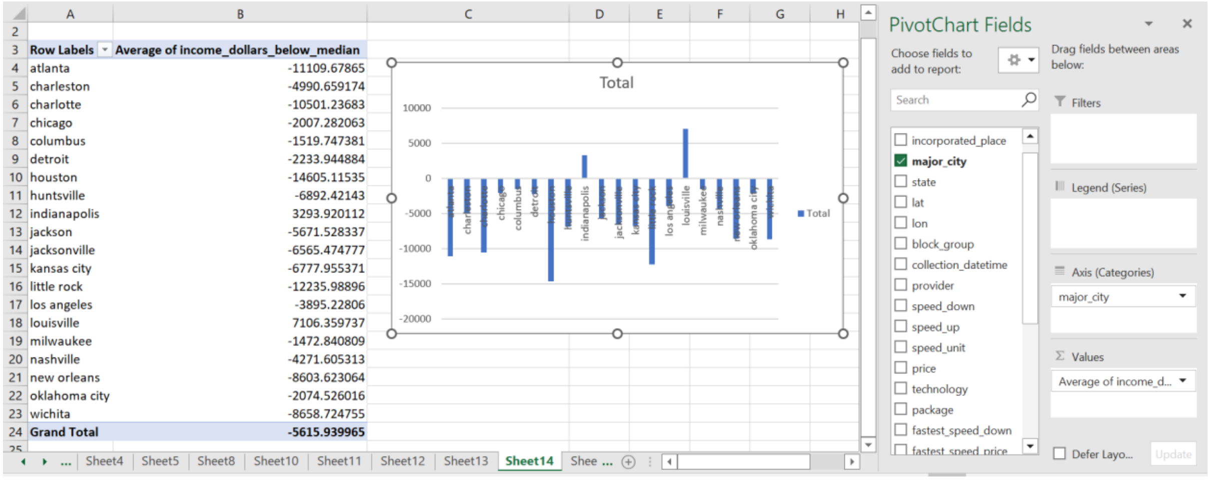
Values: Average of lon; Average of lat

□ Defer Layo... Update



To analyse the average income with respect to cities

- Create Pivot table> select major city in the rows section> select income_dollars_below_median in the values section.
- Edit Value field settings> select average option> click OK.
- Select bar chart from the charts option.
- Click OK.



Row Labels	Average of income_dollars_below_median
atlanta	-11109.67865
charleston	-4990.659174
charlotte	-10501.23683
chicago	-2007.282063
columbus	-1519.747381
detroit	-2233.944884
houston	-14605.11535
huntsville	-6892.42143
indianapolis	3293.920112
jackson	-5671.528337
jacksonville	-6565.474777
kansas city	-6777.955371
little rock	-12235.98896
los angeles	-3895.22806
louisville	7106.359737
milwaukee	-1472.840809
nashville	-4271.605313
new orleans	-8603.623064
oklahoma city	-2074.526016
wichita	-8658.724755
Grand Total	**-5615.939965**

PivotChart Fields

Choose fields to add to report:

- ☐ incorporated_place
- ☑ **major_city**
- ☐ state
- ☐ lat
- ☐ lon
- ☐ block_group
- ☐ collection_datetime
- ☐ provider
- ☐ speed_down
- ☐ speed_up
- ☐ speed_unit
- ☐ price
- ☐ technology
- ☐ package
- ☐ fastest_speed_down
- ☐ fastest_speed_price

Drag fields between areas below:

