

# **Principles/Social Media Mining**

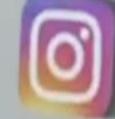
## **CIS 600**

### **Week 1: Introduction**

**Edmund Yu, PhD**  
**Associate Teaching Professor**  
**[esyu@syr.edu](mailto:esyu@syr.edu)**

**August 25, 2020**

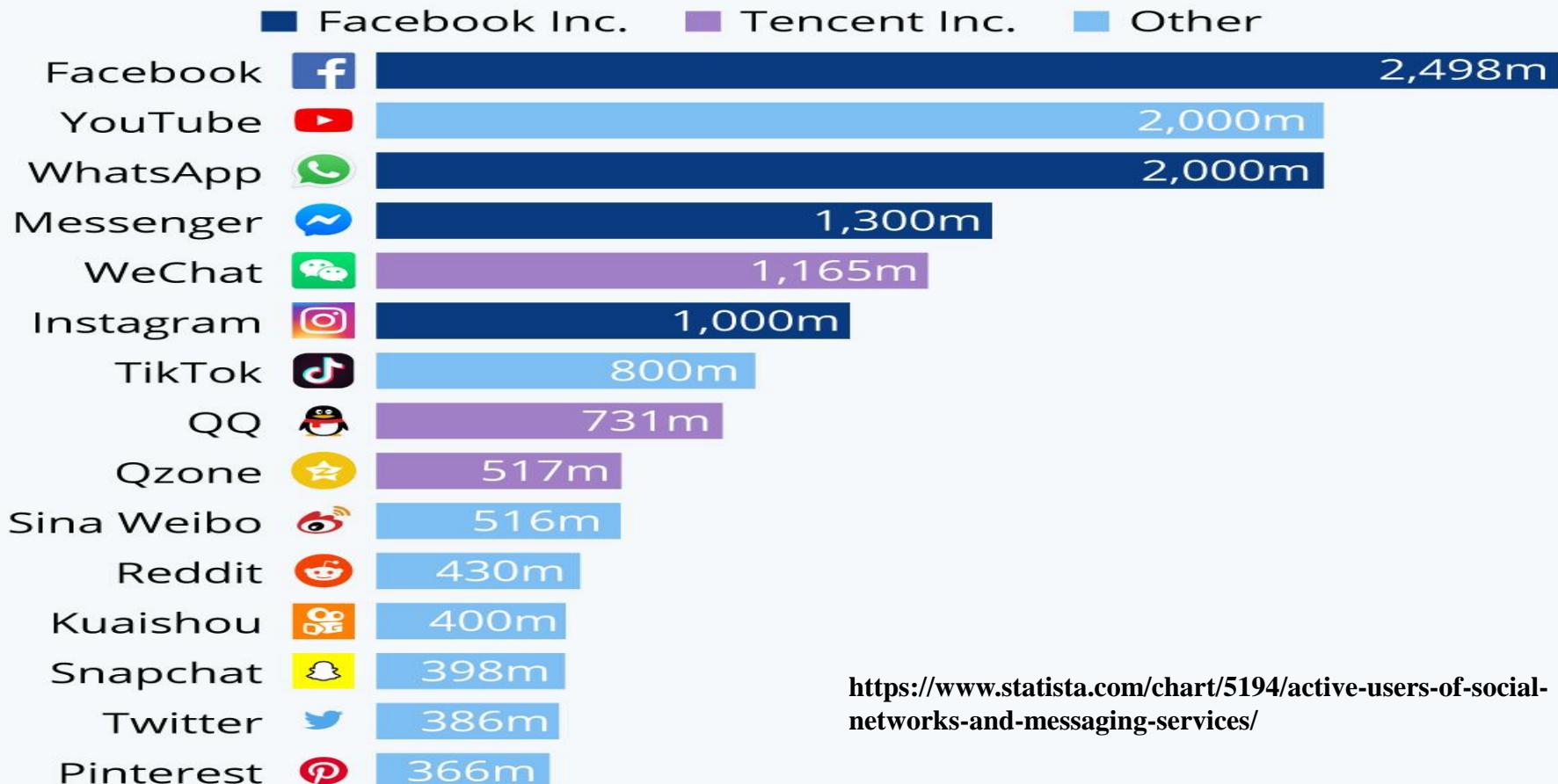
# WORLD POPULATIONS

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[Bigspeak.com](http://Bigspeak.com)

# Facebook Dominates the Social Media Landscape

Monthly active users of selected social networks and messaging services\*



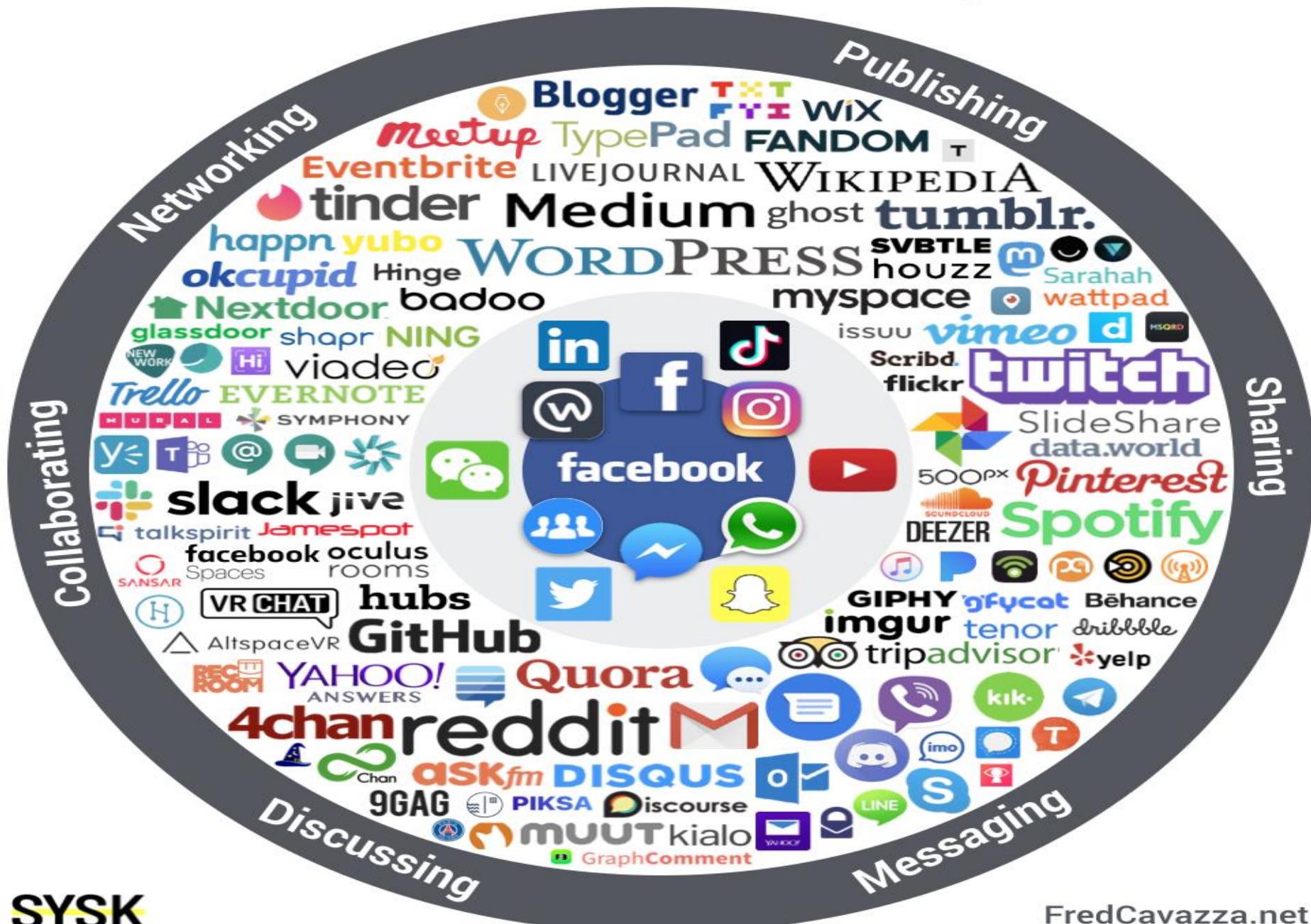
<https://www.statista.com/chart/5194/active-users-of-social-networks-and-messaging-services/>

