CS_ELEC_3C | Nov 5, 2025
LAB ACTIVITY - NETWORK AND HIERARCHICAL

Baylon, Karyle Zhienelle V.
4CSD

NETWORK

1. *Using the given network, improve the graph by incorporating the audience size, weights of edges, and the type of edges. Provide interactivity, if possible.*
2. *Answer the questions. Interpret the degree centrality obtained.*

TASK: Briefly describe the size and characteristics of the dataset.

The analysis shows that the dataset features 17 media outlets and 51 interconnections, forming a compact yet informative media network. Each outlet entry provides details such as its name, category, and audience size, while the links illustrate relationships established through mentions or hyperlinks. Audience figures fall between 20 and 60, and link strengths range from 2 to 23, revealing that certain outlets hold greater influence or connectivity within the network. The absence of missing data confirms that the dataset is complete and ready for further exploration.

```
    id                media  media.type type.label  audience.size
0  s01            NY Times           1  Newspaper             20
1  s02      Washington Post           1  Newspaper             25
2  s03  Wall Street Journal           1  Newspaper             30
3  s04            USA Today           1  Newspaper             32
4  s05             LA Times           1  Newspaper             20
  from   to  weight       type
0  s01  s02      10  hyperlink
1  s01  s02      12  hyperlink
2  s01  s03      22  hyperlink
3  s01  s04      21  hyperlink
4  s04  s11      22    mention
(17, 5) (51, 4)
```

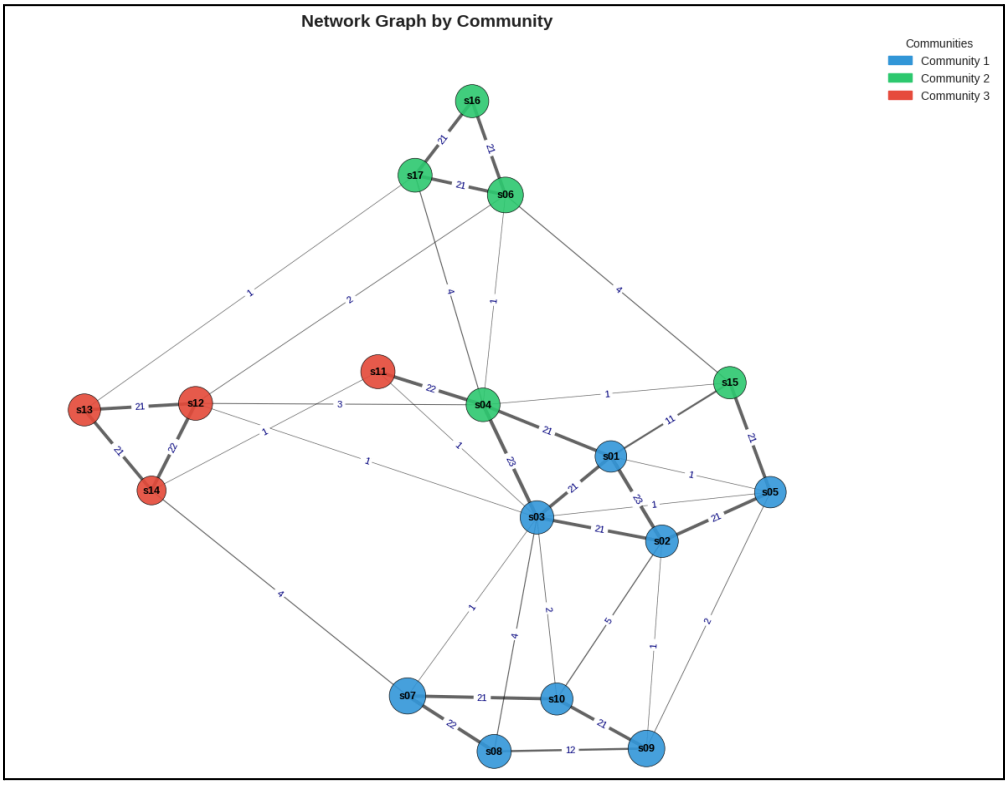
```
--- Dataset Overview ---
Number of nodes (media outlets): 17
Number of edges (connections): 51
Node columns: ['id', 'media', 'media.type', 'type.label', 'audience.size']
Edge columns: ['from', 'to', 'weight', 'type']

--- Numeric summary (audience size, weight) ---
       media.type  audience.size
count   17.000000      17.000000
mean     2.000000      31.588235
std      0.866025      12.927968
min      1.000000      12.000000
25%      1.000000      23.000000
50%      2.000000      30.000000
75%      3.000000      34.000000
max      3.000000      60.000000
          weight
count  51.000000
mean   11.901961
std     9.254739
min     1.000000
25%     2.000000
50%    11.000000
75%    21.000000
max    23.000000

--- Missing values ---
Nodes missing:
 id              0
media            0
media.type       0
type.label       0
audience.size    0
dtype: int64
```

