Social Networks

Connecting with others

Q1

What are the benefits of leveraging online social networks?

Q2

How to describe the structure of social networks?

Q3

How to find important influencers in a social network?

What is the difference?

Web 1.0

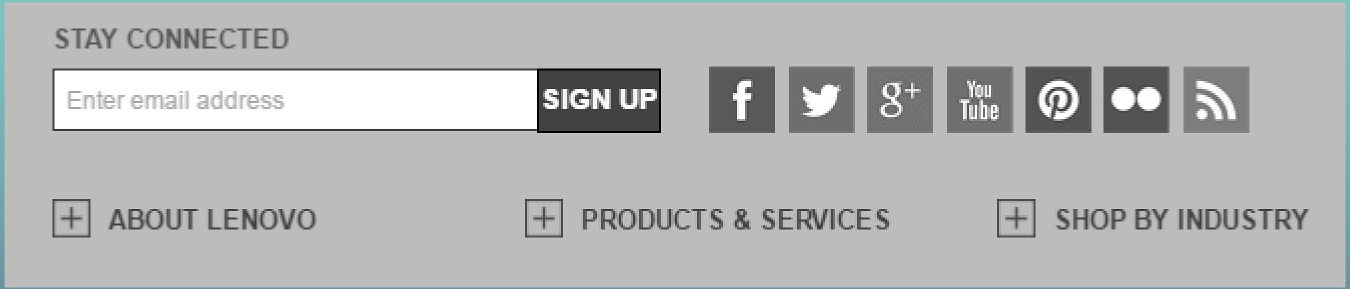
Expedia
Google
eBay
Amazon.com
CNN.com
WSJ.com

Web 2.0 and beyond

Twitter
Snapchat
Instagram
Pinterest
Reddit
Wikipedia
Facebook

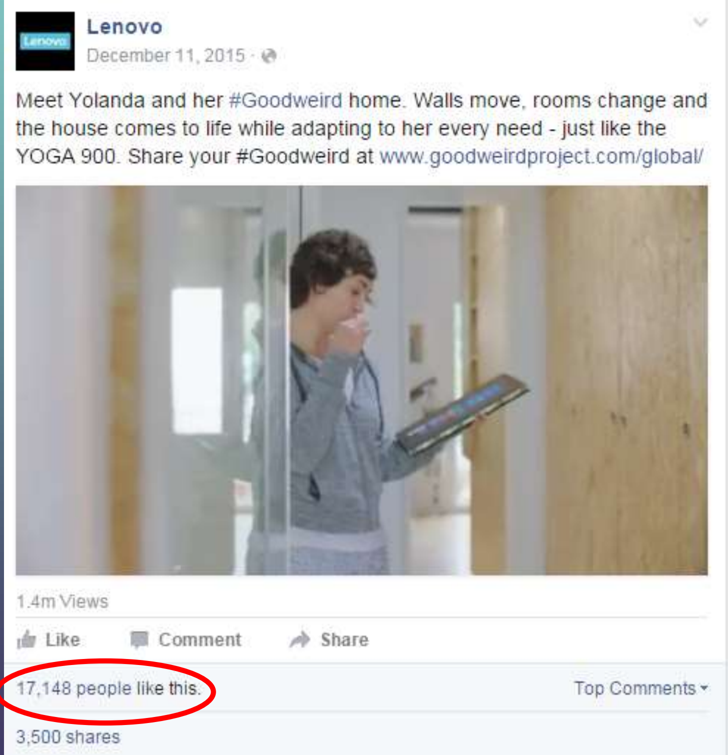
Leveraging Online Social Networks

Get Fans



The vast majority of large brands today have an active social media presence, such as FB fan page. For brands to resonate on Facebook, the first step is to accumulate your fan base.

Engage

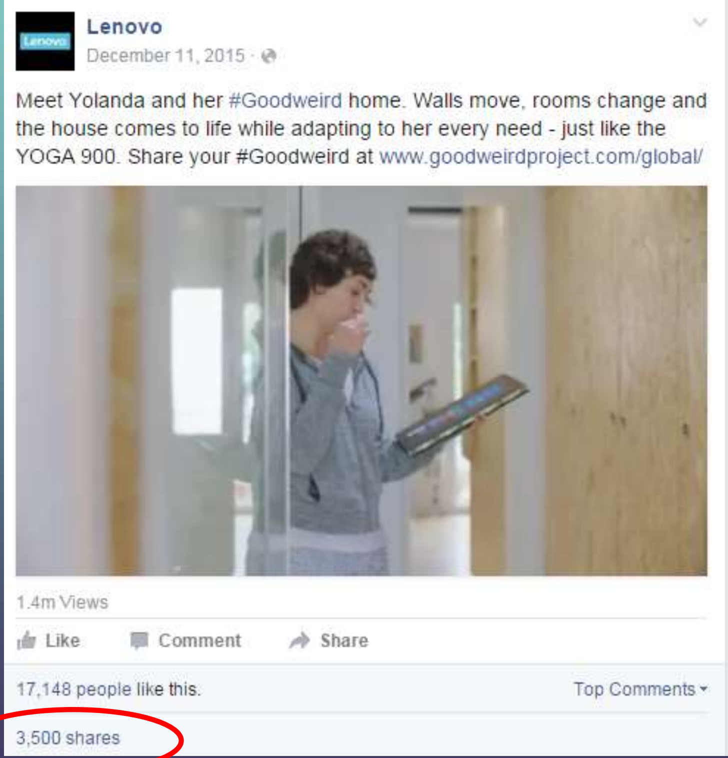


Brand messages only reach subset of fans.

Users that engage in fan page more likely to receive messages on news feed.

Users can engage by *liking, sharing, posting, commenting and checking in*.

Amplify



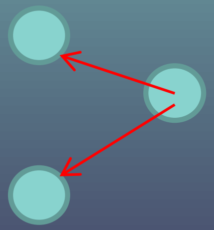
Spread brand message across social network (i.e., newsfeed).