\* April 2020 or latest available

Source: Company data via DataReportal Global Digital Statshot



# Social Media Landscape 2019



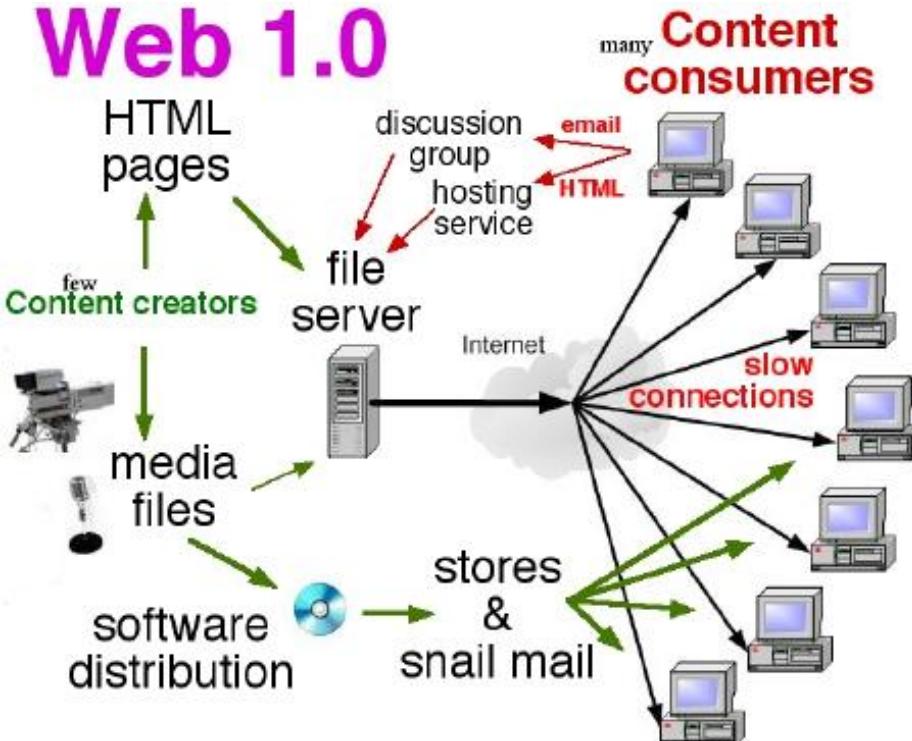
# Social Media Defined

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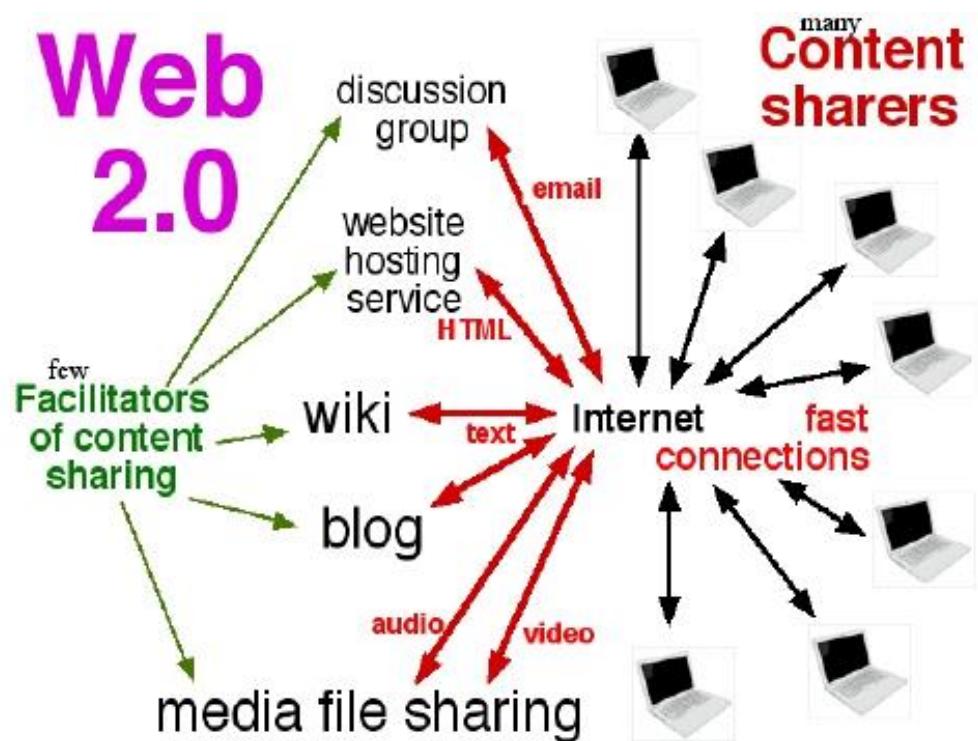
- ❖ Andreas Kaplan and Michael Haenlein define social media as "a group of Internet-based applications that build on the **ideological** and **technological** foundations of **Web 2.0**, and that allow the creation and exchange of user-generated content." ("Users of the world, unite! The challenges and opportunities of Social Media," Andreas M. Kaplan, Michael Haenlein, *Business Horizons* (2010) 53, 59—68)
  - ❖ Ideological foundations → **Web as participation platform**
  - ❖ Technological foundations → **Flash, RSS, AJAX, REST,...**
  - ❖ Web 2.0 is more of a paradigm shift (Web as participation platform) than a technology shift (AJAX et al.)
-

# Web 2.0

## Web 1.0

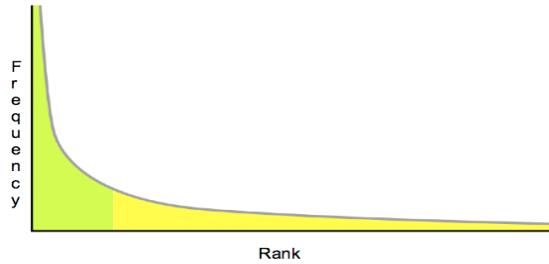


## Web 2.0

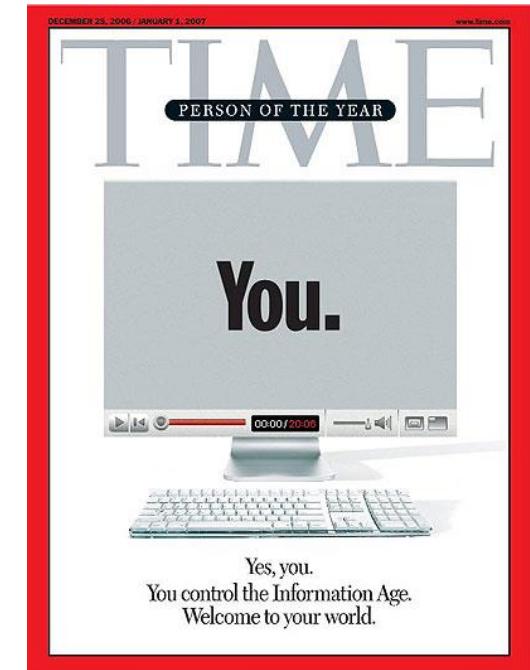


# Characteristics of Social Media

- ❖ Consumers become Producers
- ❖ Rich User Interaction
- ❖ User-Generated Contents
- ❖ Collaborative Environment
- ❖ Collective Intelligence
- ❖ Long Tail



Broadcast Media  
**Filter, then Publish**



Social Media  
**Publish, then Filter**

# Social Media Classified

		Social presence/ Media richness		
		Low	Medium	High
Self-presentation/ Self-disclosure	High	Blogs	Social networking sites (e.g., Facebook)	Virtual social worlds (e.g., Second Life)
	Low	Collaborative projects (e.g., Wikipedia)	Content communities (e.g., YouTube)	Virtual game worlds (e.g., World of Warcraft)

W http://www.wikipedia.org/ W Wikipedia X

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**中文**  
自由的百科全書  
743 000+ 條目

Kotaro Nakayama, Takahiro Hara and Shojiro Nishio

Dept. of Multimedia Eng., Graduate School of Information Science and Technology  
Osaka University, 1-3 Yamadaoka, Suita, Osaka 565-0871, Japan  
TEL: +81-6-6879-4513 FAX: +81-6-6879-4514  
{nakayama.kotaro, hara, nishio}@ist.osaka-u.ac.jp

Abstract. Wikipedia, a collaborative Wiki-based encyclopedia, has become a huge phenomenon among Internet users. It covers huge number of concepts of various fields such as Arts, Geography, History, Science, Sports and Games. Since it is becoming a database storing all human knowledge, Wikipedia mining is a promising approach that bridges the Semantic Web and the Social Web (a. k. a. Web 2.0). In fact, in the previous researches on Wikipedia mining, it is strongly proved that Wikipedia has a remarkable capability as a corpus for knowledge extraction, especially for relatedness measurement among concepts. However, semantic