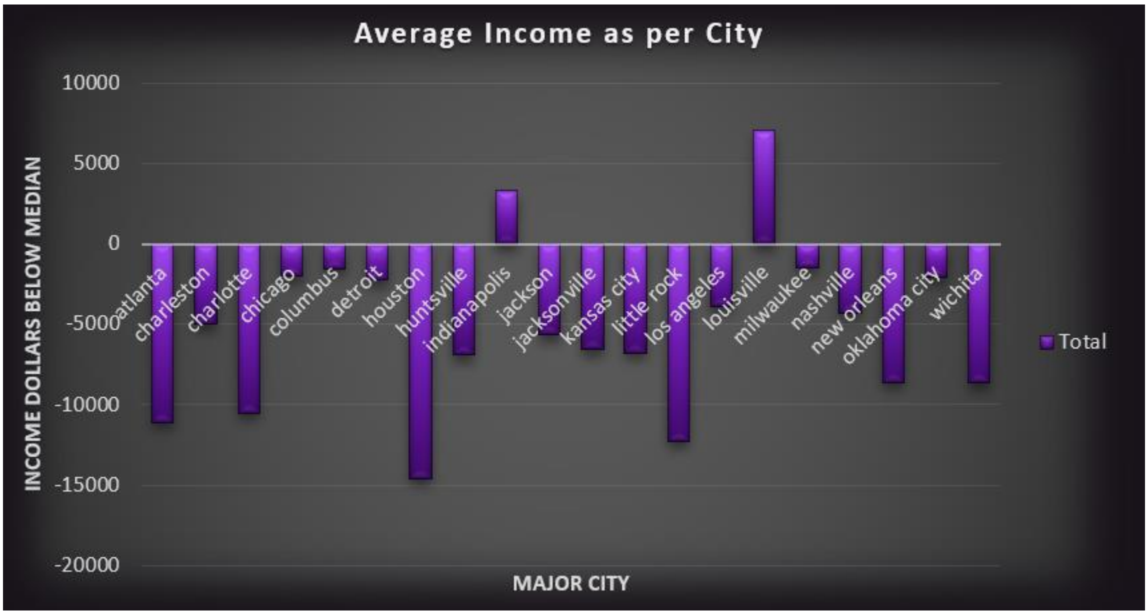
Filters

Legend (Series)

Axis (Categories): major_city

Values: Average of income_d...

☐ Defer Layo... Update



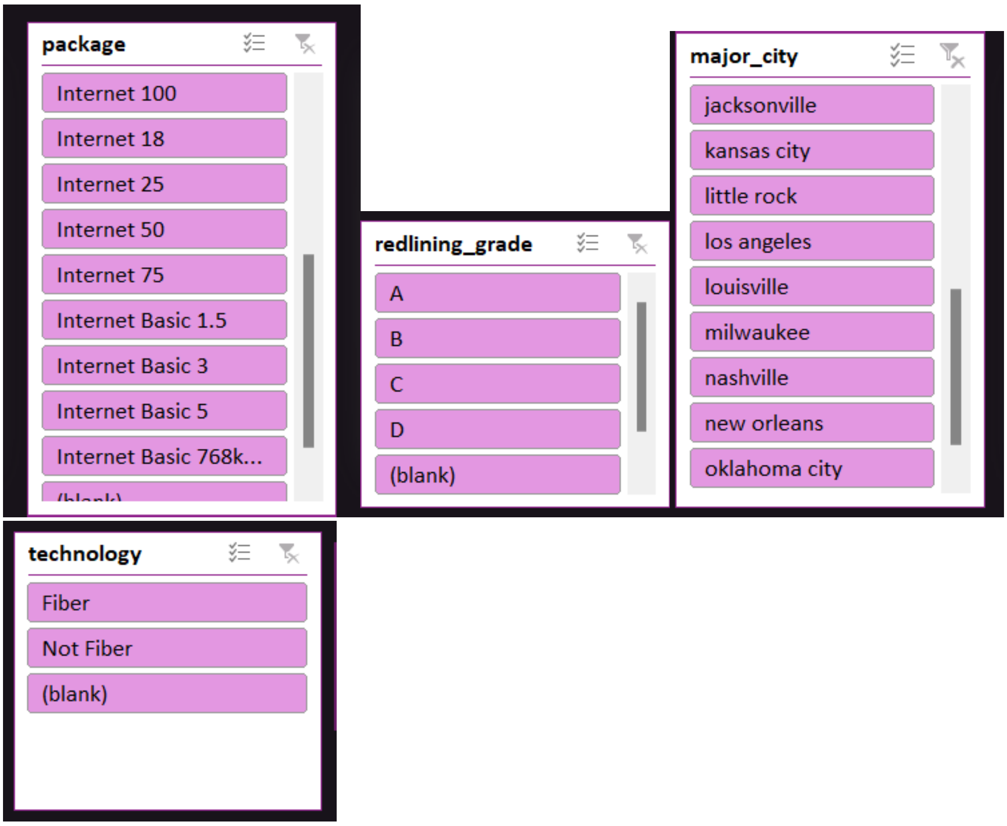
Slicers:

Slicers provide buttons that you can click to filter tables, or PivotTables. In addition to quick filtering, slicers also indicate the current filtering state, which makes it easy to understand what exactly is currently displayed.

How to use Slicer:

1. Click anywhere in the table or PivotTable.
2. On the Home tab, go to Insert> Slicer.

3. In the Insert Slicers dialog box, select the check boxes for the fields you want to display, then select OK.
4. A slicer will be created for every field that you selected. Clicking any of the slicer buttons will automatically apply that filter to the linked table or PivotTable.
5. You can adjust your slicer preferences in the Slicer tab on the ribbon.
6. If you want to connect a slicer to more than one PivotTable, go to Slicer> Report Connections> check the PivotTables to include, then select OK.