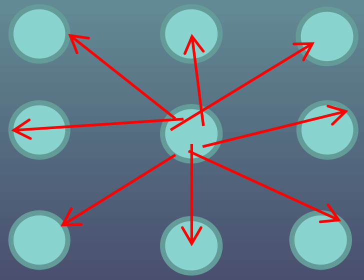
Organic word-of-mouth advertising.

Network can also be used for social advertising.

Amplification Ratio

Amplification ratio
= # Friends of Fans exposed / # Fans exposed





Amplification Ratio

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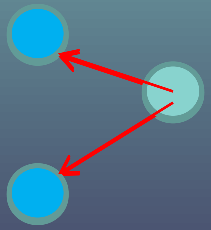
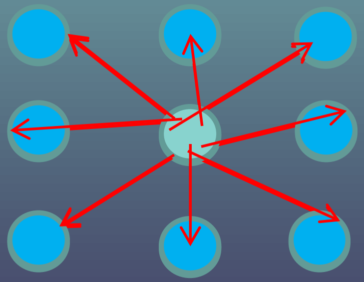
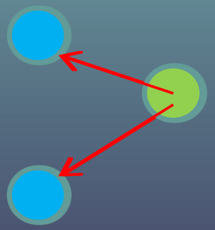
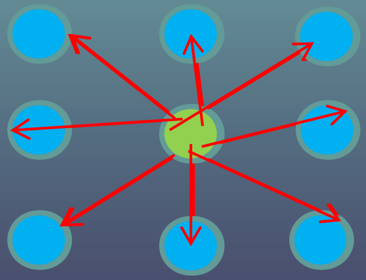




Amplification Ratio

Amplification ratio
= # Friends of Fans exposed / # Fans exposed
= 10/2 = 5.





AMPLIFICATION RATIO

Here are some facts. According to FB:

The top ten corporate brands had an average Amplification Ratio average of 1.05 (Range: 0.42 to 2.18).

The top 100 brands (excluding Celebrities & Entertainment) had an average Amplification Ratio of 0.84 (Range: 0.06 to 2.87).

CASE STUDY: Holiday Sales

Case study focused on Amazon, Best Buy, Target and Walmart.

Retailers offered Facebook fans Black Friday deals.

Friends of Fans received notifications about their friends becoming fans, which lead to increased amplification.

Online and offline purchases of exposed fans and Friends of Fans compared to typical week.

CASE STUDY: Holiday Sales

Social Networks Analysis: Theory

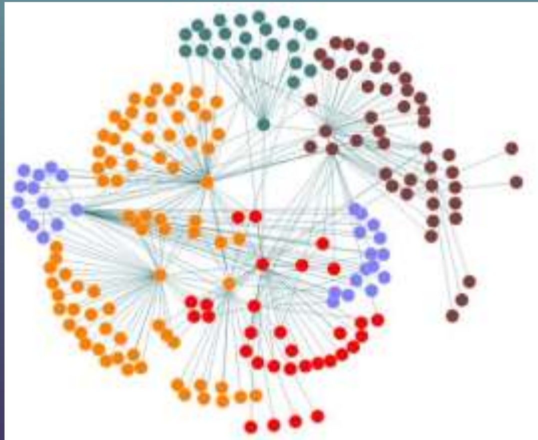
Social Network Analysis Useful for…

Spotting influential people

- Who has a lot of linkages?
- Who is vital at linking people up?
- Why not just looking at no. of friends/followers?
  - Strength of tie

Understanding how connected the network is

- How many people are connected?
- What is the longest path between people?
- How to measure the density of a network?



Metrics

Individual

Has meaning independently of social network

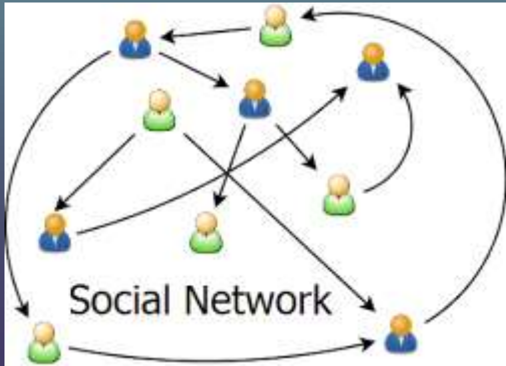
You live in Hong Kong island, HK

Connection

You are close friends with 10 people at HKU

Whole Network

On average, students know each other within 4 steps



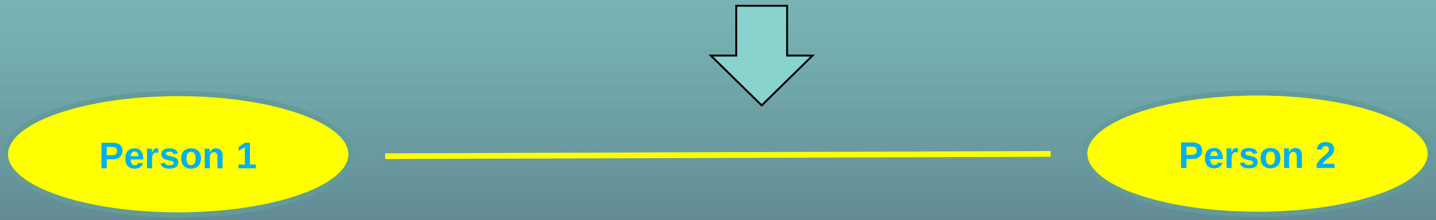
Edges

Person 1

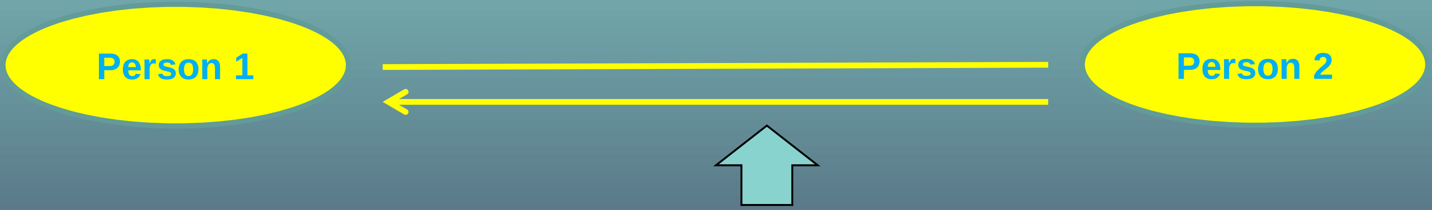
Edges

Edges

Undirected (e.g., study at HKU)