Find Wikipedia in a language:  English

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# Blogs

- ❖ A blog is a website with regular entries of commentary or news
- ❖ Gain expert status by providing useful tips
- ❖ Improve your search engine visibility
- ❖ Blogs serve to establish your company as transparent, relevant, active, and expert.
- ❖ Engage in dialogue with your customers
- ❖ Promote product launches and events



# Twitter/Microblogging

- ❖ Microblogs are blogs limited to a sentence or two (about **140/280 characters**)
- ❖ People use microblogging to **promote** themselves, **share** content and **follow** friends, celebrities and brands
- ❖ Companies use it for **marketing, public relations** and **customer service** by giving their brand a voice within the community





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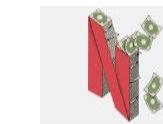
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# Katy Perry Becomes First Twitter User to Hit 100 Million Followers

By TODD SPANGLER 



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# List of most-followed Twitter accounts

From Wikipedia, the free encyclopedia

The list below contains the top 50 accounts with the largest number of followers on the [social media platform Twitter](#).<sup>[1]</sup> American singer [Katy Perry](#) tops the list with nearly 107 million followers. Her account was the first to exceed 100 million followers, in June 2017.<sup>[2]</sup>

On July 12, 2018, Twitter purged locked accounts—those disabled due to suspicious activity—from follower-count tallies.<sup>[3]</sup> Consequently, Twitter's own account took the fastest and greatest plunge out of all the top 50 accounts, from 63 million to 55 million followers, and in ranking, from 11th to 16th place.<sup>[4]</sup>



Katy Perry is currently the most followed account on Twitter with nearly 107 million followers.

## Contents [hide]

- 1 [Top 50 accounts](#)
- 2 [See also](#)
- 3 [References](#)

## Top 50 accounts [edit]

The following table lists the top 50 most followed accounts on Twitter, with each total rounded to the nearest million followers, as well as the

List of most-followed Twitter accounts

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## Contents [hide]

- 1 Top 50 accounts
- 2 See also
- 3 Notes
- 4 References

## Top 50 accounts [edit]

The following table lists the top 50 most followed accounts on Twitter, with each total rounded to the nearest million followers, as well as the profession or activity of each user, and their country of origin.<sup>[1]</sup> It was last updated on January 12, 2020.

Rank	Change (monthly)	Account name	Owner	Followers (millions)	Activity	Country
1	—	@BarackObama	Barack Obama	112	Former U.S. president	USA
2	—	@katyperry	Katy Perry	108	Musician	USA
3	—	@justinbieber	Justin Bieber	108	Musician	CAN
4	—	@rihanna	Rihanna	95	Musician and businesswoman	BAR
5	—	@taylorswift13	Taylor Swift	86	Musician	USA

Barack Obama is currently the most followed account on Twitter with over 111 million followers.

Main page  
Contents  
Featured content  
Current events  
Random article  
Donate to Wikipedia  
Wikipedia store  
  
Interaction  
  
Help  
About Wikipedia  
Community portal  
Recent changes  
Contact page  
  
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Related changes  
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4	—	@rihanna	Rihanna	95	Musician and businesswoman	BAR
5	—	@taylor swift13	Taylor Swift	86	Musician	USA
6	—	@Cristiano	Cristiano Ronaldo	82	Footballer	POR
7	—	@ladygaga	Lady Gaga	81	Musician and actress	USA
8	—	@TheEllenShow	Ellen DeGeneres	79	Comedian	USA
9	—	@YouTube	YouTube	72	Online video platform	USA
10	▲	@realDonaldTrump	Donald Trump	71	Current U.S. president	USA
11	▼	@ArianaGrande	Ariana Grande	69	Musician and actress	USA
12	—	@jtimberlake	Justin Timberlake	65	Musician and actor	USA
13	—	@KimKardashian	Kim Kardashian	63	Television personality and businesswoman	USA
14	—	@selenagomez	Selena Gomez	59	Musician and actress	USA
15	—	@twitter	Twitter	57	Social media platform	USA
16	—	@britneyspears	Britney Spears	56	Musician	USA
17	—	@cnnbrk	CNN Breaking News	56	News channel	USA



Barack Obama is currently the most followed account on Twitter with over 111 million followers.

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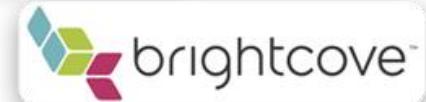
# Video Sharing

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- ❖ Video sharing sites let you upload videos and share them with people.
- ❖ They're a perfect repository for video blogs (vlogs), taped seminars, witty Power Points, commercials, and how-to's.



vimeo



# Photo Sharing

- ❖ Photo sharing sites give you a place to upload and organize your photos
- ❖ You can invite friends to check out your photos and people can find your photos by searching for the keywords (tags) you apply to your photos.



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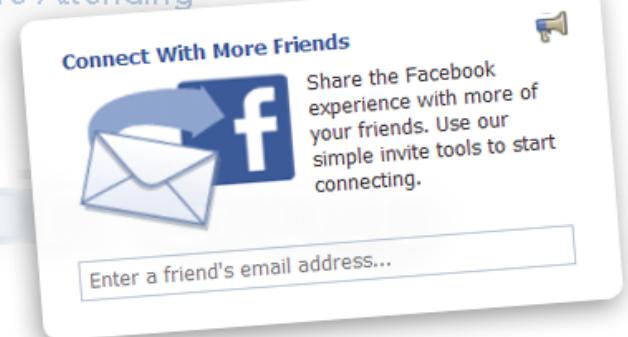
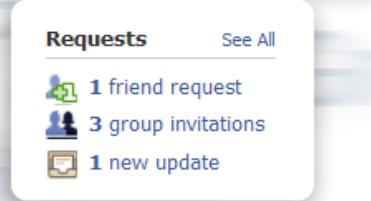
# Facebook

- ❖ Fastest growing social network in US and the world (2.45 billion users)
- ❖ Powerful tools to engage and understand your audience:
  - ❖ Brand **pages**
  - ❖ Custom **applications**
  - ❖ Targeted **advertising**
  - ❖ Audience **insights/metrics**
  - ❖ Opinion **polls**

Join Group      Become a Fan



Become a Fan  
284,490 fans  
378 People are Attending



1 Event Invitation      Join Group      Become a Fan

# Facebook Pages: An Example

Syracuse University Coll X +

https://www.facebook.com/EngineeringSU/

Syracuse University College of Engineering and Computer Sci Edmund Home Find Friends Create

Engineering & Computer Science Syracuse University

Syracuse University College of Engineering and Computer Science @EngineeringSU

Home About Photos Events Reviews Videos Posts Community

Liked Following Share ... Call Now Send Message

Create Post Write a post... Photo/Video Tag Friends Check in ...

4.9 out of 5 · Based on the opinion of 41 people

Community See All

Invite your friends to like this Page 3,883 people like this 4,106 people follow this

Photos Chat

Create a Page

# LinkedIn

- ❖ Contains profiles of Fortune 500 executives and leading entrepreneurs
  - ❖ Average individual salary on LinkedIn is \$109,000
- ❖ On LinkedIn you can:
  - ❖ Post a profile and resume
  - ❖ Connect with colleagues
  - ❖ Share professional recommendations
  - ❖ Find jobs
  - ❖ Forums to demonstrate expertise and find answers