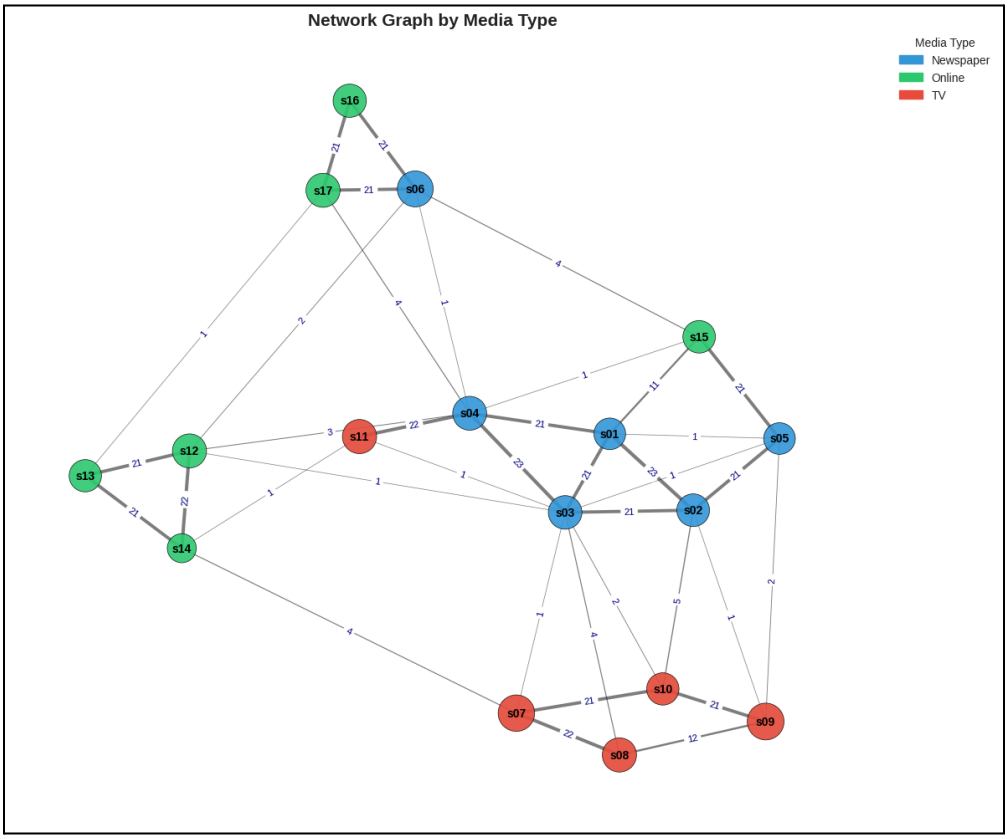
TASK: Summarize the characteristics of the created network graph.

The generated network graph reveals a distinct modular pattern composed of three main communities, represented by blue, green, and red nodes. The blue community serves as the most interconnected cluster, forming the network's core where several nodes maintain multiple direct links. The green group bridges the blue and red communities, facilitating connections between them. Meanwhile, the red community is smaller and more localized, exhibiting limited links beyond its own members. Overall, the network demonstrates strong internal cohesion within each cluster and moderate inter-community connectivity, reflecting a structure that balances clustering and integration.

CS_ELEC_3C | Nov 5, 2025

LAB ACTIVITY - NETWORK AND HIERARCHICAL





CS_ELEC_3C | Nov 5, 2025

LAB ACTIVITY - NETWORK AND HIERARCHICAL

TASK: Determine the highly connected and most influential nodes.