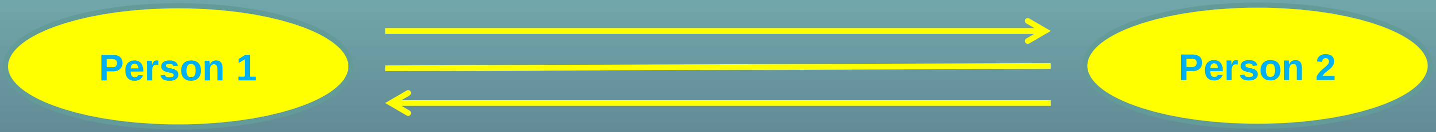


Edges



Directed (e.g., 2 follows 1)

Edges



Edges are also called links or ties.

Nodes and Edges

Vertex/Node: an end point

Often a person

Edge/Link: What connects up the Nodes

A relationship

Maximum number of edges in group of size $N(N-1)/2$.

Where everyone connects to everyone else

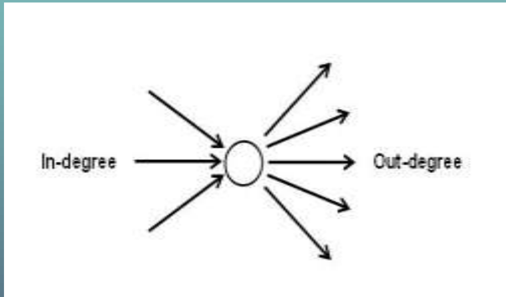
If undirected (my friends also have me as a friend)

Who is well-connected?

Degree (centrality): The number of linkages you have.

“In-degree”, e.g., someone that follows me.

“Out-degree”, e.g., I follow someone else.



Edge Weight

Sometimes edge can also carry weight

Can capture how deep the relationships are

E.g., frequency of interactions between two nodes.

QUESTION

How to determine the influential person (i.e., node) in a social network?

QUESTION

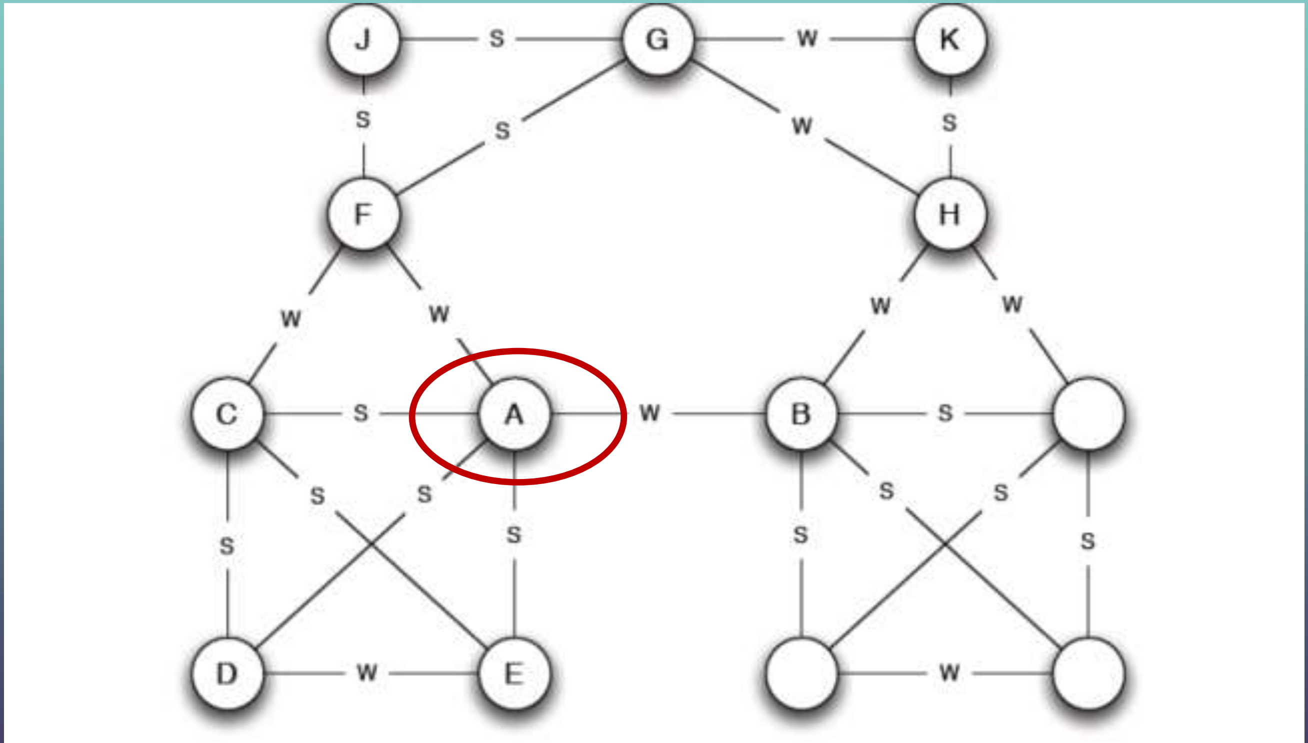
How to define the importance of a node?

Strong vs. Weak Ties

Suppose that two individuals are connected in a social network (i.e., they know each other).

However, the strength of their connection may differ: It may be a strong tie (i.e., they are friends) or a weak tie (they are acquaintances).