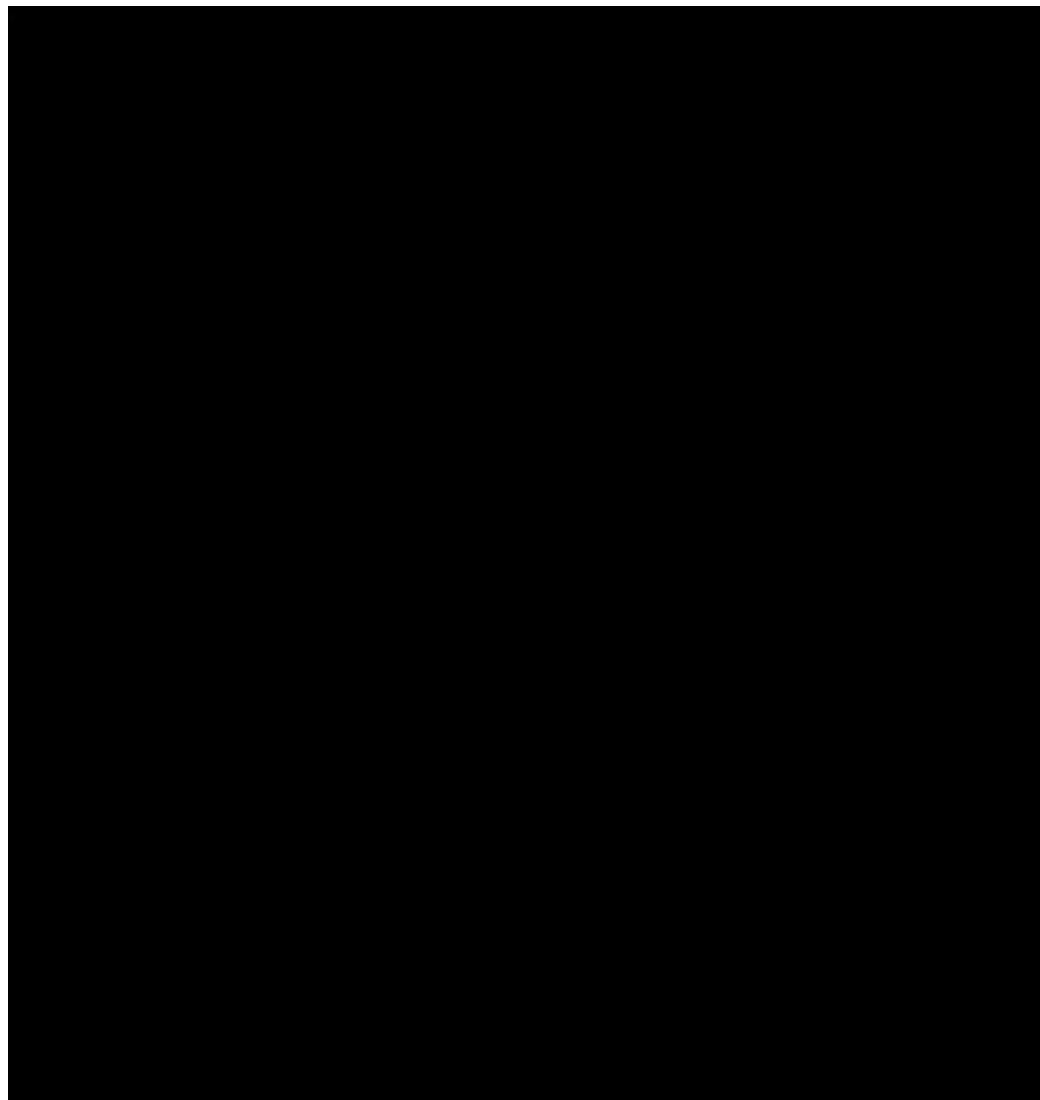


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# Virtual (Game) Worlds

- ❖ A virtual world is a computer-based simulated environment.
- ❖ The term has become largely synonymous with interactive 3D virtual environments, where the users take the form of avatars visible to others.
- ❖ Massively multiplayer online games depict a wide range of worlds, including those based on science fiction, the real world, super heroes, sports, horror, and historical milieus.



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# Virtual (Social) Worlds

- ❖ Internet-based 3D virtual worlds like **Second Life** reimagine our world with all its potential for commerce and branding
- ❖ People interact through characters called avatars
- ❖ Residents explore, meet other residents, socialize, participate in individual and group activities, and create and trade items and services with one another



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Study explores how social movements can use virtual worlds

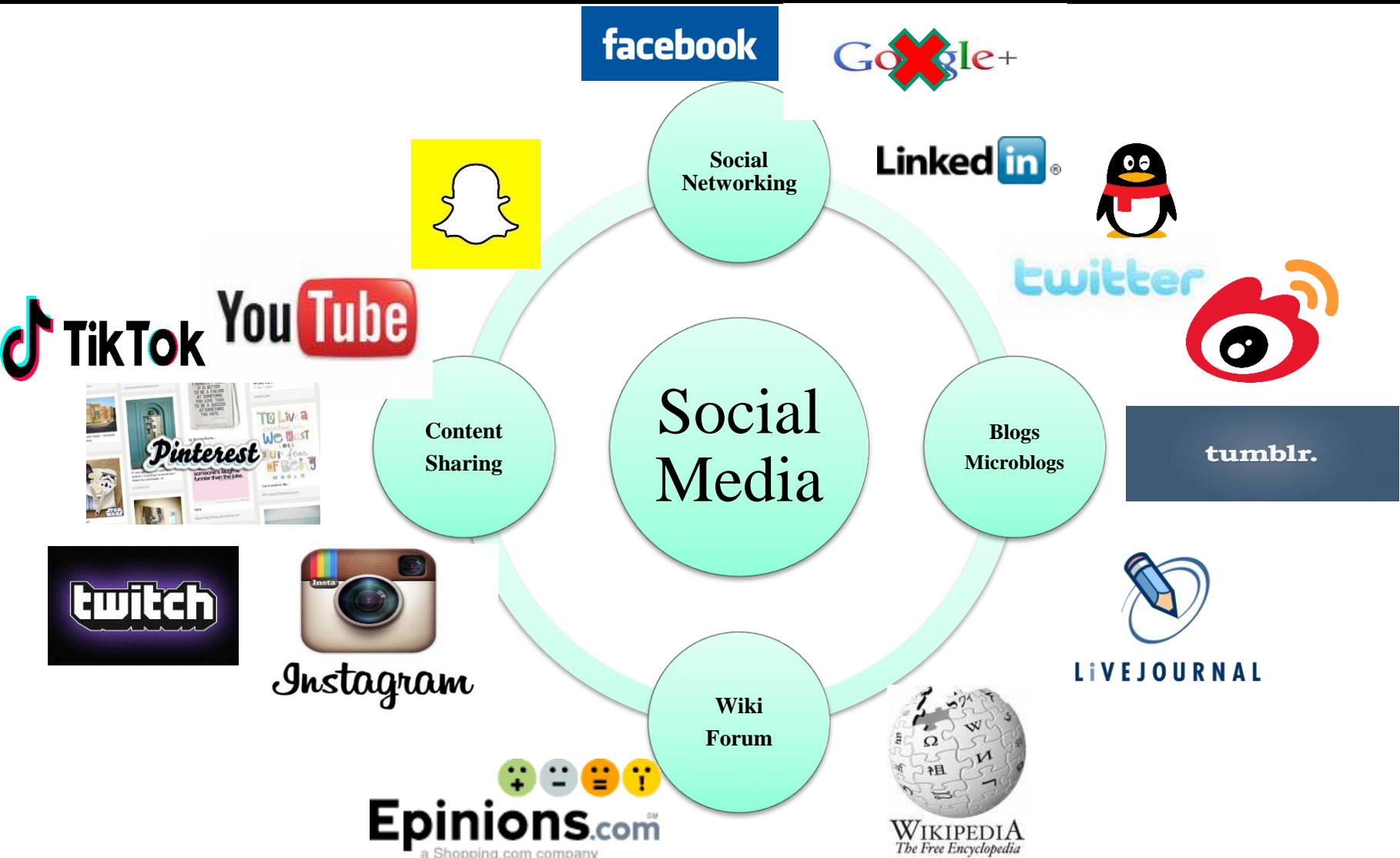


Online virtual worlds can help social movements raise awareness and create safe spaces for their members, according to a new study by an academic at the University of East Anglia (UEA).

The research examined how an LGBT group used a virtual world for their own cause, which was different to its intended design. These worlds are immersive, three-dimensional environments, where users create an avatar, or character, that enables them to interact with other users.

The study by Dr Brad McKenna of UEA's Norwich Business School focused on the game World of Warcraft, which has been used by various social groups to express their identity and connect with others.

# Social Media Classified





Legacy Google+ APIs have been shut down as of March 7, 2019. Changes to the shutdown plan have been made recently which may mitigate its effect on some developers. [Learn more.](#)

Google+ integrations for [web](#) and [mobile apps](#) have also stopped functioning as of March 7, 2019. [Learn more.](#)

# Google+ API Shutdown



## Google+ Shutdown

### Google+ API Shutdown

### Google+ Integrations Shutdown

### Google+ Scopes Shutdown

## Features

### Interactive Posts

### Profile & Social Graph

### Over-The-Air Installs

## Best Practices

### Overview

## Google+ Platform for...

### Android

### Web

### A UPDATES

**February 28:** This posting was updated with important, recent changes to aspects of the shutdown covering Google+ Sign-in, Google+ APIs, and Google+ OAuth scope requests. These changes may help mitigate the impact of the shutdown for some developers.