S03 clearly stands out as the main hub of the network, as reflected by its dominant centrality measures. Acting as the graph's "center of gravity," it achieves the highest degree, betweenness, closeness, and eigenvector centrality scores—showing that it not only maintains numerous direct links but also lies along key shortest paths and is closely integrated with other influential nodes. Following closely, S04 ranks second across most metrics, functioning as a strong secondary hub that reinforces the network's connectivity. Although not as central as S03 and S04, nodes such as S01, S05, S06, and S12 also display relatively elevated centrality values, suggesting that they play a crucial role in supporting the core network and facilitating interactions across different parts of the system.

```
Rebuilding Graph G to ensure it's not null...
Graph G has 17 nodes and 38 edges after rebuilding.
Calculating Centrality Measures...

Degree Centrality:
Node s03: 0.5625
Node s04: 0.4375
Node s01: 0.3125
Node s02: 0.3125
Node s05: 0.3125
Node s06: 0.3125
Node s12: 0.3125
Node s07: 0.2500
Node s09: 0.2500
Node s10: 0.2500
Node s14: 0.2500
Node s15: 0.2500
Node s17: 0.2500
Node s08: 0.1875
Node s11: 0.1875
Node s13: 0.1875
Node s16: 0.1250

Betweenness Centrality:
Node s03: 0.3404
Node s04: 0.1957
Node s12: 0.1227
Node s06: 0.1002
Node s05: 0.0655
Node s15: 0.0562
Node s17: 0.0529
Node s07: 0.0503
Node s14: 0.0492
Node s01: 0.0391
Node s02: 0.0260
Node s10: 0.0258
Node s13: 0.0211
Node s08: 0.0196
Node s11: 0.0179
Node s09: 0.0174
Node s16: 0.0000
```

```
Closeness Centrality:
Node s03: 0.6667
Node s04: 0.6154
Node s12: 0.5714
Node s01: 0.5333
Node s05: 0.5161
Node s11: 0.5161
Node s06: 0.5000
Node s02: 0.4848
Node s07: 0.4848
Node s15: 0.4848
Node s10: 0.4706
Node s14: 0.4706
Node s08: 0.4571
Node s17: 0.4571
Node s13: 0.4324
Node s09: 0.4103
Node s16: 0.3556

Eigenvector Centrality:
Node s03: 0.4485
Node s04: 0.3528
Node s01: 0.3191
Node s05: 0.2926
Node s02: 0.2910
Node s12: 0.2488
Node s15: 0.2313
Node s10: 0.2221
Node s06: 0.2069
Node s07: 0.1936
Node s09: 0.1916
Node s11: 0.1869
Node s08: 0.1646
Node s14: 0.1453
Node s17: 0.1453
Node s13: 0.1065
Node s16: 0.0695
```

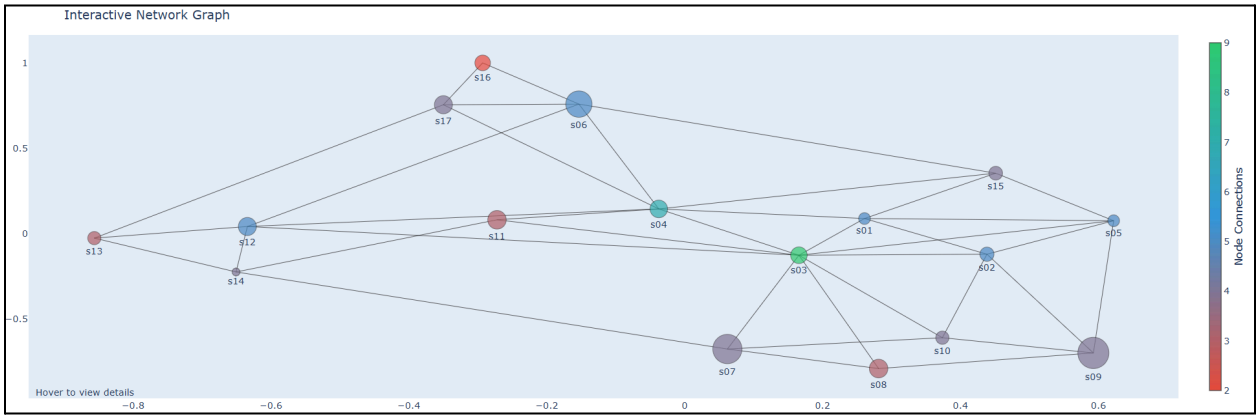
CS_ELEC_3C | Nov 5, 2025
LAB ACTIVITY - NETWORK AND HIERARCHICAL

TASK: How many communities are detected? Describe.