Strong vs. Weak Ties

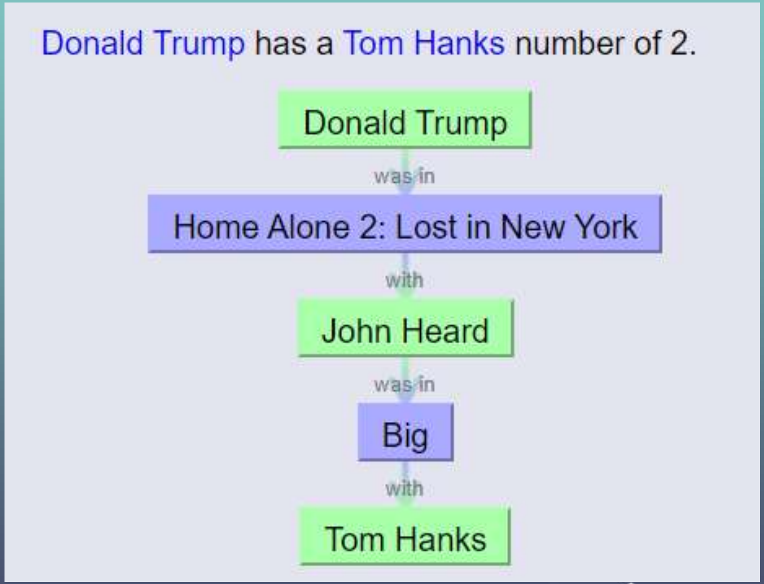


Degrees of Separation

Path of how many people are needed to connect people up
Technical name: Geodesic distance

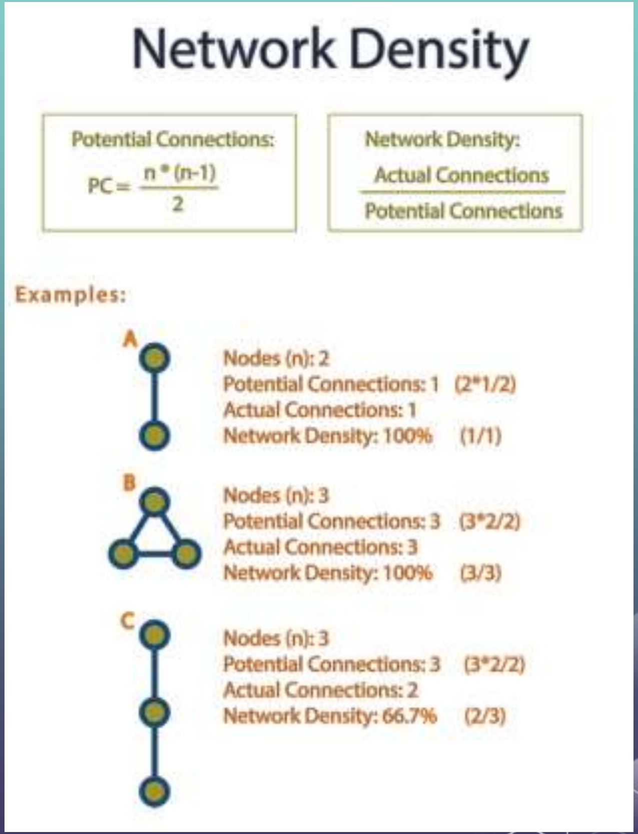
6 is the magical number: Kevin Bacon game (Link)

Don't fixate on 6! It does not apply to all networks!



Is a Network Well-Connected?

Graph/network density



Networks Analysis in R

Preparing Packages

```
library(igraph)
library(readr)
```

The “igragh” package provides you tools for network analysis while the “readr” facilitates reading data.

Reading Data

```
actors <-
read_csv("https://ximarketing.github.io/class/D
M//Actors.csv")
movies <-
read_csv("https://ximarketing.github.io/class/D
M/Movies.csv")
```

Here, the first file contains the nodes information, whereas the second file contains the edge information. Each actor/actress is a node, and if two actors/actresses appear in a same movie, there is an edge between them.

Reading Data

Actor Information (nodes):

```
> head(actors)
# A tibble: 6 x 3
  Actor        Gender BestActorActress
  <chr>        <chr>  <chr>
1 Tom Hanks    Male   Winner
2 Gary Sinise  Male   None
3 Robin Wright Female None
4 Bill Paxton  Male   None
5 Kevin Bacon  Male   None
6 Ed Harris    Male   Nominated
```

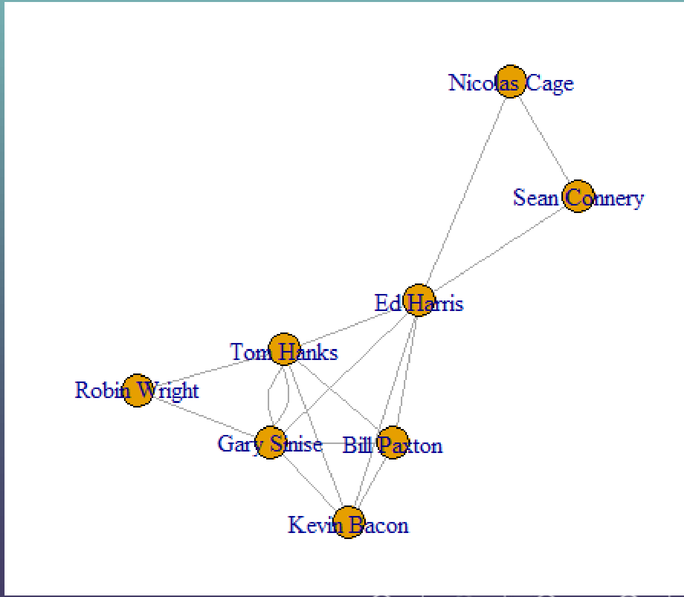
Reading Data

Movie Information (edges):

```
> head(movies)
# A tibble: 6 x 3
  `Actor 1`   `Actor 2`    Movie
  <chr>       <chr>        <chr>
1 Tom Hanks   Gary Sinise  Forest Gump
2 Tom Hanks   Robin Wright Forest Gump
3 Gary Sinise Robin Wright Forest Gump
4 Tom Hanks   Gary Sinise  Apollo 13
5 Tom Hanks   Bill Paxton  Apollo 13
6 Tom Hanks   Kevin Bacon  Apollo 13
```