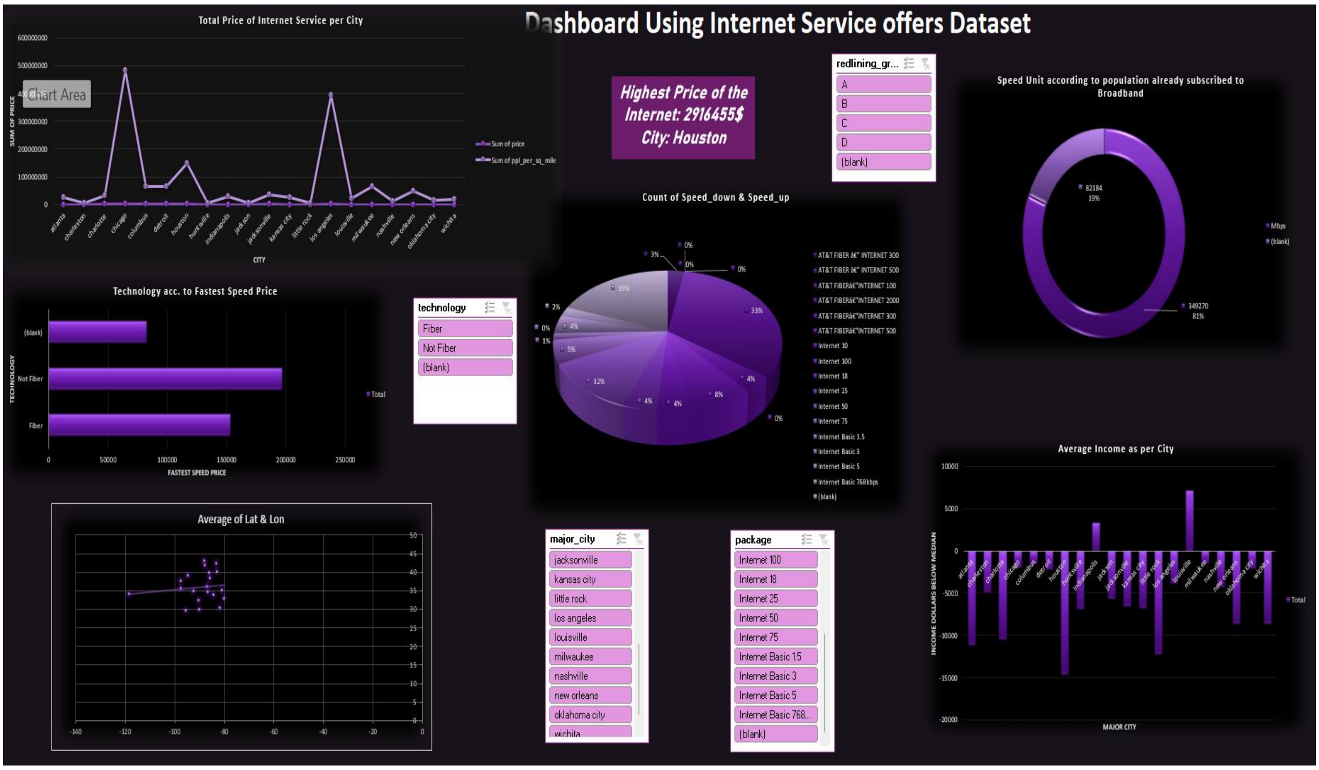


Dashboard:

A dashboard is a visual display of all of your data. While it can be used in all kinds of different ways, its primary intention is to provide information at-a-glance, such as KPIs.

A dashboard usually sits on its own page and receives information from a linked database. In many cases it's configurable, allowing you the ability to choose which data you want to see and whether you want to include charts or graphs to visualize the numbers.

Overview of the Dashboard



Summary:

- The excel dashboard is used to display overviews of the large datasets.
- Excel dashboard use the elements like pivot tables, charts, graphs and gauges to show the overviews.
- The dashboard eases the decision-making process by showing the vital parts of the data in the same place.

Key Features:

- Total price of the Internet.
- Technologies which are available: fiber & non-fiber.
- Total Population density per square mile.
- Upload speed and download speed.
- Speed unit which measures in Mbps only.
- Fastest download speed of the fastest package available.
- Income in dollars.

Special Features:

- We can analyse the dataset according to the cities in US, redlining grade, technology, and package of the internet service provider.
- Using the slicer in Cities can show the data of a particular city.
- Package in slicer can show the total price of that package in the cities.
- Technology in slicer can show the count of median household income.

References

- https://www.kaggle.com/
- https://support.microsoft.com/en-us/office/use-slicers-to-filter-data-249f966b-a9d5-4b0f-b31a-12651785d29d#:~:text=Slicers%20provide%20buttons%20that%20you,what%20exactly%20is%20currently%20displayed.

THANK YOU