The network consists of three clearly defined communities, each serving a distinct function within the overall structure. Community 1, the largest cluster with eight nodes (s01, s02, s03, s05, s07, s08, s09, s10), represents the core of the network, characterized by dense internal links that indicate frequent interaction or shared associations among its members. Community 2, comprising five nodes (s04, s06, s15, s16, s17), functions as a bridge, connecting various sections of the network and facilitating communication between clusters. Community 3, the smallest group with four nodes (s11, s12, s13, s14), forms a tight-knit subgroup with strong internal connectivity, reflecting a specialized or focused set of relationships. Collectively, these communities demonstrate a balanced and well-structured network, where both central and peripheral clusters play integral roles in maintaining overall cohesion.

```
Detecting communities using greedy_modularity_communities...

Detected Communities:
Community 1: ['s01', 's02', 's03', 's05', 's07', 's08', 's09', 's10']
Community 2: ['s04', 's06', 's15', 's16', 's17']
Community 3: ['s11', 's12', 's13', 's14']

Total number of communities found: 3
```

Additional Interactive Network Graph

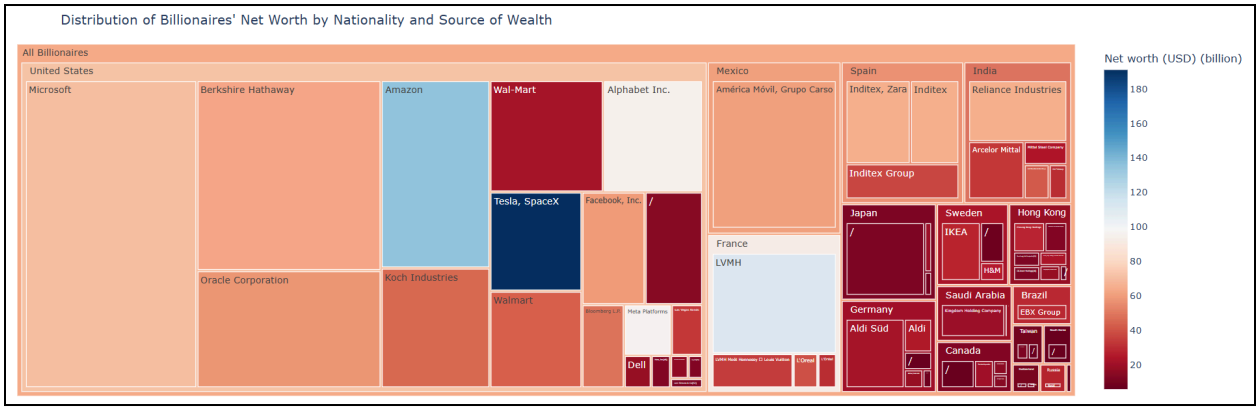


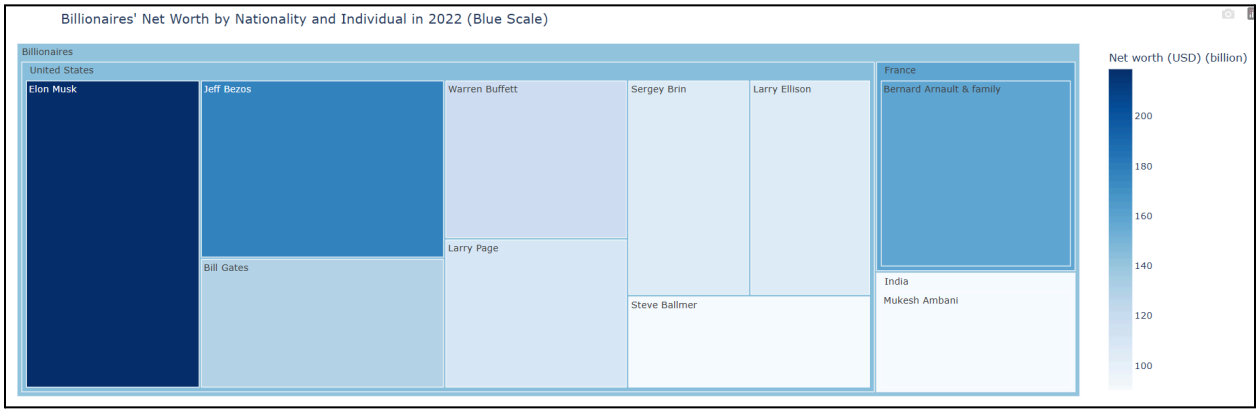
CS_ELEC_3C | Nov 5, 2025

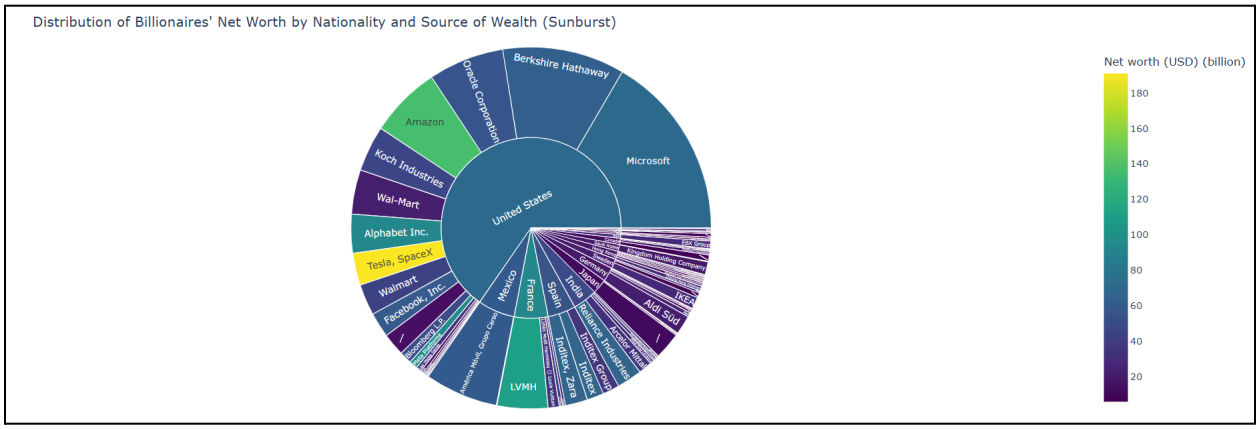
LAB ACTIVITY - NETWORK AND HIERARCHICAL

HIERARCHICAL

1. *Create 1 or 2 different hierarchical visualizations. This can be a Radial Tree or Packed Circles.*
2. *Answer the questions. Provide your own insights from the chart.*