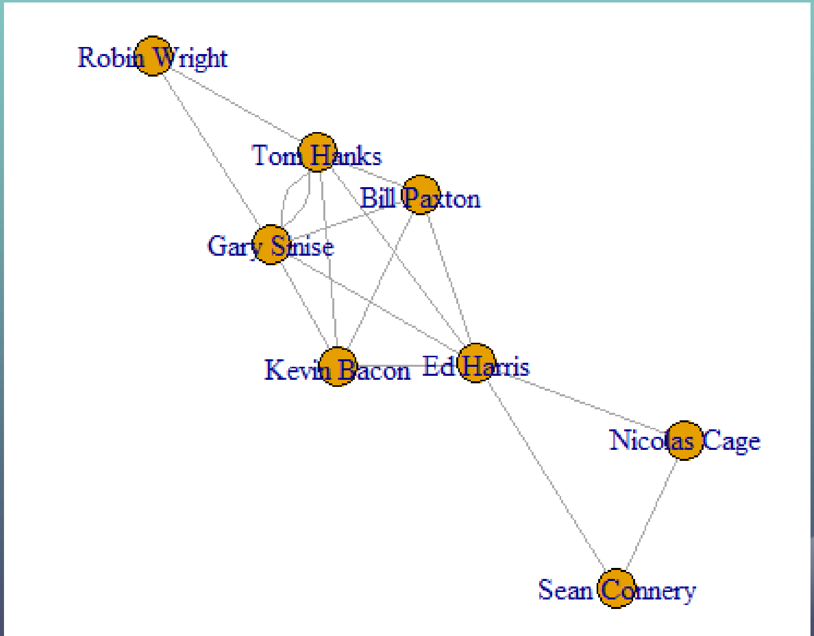
Visualize the Network

```
actorNetwork <-
graph_from_data_frame(d=movies,
vertices=actors, directed=F)
plot(actorNetwork)
```



Visualize the Network

```
plot(actorNetwork)
```

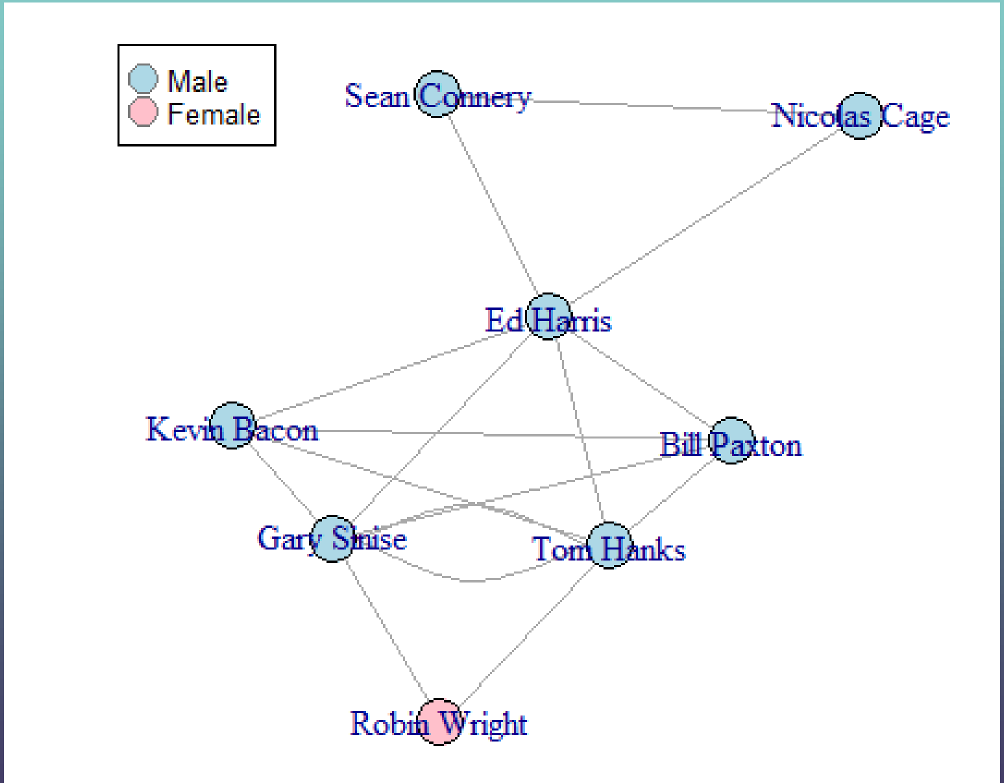


Visualize the Network

You can also add colors to your nodes:

```
V(actorNetwork)$color <-
ifelse(V(actorNetwork)$Gender == "Male",
"lightblue", "pink")
plot(actorNetwork)
legend("topleft", c("Male","Female"),
pch=21,
  col="#777777",
pt.bg=c("lightblue","pink"), pt.cex=2,
cex=.8)
```

Visualize the Network



Degree of the nodes

To check the degree of nodes in the network:

```
degree(actorNetwork, mode="all")
```

```
   Tom Hanks   Gary Sinise Robin Wright  Bill Paxton  Kevin Bacon    Ed Harris
           6             6            2            4            4            6
Sean Connery Nicolas Cage
           2            2
```