**January 29:** A clarification regarding "plus.me" scope was provided.

**January 15:** This posting was updated with new information about OAuth scopes.

Legacy Google+ APIs have been shut down as of **March 7, 2019**.

Developers should have received one or more emails listing recently used Google+ API methods in their projects. Whether or not an email was received, we strongly encourage developers to search for and remove any affected dependencies on Google+ APIs from their applications.

# Social Media – The Origin

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- ❖ **1979** - Tom Truscott and Jim Ellis from Duke University had created the **Usenet**, a worldwide discussion system that allowed Internet users to post public messages
- ❖ **1991** – Sir Tim Berners Lee invented the **Web**
- ❖ **1997** - The term “**weblog**” was introduced, and truncated as “blog” a year later when one blogger (Peter Merholz) jokingly transformed the noun ““weblog” into the sentence “**we blog**”
- ❖ **1997** – **Six Degrees**, the first social networking site, launched. 1 million member at the height of its popularity.
- ❖ **1998** - Bruce and Susan Abelson founded “**Open Diary**,” an early social networking site that brought together online diary writers into one community

W Usenet - Wikipedia + <https://en.wikipedia.org/wiki/Usenet>

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# Usenet

From Wikipedia, the free encyclopedia

**Usenet** (/juːznet/) is a worldwide distributed discussion system available on computers. It was developed from the general-purpose Unix-to-Unix Copy (UUCP) dial-up network architecture. Tom Truscott and Jim Ellis conceived the idea in 1979, and it was established in 1980.<sup>[1]</sup> Users read and post messages (called *articles* or *posts*, and collectively termed *news*) to one or more categories, known as **newsgroups**. Usenet resembles a **bulletin board system** (BBS) in many respects and is the precursor to Internet forums that are widely used today. Discussions are **threaded**, as with web forums and BBSs, though posts are stored on the server sequentially. The name comes from the term "users network".<sup>[2][3]</sup>

A major difference between a BBS or web forum and Usenet is the absence of a central server and dedicated administrator. Usenet is distributed among a large, constantly changing conglomeration of servers that store and forward messages to one another via "news feeds". Individual users may read messages from and post messages to a local server, which may be operated by anyone.