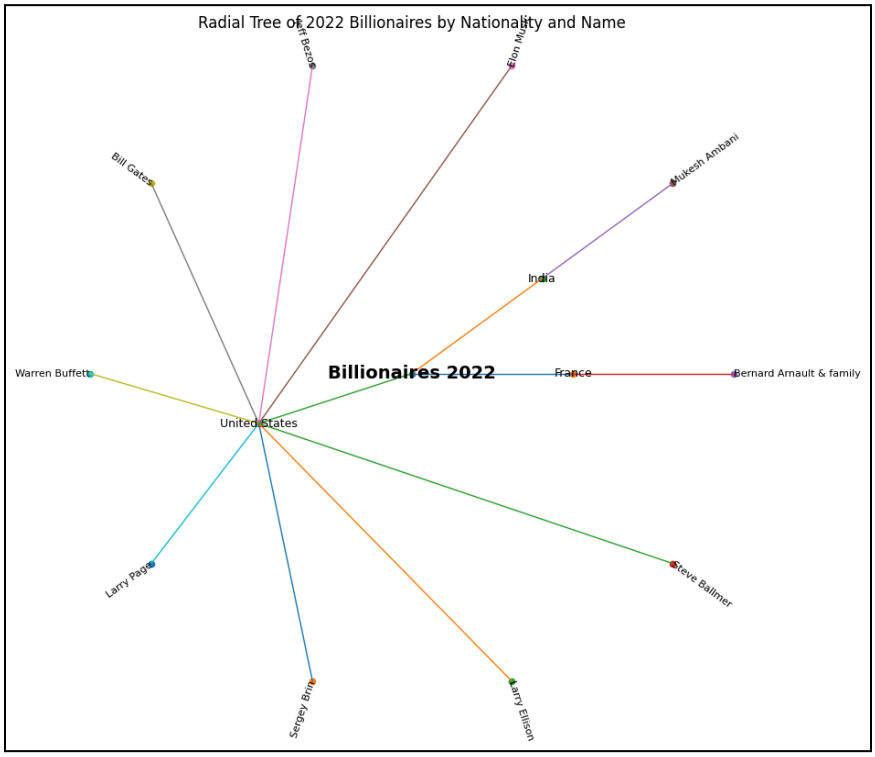


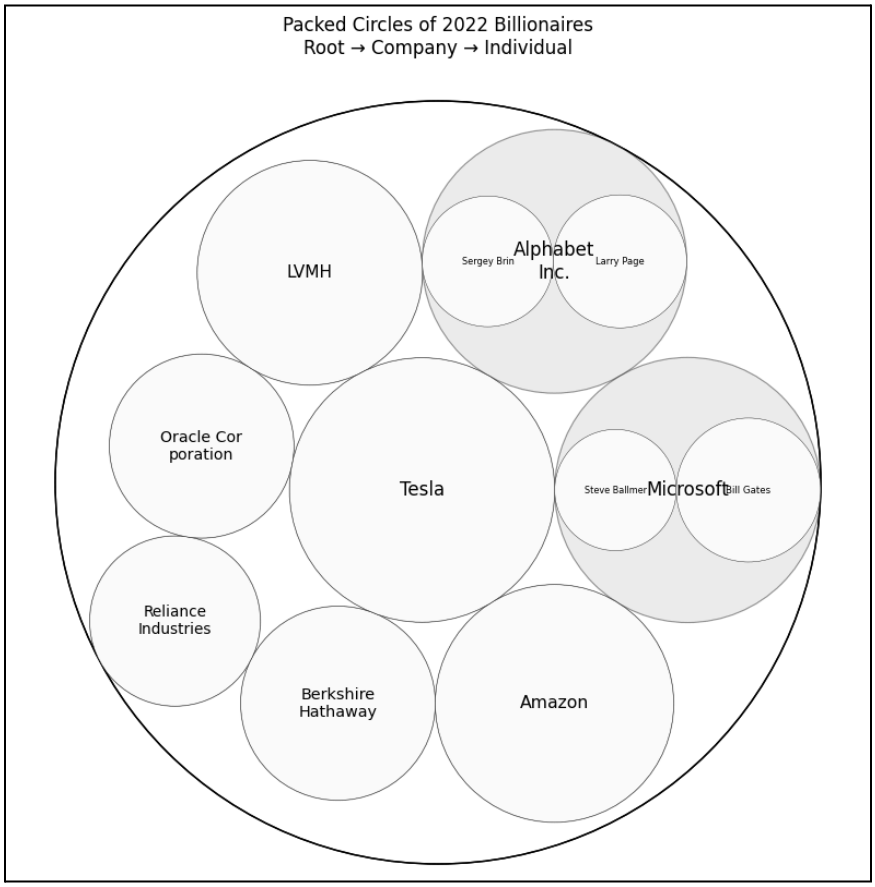




CS_ELEC_3C | Nov 5, 2025

LAB ACTIVITY - NETWORK AND HIERARCHICAL





CS_ELEC_3C | Nov 5, 2025
LAB ACTIVITY - NETWORK AND HIERARCHICAL

Which company occupies the largest portion of the treemap? What does this suggest about global wealth concentration?

In the treemap visualization, Microsoft occupies the largest area, representing a combined billionaire wealth of roughly $220.4 billion, primarily attributed to Bill Gates and Steve Ballmer. This dominance underscores the concentration of global wealth within a small group of powerful technology companies. Corporations such as Microsoft, Tesla, Alphabet Inc., and Amazon account for a significant share of billionaire wealth, indicating that the global financial landscape is heavily influenced by the tech sector and a handful of leading firms. Such uneven distribution reveals that a limited number of companies and individuals control a disproportionate portion of global wealth, reflecting the growing centralization of economic power in the modern digital economy.

Identify the top three billionaires represented. Which industries do they belong to?

The top three billionaires in the 2022 dataset are Elon Musk, Jeff Bezos, and Bernard Arnault & family.

- Elon Musk holds the highest net worth at $219 billion, primarily generated through Tesla and SpaceX, placing him within the electric vehicle, renewable energy, and aerospace industries.
- Jeff Bezos, with $177 billion, built his fortune through Amazon, representing the e-commerce and cloud computing sectors.
- Bernard Arnault & family rank third with $158 billion, associated with LVMH, a leader in luxury goods and fashion.

Together, these figures highlight how modern wealth is concentrated across dominant global industries—technology, digital commerce, and luxury—each shaping different facets of the global economy.

Which company appears to have the most number of billionaires? Does this always correspond to the highest wealth?

In 2022, Alphabet Inc. and Microsoft each have two prominent billionaires. Alphabet includes Sergey Brin and Larry Page, while Microsoft features Bill Gates and Steve Ballmer. However, a larger number of billionaires does not necessarily translate to greater total wealth. For instance, Tesla, represented solely by Elon Musk, nearly equals Microsoft's total at $219 billion, despite having only one billionaire. This illustrates that the quantity of billionaires within a company does not directly reflect total wealth—a single individual with exceptional net worth can surpass the combined fortunes of multiple peers from another corporation.