Closeness/Betweenness Centrality

```
closeness(actorNetwork, mode="all",
weights=NA, normalized=T)
```

```
   Tom Hanks   Gary Sinise Robin Wright  Bill Paxton  Kevin Bacon     Ed Harris
   0.7777778     0.7777778    0.5000000    0.7000000    0.7000000     0.8750000
Sean Connery Nicolas Cage
   0.5384615     0.5384615
```

```
betweenness(actorNetwork, directed=F,
weights=NA, normalized = T)
```

```
   Tom Hanks   Gary Sinise Robin Wright  Bill Paxton  Kevin Bacon     Ed Harris
   0.1190476     0.1190476    0.0000000    0.0000000    0.0000000     0.4761905
Sean Connery Nicolas Cage
   0.0000000     0.0000000
```

Network Density

```
edge_density(actorNetwork)
```

Exercise

There are another two files containing social networks of movie actors and actress. Play with these files yourselves! The files are downloadable here:

```
actors <-
read_csv("https://ximarketing.github.io/class/DM//ActorsExercise.csv")
movies <-
read_csv("https://ximarketing.github.io/class/DM/MoviesExercise.csv")
```

Directed Network

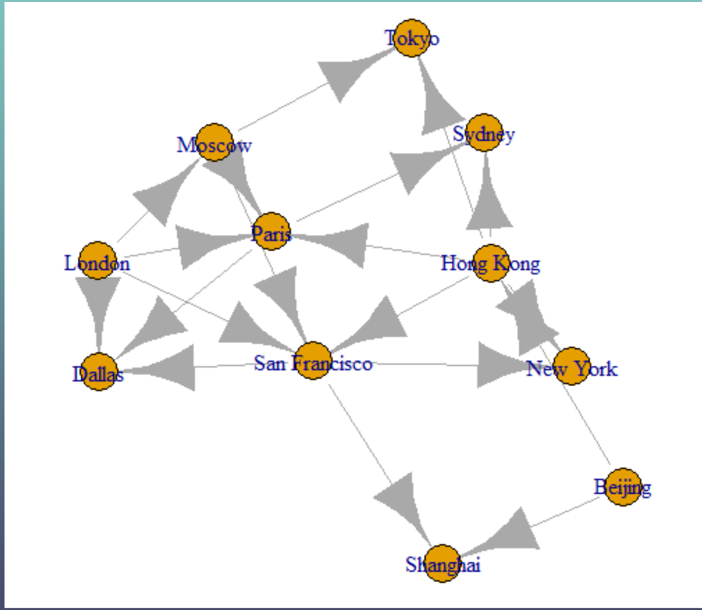
In the following exercise, we play with directed network. This is not much difference.

```
cities <-
read_csv("https://ximarketing.github.io/class/DM/DirectedNodes.csv")
routes <-
read_csv("https://ximarketing.github.io/class/DM/DirectedEdges.csv")
flightNetwork <- graph_from_data_frame(d=routes,
vertices=cities, directed=T)
```

Directed Network

Plot the directed network:

```
plot(flightNetwork)
```



Directed Network

We can distinguish between in-degrees and out-degrees:

```
degree(flightNetwork, mode="in")
```

```
     Beijing      Shanghai     Hong Kong         Tokyo      New York        London 
           0             2             1             2             2             0 
      Sydney San Francisco         Paris        Moscow        Dallas 
           2             3             4             1             3 
```

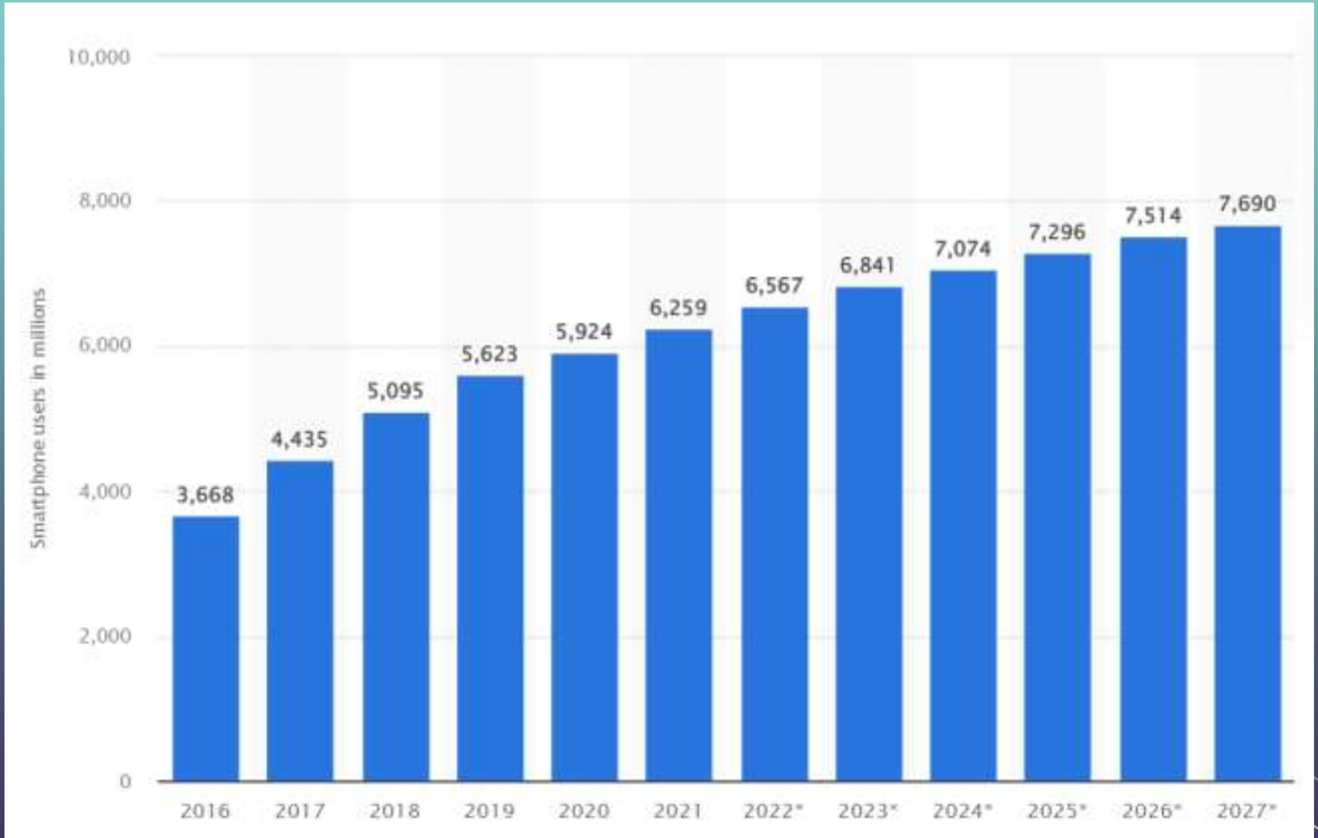
```
degree(flightNetwork, mode="out")
```

```
     Beijing      Shanghai     Hong Kong         Tokyo      New York        London 
           2             0             5             0             0             5 
      Sydney San Francisco         Paris        Moscow        Dallas 
           0             3             2             3             0 
```