Usenet is culturally and historically significant in the networked world, having given rise to, or popularized, many widely recognized concepts and terms such as "FAQ", "flame", **Sockpuppet**, and "spam".<sup>[4]</sup> In the 1990s, before access to the Internet became commonly affordable, Usenet connections via Fidonet's dial-up **BBS** networks made long-distance or worldwide discussions and other **communication** widespread, not needing a server, just (local) telephone service.<sup>[5]</sup>

```
graph TD; C1[Client] --> S1[Server]; C2[Client] --> S1; S1 --> S2[Server]; S1 --> S3[Server]; S2 --> S3; S2 --> C3[Client]; S3 --> S4[Server]; S3 --> C4[Client]; S4 --> S5[Server]; S4 --> C5[Client]; S5 --> S6[Server]; S5 --> C6[Client]; S6 --> S7[Server]; S6 --> C7[Client]; S7 --> S8[Server]; S7 --> C8[Client]; S8 --> S9[Server]; S8 --> C9[Client]; S9 --> S10[Server]; S9 --> C10[Client]; S10 --> S11[Server]; S10 --> C11[Client]; S11 --> S12[Server]; S11 --> C12[Client]; S12 --> S13[Server]; S12 --> C13[Client]; S13 --> S14[Server]; S13 --> C14[Client]; S14 --> S15[Server]; S14 --> C15[Client]; S15 --> S16[Server]; S15 --> C16[Client]; S16 --> S17[Server]; S16 --> C17[Client]; S17 --> S18[Server]; S17 --> C18[Client]; S18 --> S19[Server]; S18 --> C19[Client]; S19 --> S20[Server]; S19 --> C20[Client]; S20 --> S21[Server]; S20 --> C21[Client]; S21 --> S22[Server]; S21 --> C22[Client]; S22 --> S23[Server]; S22 --> C23[Client]; S23 --> S24[Server]; S23 --> C24[Client]; S24 --> S25[Server]; 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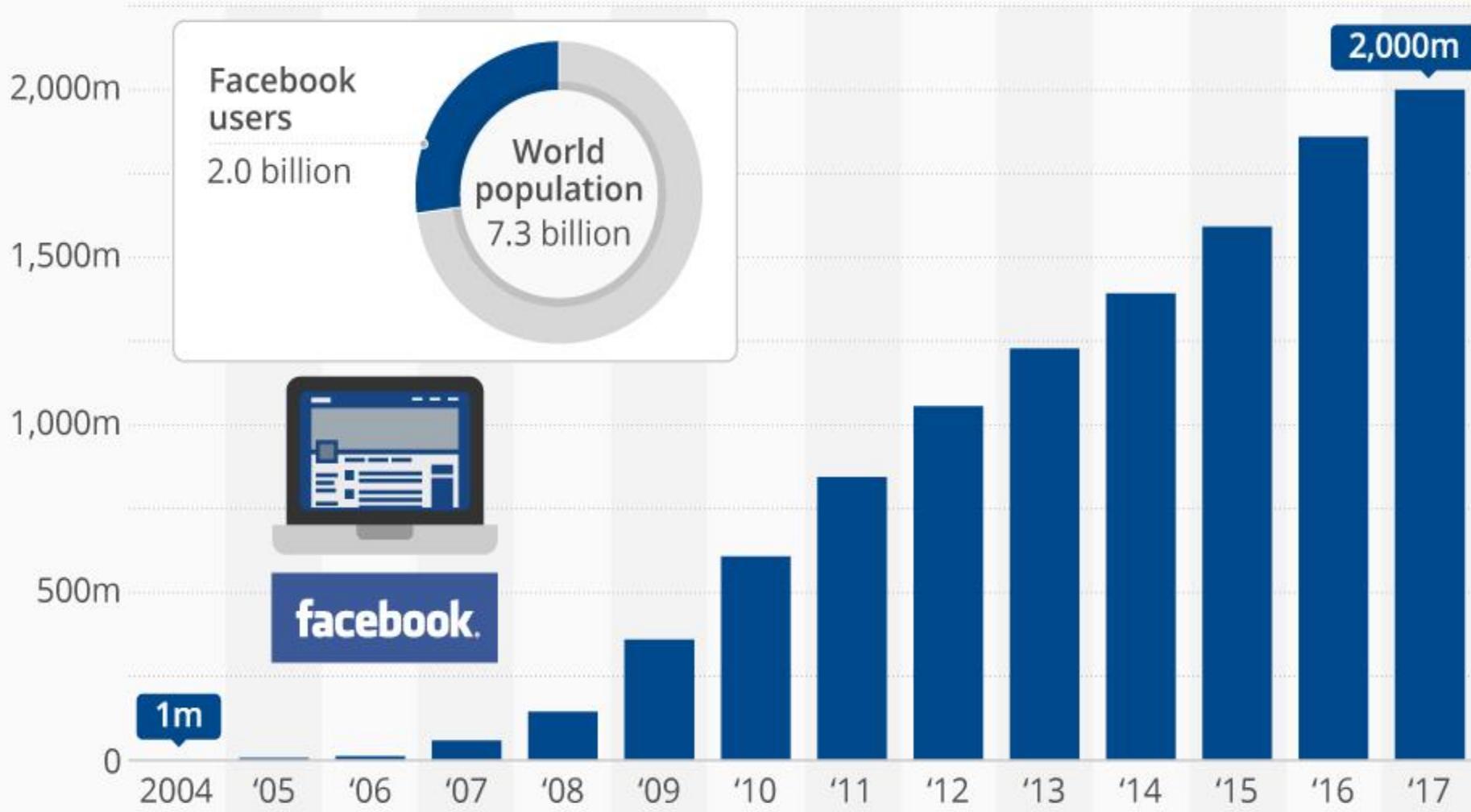
# Social Media – The History

- ❖ 2002 – **Friendster** launched
- ❖ 2003 - **LinkedIn** Launched in May (founded by Reid Hoffman in 2002); **MySpace** launched in August
- ❖ 2004 - **Facebook** launched in February.
- ❖ 2005 – **YouTube** launched in February. Bought by Google in October 2006 for \$1.65 billion dollars.
- ❖ 2006 - **Twitter** launched in July (by Jack Dorsey)
- ❖ 2007 – ‘**You**’ become the person of the year
- ❖ 2011 - **Google+** launched in June

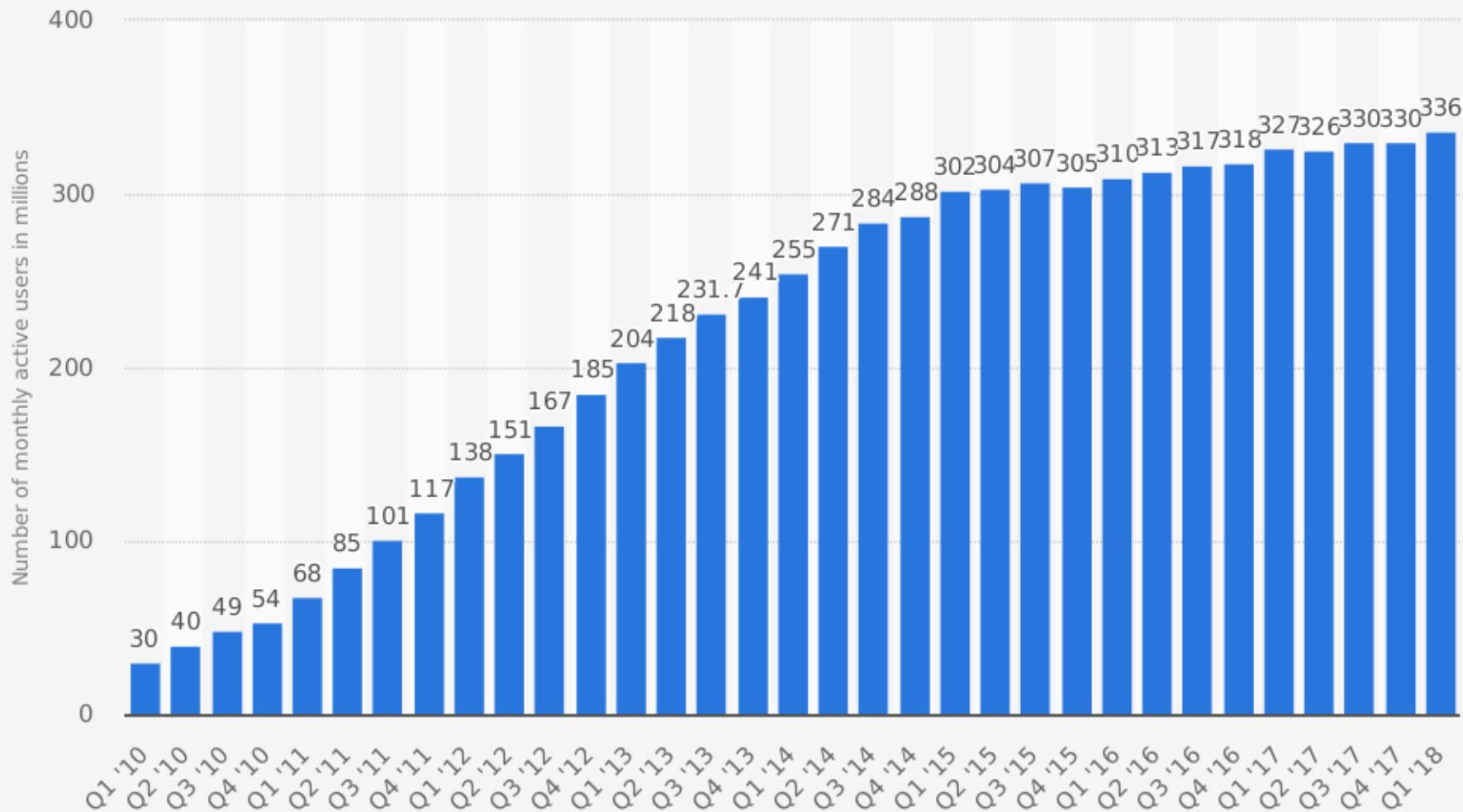


# Facebook's Road to 2 Billion

Number of monthly active Facebook users worldwide\*

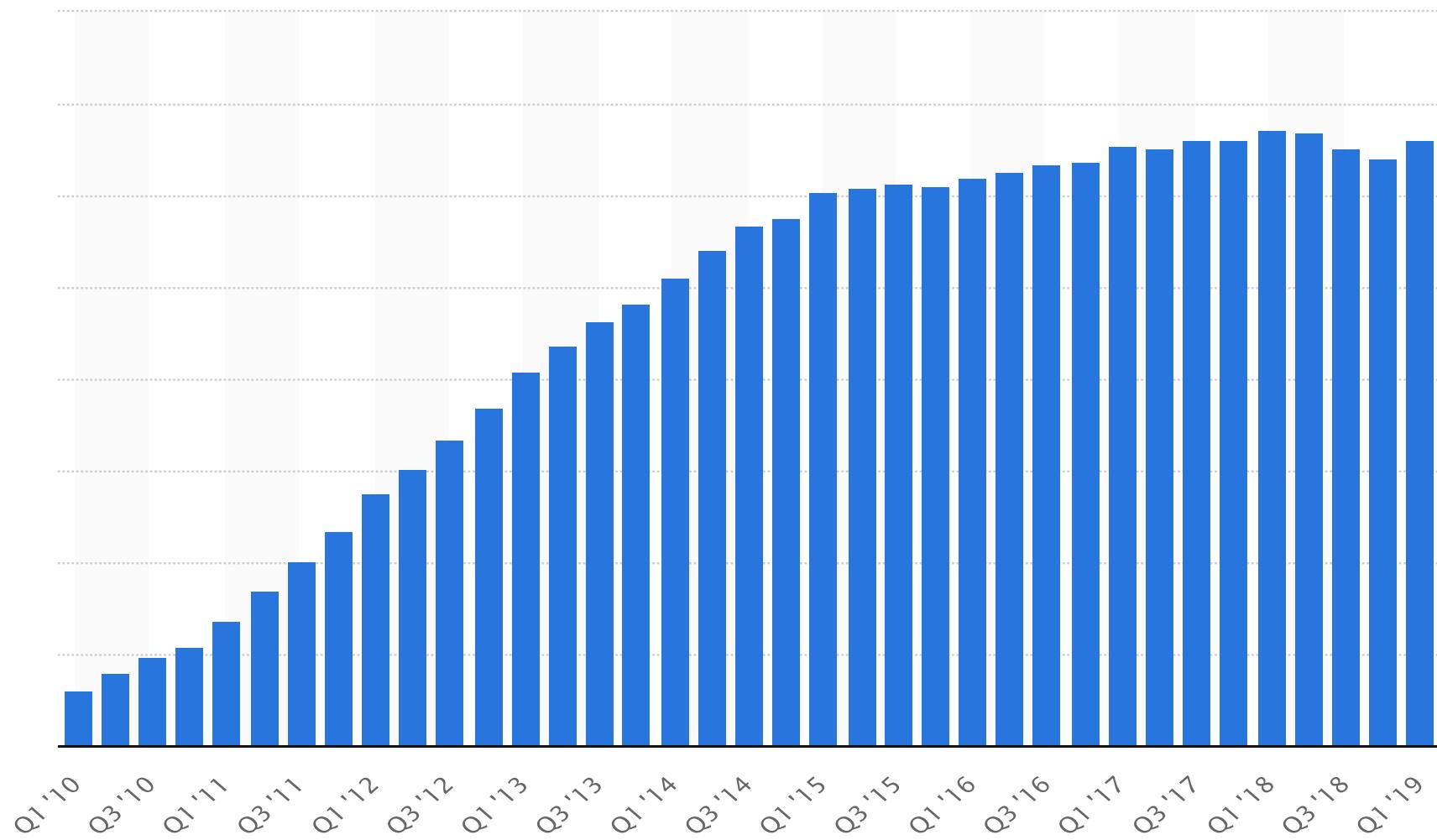


# Number of monthly active Twitter users worldwide from 1st quarter 2010 to 1st quarter 2018 (in millions)



# Twitter Users 2010-2019

Number of monthly active users in millions



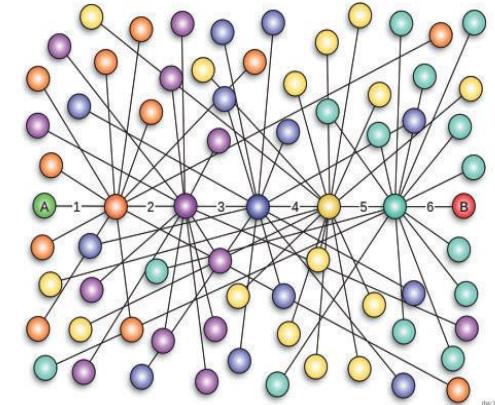
# Social Media Mining

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- ❖ Network Modeling
- ❖ Centrality Analysis and Influence Modeling
- ❖ Community Detection
- ❖ Classification
- ❖ Recommendation

# Network Modeling

- ❖ Large Networks demonstrate **statistical patterns**
  - ❖ Small-world effects (e.g., 6 degrees of separation)
  - ❖ Power-law distribution (a.k.a. scale-free distribution)  
$$f(x) = ax^k \quad f(cx) = a(cx)^k = c^k f(x) \propto f(x).$$
  - ❖ Community structure (high clustering coefficient)
- ❖ Model the network dynamics
  - ❖ Find a mechanism such that the statistical patterns observed in large-scale networks can be reproduced.
  - ❖ Examples: random graph, preferential attachment process, Watts and Strogatz model
- ❖ Used for simulation to understand network properties
  - ❖ Thomas Shelling's famous simulation: What could cause the segregation
  - ❖ Network robustness under attack
  - ❖ Information diffusion within a given network structure



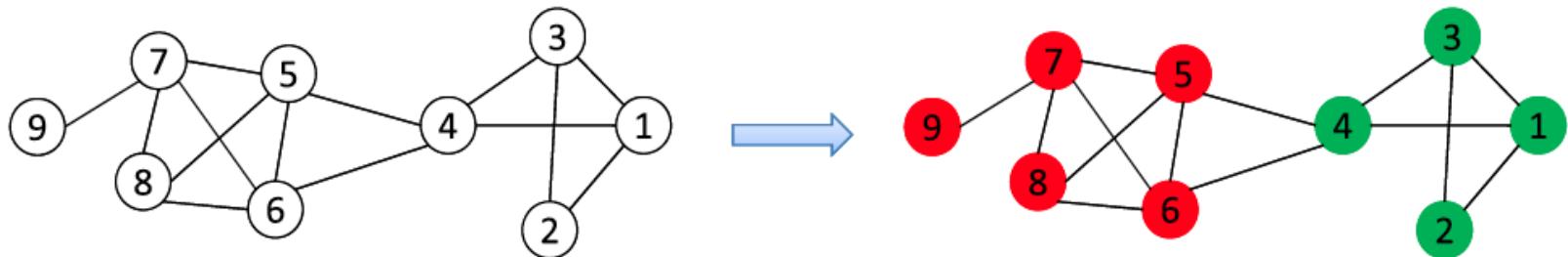
# Centrality Analysis

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- ❖ Centrality Analysis
  - ❖ Identify the most important actors ([leaders](#)) or edges
    - ❖ The importance of a node is determined by the number of nodes adjacent to it
    - ❖ The larger the degree, the more important the node is
    - ❖ Only a small number of nodes have high degrees in many real-life networks
- ❖ Influence modeling:
  - ❖ Understand how people influence each other
    - ❖ Information diffusion
    - ❖ Viral marketing: word-of-mouth effect