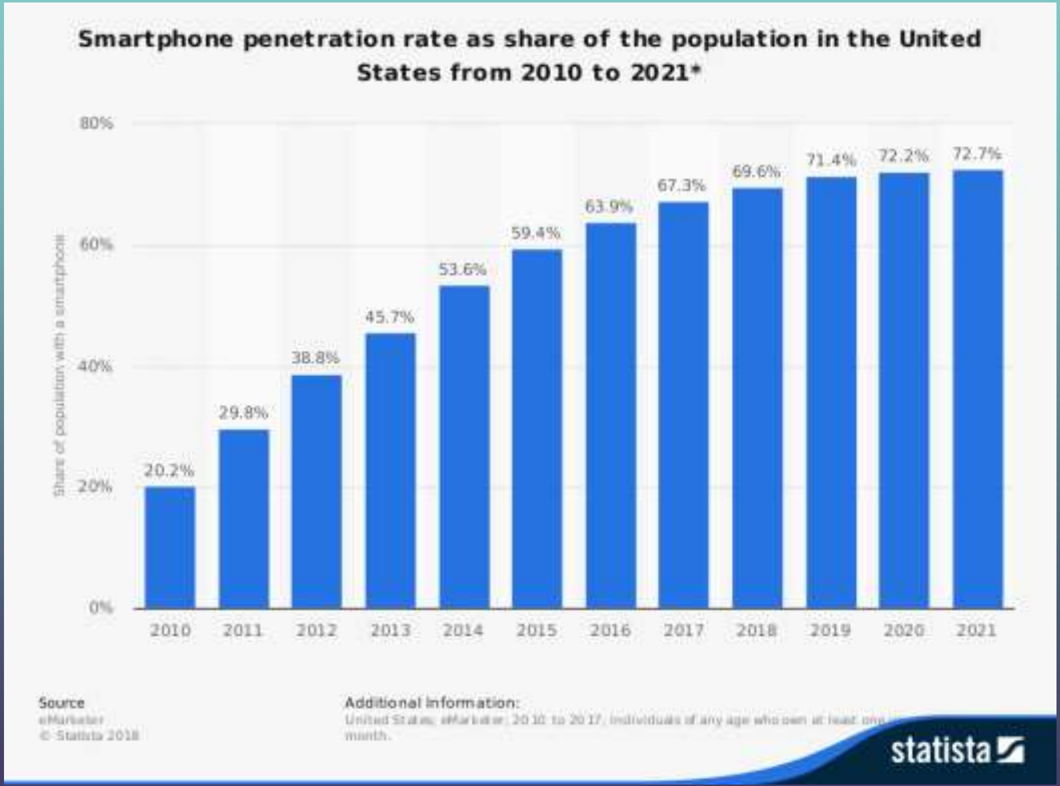
Mobile

Is mobile different?

The Rise of Mobile



The Rise of Mobile



QUESTION

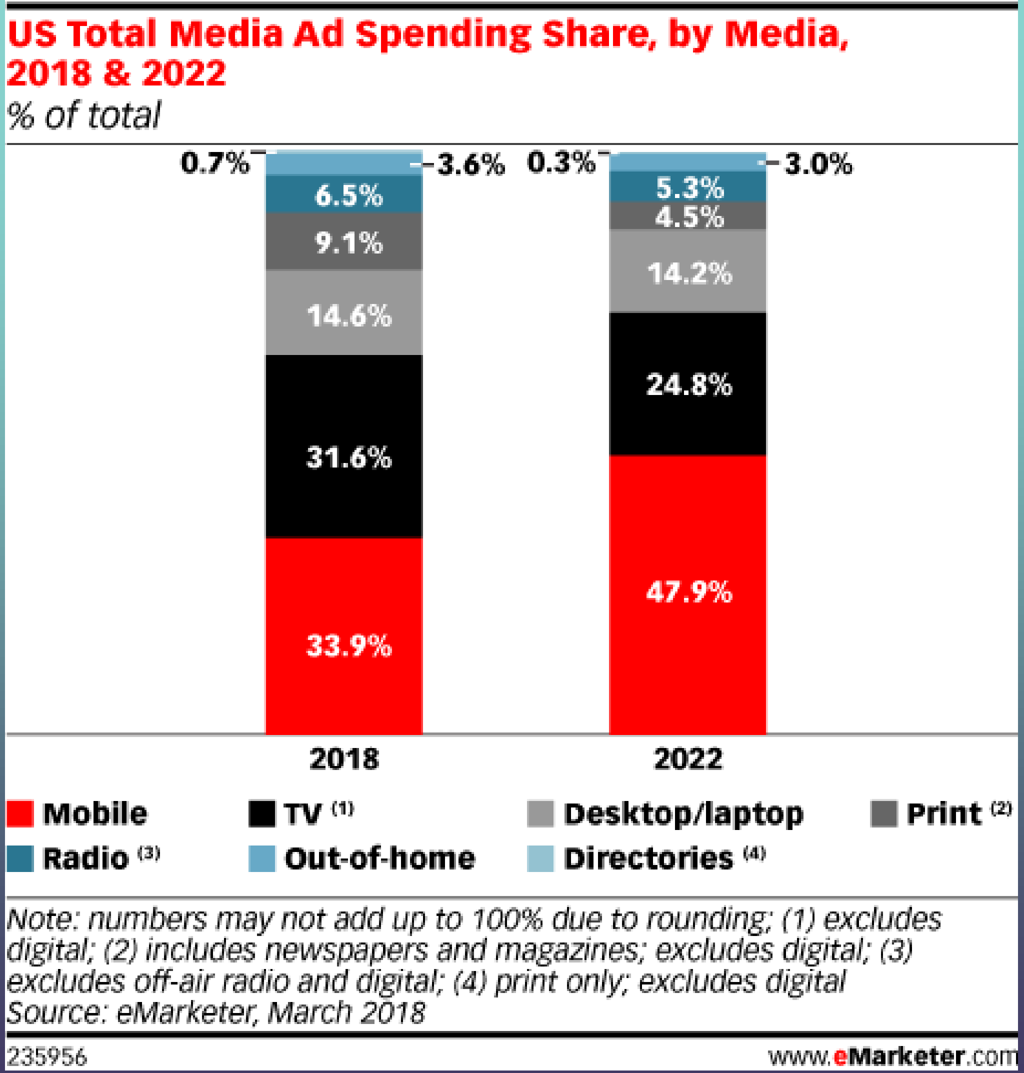
Which APPs are most downloaded?

QUESTION

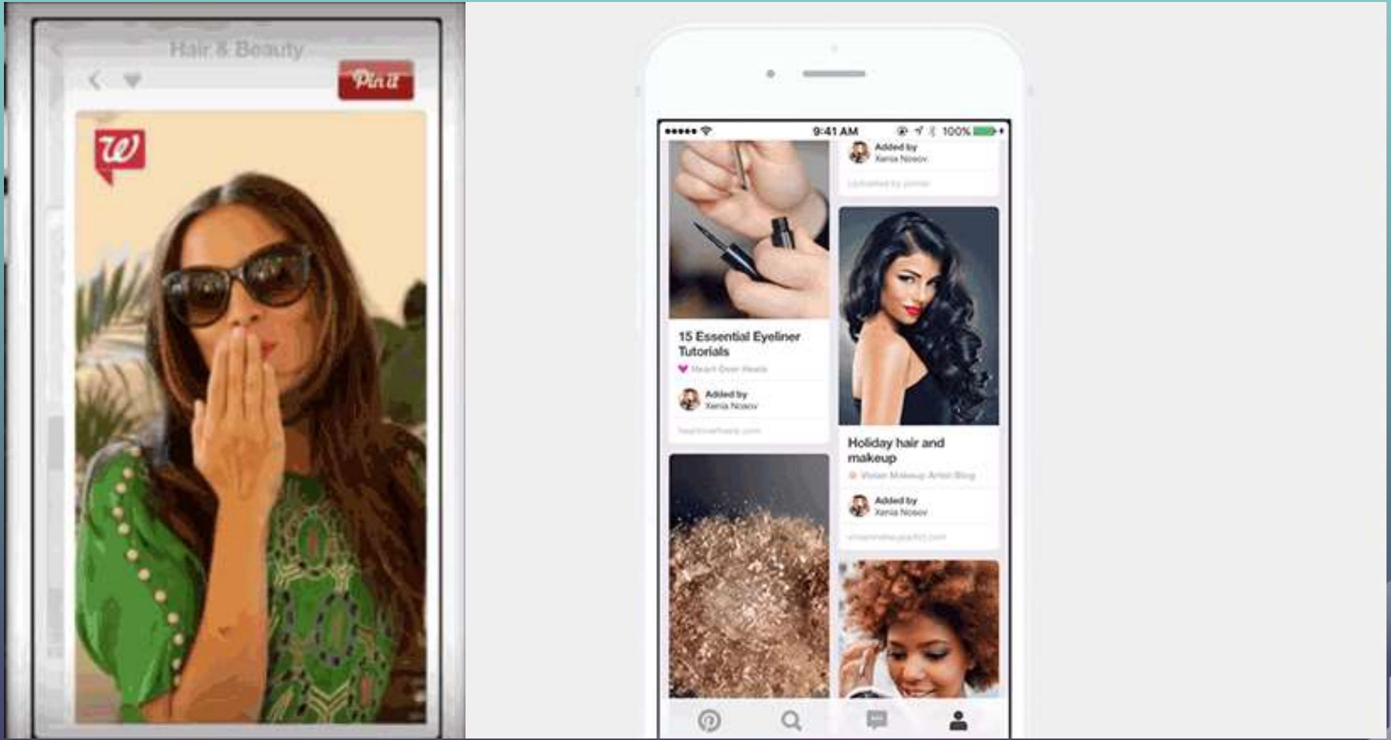
Which APPs do people spend most money on?

QUESTION

How many hours do people spend on smartphones everyday?


US Total Media Ad Spending Share, by Media, 2018 & 2022
% of total
0.7%
3.6%
6.5%
9.1%
14.6%
31.6%
33.9%
0.3%
3.0%
5.3%
4.5%
14.2%
24.8%
47.9%
2018
2022
Mobile
TV (1)
Desktop/laptop
Print (2)
Radio (3)
Out-of-home
Directories (4)
Note: numbers may not add up to 100% due to rounding; (1) excludes digital; (2) includes newspapers and magazines; excludes digital; (3) excludes off-air radio and digital; (4) print only; excludes digital
Source: eMarketer, March 2018
235956
www.eMarketer.com

Motion Based Ads (on Pinterest)



QUESTION

How is mobile different from PC? What new marketing opportunities are brought by mobile?

Mobile is not just your phone

A smart use of beacons by Nivea

QUESTION

How are Geo-fencing and Beacons different from traditional outdoor and in-store ads?