    - ❖ Influence maximization: which  $k$  nodes, in a given network, should be activated (or targeted) first to maximize the number of active nodes at the end?

# Community Detection

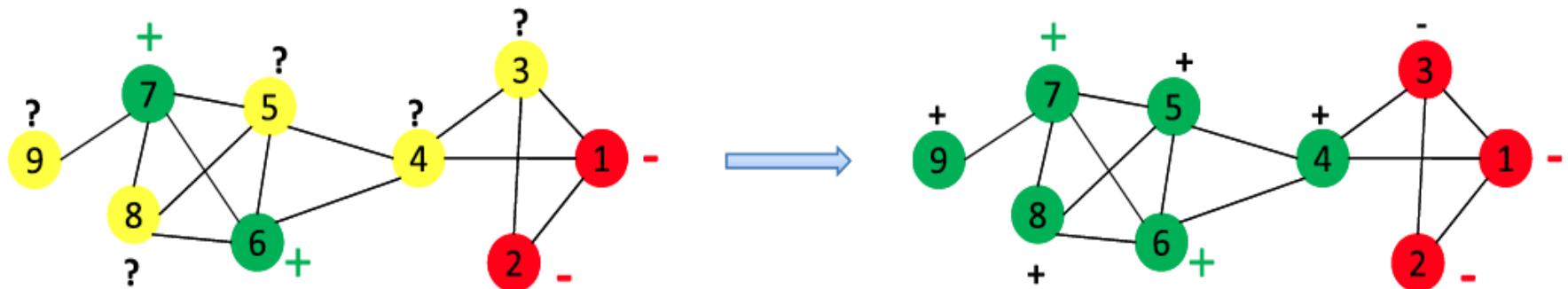
- ❖ A **community** is a set of nodes between which the interactions are (relatively) frequent
  - ❖ A.k.a., group, cluster, cohesive subgroup, module



- ❖ Applications: Recommendation based communities, Network Compression, Visualization of a huge network
- ❖ New lines of research in social media
  - ❖ Community Detection in Heterogeneous Networks
  - ❖ Community Evolution in Dynamic Networks
  - ❖ Scalable Community Detection in Large-Scale Networks

# Classification

- ❖ Network-based classification:
  - ❖ How to leverage the correlation observed in a networks to help predict user attributes or interests?



# Classification

## ❖ Content-based classification (Sentiment Analysis)

The screenshot shows a web browser window with the title "Twitter Corpus Classifier". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL 127.0.0.1/twitter\_corpus/corpus-class.php. The main content area displays a table of sentiment indicators and a list of tweets with their classifications.

Category	Description
Positive	Positive indicator for topic
Neutral	Neither positive nor negative, or undeterminable
Negative	Negative indicator for topic
Irrelevant	Not english or not on topic
Unknown	Not yet classified

ID	Text	Classification
1	apple RT @cjwallace03: So apparently @apple put MB cap on your SMS with the new update. 25mb storage before it tells you your inbox is full. What is this 2001?	Negative
2	apple @Late_Show I would have watched but the folks at @apple have a jihad against adobe flash. Plse consider a YouTube link in future on UR site	Neutral
3	apple RT @Jewelz2611 @mashable @apple, iphones r 2 expensive. Most went w/ htc/galaxy. No customer loyalty w/phone comp..	Negative
4	apple @mashable @apple, iphones r 2 expensive. Most went w/ htc/galaxy. No customer loyalty w/phone comp..	Negative
5	apple THiS IS WHAT WiLL KiLL APPLE http://t.co/72Jw4z5c RiP @APPLE	Negative
6	apple RT @rdingwell: .@Apple has a record quarter and because a bunch of professional guessers (aka analysts) wanted more, its a disappointment #wtf	Neutral
7	apple Hey @apple, androids releasing brand new state of the art phones, whens your new phone come out? What's that? (cont) http://t.co/2sko9l3d	Neutral
8	apple Now all @Apple has to do is get swype on the iphone and it will be crack. Iphone that is	Positive
9	apple .@Apple has a record quarter and because a bunch of professional guessers (aka analysts) wanted more, its a disappointment #wtf	Neutral
10	apple @apple why my tunes no go on my iPhone? iPhone lonely without them. silly #iOS5	Negative
11	apple @apple needs to hurry up and release #iTunesMatch	Negative
12	apple @Apple how fun wouldn't it be if it was possible to integrate ( soon to be named ) with notifications?	Neutral
13	apple Interesting read on war b/w @Apple & @Samsung- http://t.co/Vt9d24Yi -using latter, agree lack of innovation, but better specs at same price!	Neutral
14	apple Why is #Siri always down @apple	Negative
15	apple I just need to exchange a cord at the apple store why do I have to wait for a genius? @apple	Negative
16	apple @apple AirDrop #fail - Immediate "declined your request." every time	Negative
17	apple RT @adamnash: The takeaway from the @Apple earnings call? Even Apple needs a new iPhone release every 12 months to stay competitive. cc: @hblodget	Neutral

# Sentiment Analysis: An Example

Sentiment140 - A Twitter search results page for "iPhone X". The URL is sentiment140.com/search?query=iPhone+X&hl=en.

## Sentiment140

Tweet Like 977 G+

iPhone X English Search

### Sentiment analysis for iPhone X

**Sentiment by Percent**

A pie chart divided into two segments. The larger green segment is labeled "Positive (59%)". The smaller red segment is labeled "Negative (41%)".

**Sentiment by Count**

A horizontal bar chart with two bars. The green bar represents "Positive (16)". The red bar represents "Negative (11)".

### Tweets about: iPhone X

lulalayla: RT @gra\_produce: Three. More. Days!!!!!! Our **iPhone X** competition, run in association with @dunnesstores closes this Sunday the 7th. B?  
Posted: 27 seconds ago

CANNONGRAMZ: DIS **IPHONE X** REALLIVE LIKE A HANDHELD MACBOOK ??  
Posted: 36 seconds ago

xMochahontas\_: I still don?t know how to work my **iPhone X** ??  
Posted: 50 seconds ago

Poskatronas: RT @GiveawayPluss: HUGE **iPhone X** Giveaway ! -Follow us -RT -Turn Post Notification On! 12 winners ?? JOIN NOW ! Only choosing active ! h?  
Posted: 56 seconds ago

kathchandreya: RT @comelychandria: I can?t believe Trina just shot this with **Iphone X!!!** Omg ?? Totoo ba? Ang ganda ???? <https://t.co/K5TkvERrNQ>  
Posted: 1 minute ago

derviec: RT @gra\_produce: FOUR. MORE. DAYS!!!! We?re nearing the end of our **iPhone X** competition run in association with @dunnesstores But there???

The results for this query are: Accurate Inaccurate

Posted: 2 minutes ago

# Sentiment Analysis: An Example

API - Sentiment140 - A X + help.sentiment140.com/api Search this site

## Sentiment140

General Information  
Site Functionality  
For Academics  
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## API

We provide APIs for classifying tweets. This allows you to integrate our sentiment analysis classifier into your site or product.

**Contents**

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[4.3 Bulk Classification Service \(CSV\)](#)

### Registration

You may register your application  
at <http://help.sentiment140.com/api/registration>.

Please provide an `appid` parameter in your API requests. The `appid` value  
should be an email address we can contact. For example, if you are using the JSON Bulk Classification API, the HTTP endpoint that  
you use to send requests may look like this:



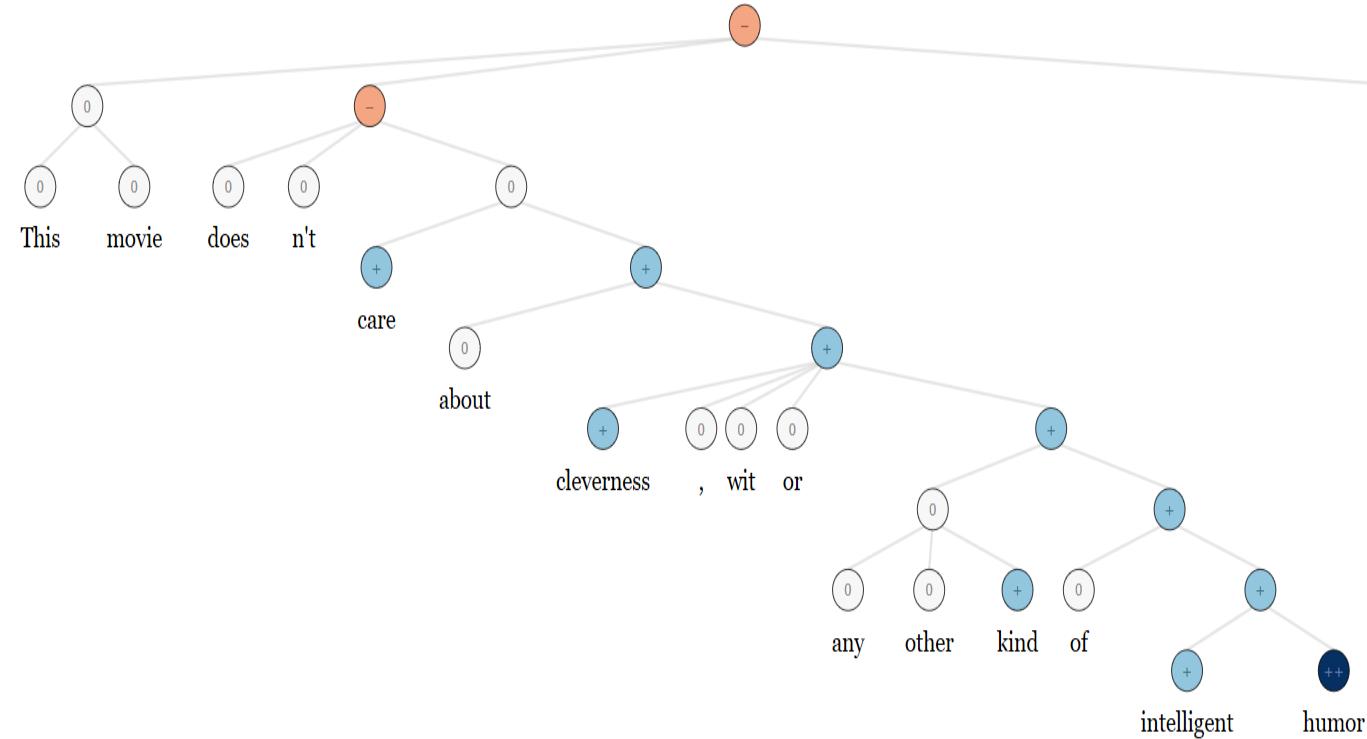


# Sentiment Analysis

| Information | **Live Demo** | Sentiment Treebank | Help the Model | Source Code

## Sentiment Trees

You can double-click on each tree figure to see its expanded version with greater details. There are 5 classes of sentiment classification: **very negative**, **negative**, neutral, **positive**, and **very positive**.



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VTAlum

\$SPY She's just waiting for \$AAPL to pick up more steam to break 330.

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Bullish



gomez21

\$AAPL Will be hitting \$325 by tomm! Let's get it!!!!

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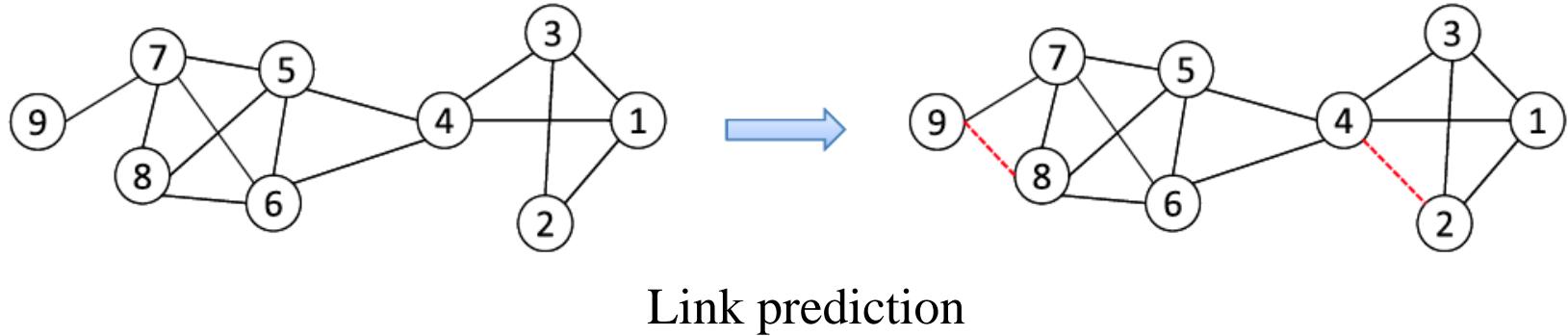
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# Recommendation

- ❖ Very common in social media applications
  - ❖ Tag, Friend, Group, Media, Link Recommendations



# Recommender Systems: Facebook

- ❖ Facebook friend recommendations
- ❖ “People you may know”
- ❖ “Based on mutual friends, work and education information, networks you’re part of, contacts and many other factors.”
- ❖ “Since our formula is automatic, you might occasionally see people you don’t know or don’t want to be friends with. To remove them from view, just click the X next to their names.”

<http://www.facebook.com/help/?page=199421896769556>



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# Recommender Systems: Netflix

- ❖ Netflix (movie recommendation)
- ❖ \$1M prize for 10% accuracy improvement



# Privacy, Spam and Security

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- ❖ Privacy is a big concern in social media
  - ❖ Facebook, Google buzz often appear in debates about privacy
  - ❖ NetFlix Prize Sequel cancelled due to privacy concern  
(see [https://en.wikipedia.org/wiki/Netflix\\_Prize](https://en.wikipedia.org/wiki/Netflix_Prize))
  - ❖ Simple anonymization does not necessarily protect privacy
- ❖ Spam blog (splog), spam comments, fake identity/news, etc., all requires new techniques
- ❖ As private information is involved, a secure and trustable system is critical
- ❖ Need to achieve a balance between sharing and privacy

# Recommended Textbooks

