

UNIT – I

Introduction

Social Media

Social Network Analysis

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Introduction

- **Social Media and Social Networks**
- Social media refers to a set of computer-network based tools that support social interaction between users.
- The term is often used to contrast with more traditional media such as television and books that deliver content to mass populations but do not facilitate the creation or sharing of content by users.
- Social media is about transforming broadcast (one-to-many) into dialog (many-to-many).
- In practice, “social media” is a catchall phrase intended to describe the many online sociotechnical systems that have emerged in recent years, including services like email, discussion forums, blogs, microblogs, texting, chat, social networking sites, wikis, photo and video sharing sites, review sites, and multiplayer games.

Introduction

- **Social Media and Social Networks**
- Other terms are also used to describe many of these systems including “Web 2.0,” the “read/write web,” “social computing,” “social software,” “collective action tools,” “sociotechnical systems,” “computer-mediated communication,” “groupware,” “computer supported cooperative work (CSCW) systems,” “virtual” or “online communities,” “usergenerated content,” and “consumer-generated media.”

Introduction

- **Social Media Design Framework**
- Social media systems come in a variety of forms and support numerous genres of interaction.
- Although they all connect individuals, they do so in dramatically different ways depending

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- Social Media Design Framework provides a language and framework for comparing social media tools.
- It considers six key dimensions:
 - **Size of producer and consumer population**
 - **Pace of interaction**
 - **Genre of basic elements**
 - **Control of basic elements**
 - **Types of connections**
 - **Retention of content**

Introduction

- **Size of producer and consumer population**
- Producers and consumers are drawn from the same set of users. Users are producers one moment and consumers the next.
- Differentiating between those who produce and consume content can be useful in comparing social media systems, even if the set of producers and consumers are not mutually exclusive.

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TABLE 2.1 Examples of social media and pre-digital media systems organized by the size of producer and consumer populations

Size of consumer population	Size of producer population		
	Small	Medium	Large
Small	Instant messaging Personal messaging (e.g., within Facebook) Video conferencing Phone call Face-to-face office meeting	Committee report to a decision maker Online survey Social networking friend feed Twitter follow feed	Professional services reports for decision makers Personalized suggestions based on recommender systems
Medium	“Social” or family blog Stack Overflow Q&A Departmental email list Tweet sent to followers Facebook post Twitch stream	Group blog on niche topic Internet relay chat room Internal department wiki Facebook group Niche YouTube channels Local markets (e.g., Craigslist)	Professional report for specialty group Zooniverse citizen science project Idea-generation sites (e.g., IdeaConnection)
Large	Popular blog or podcast Message to large forum or email list Popular Twitter user’s tweet Popular YouTube video Company website Novel or newspaper	News rating site (e.g., Reddit) Wikipedia page Television program Popular discussion forum User-generated databases (e.g., IMDB) or marketplace (e.g., Threadless)	Large online marketplace (e.g., eBay) Wikipedia YouTube FamilySearch Indexing Popular massively multiplayer game

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- **Pace of interaction**

- The pace at which interaction occurs is another important dimension along which researchers organize social media systems.
- Traditionally, researchers distinguished between asynchronous and synchronous communication.
- Asynchronous systems like email, discussion forums, and voicemail presume a staccato pattern of interaction spread out over hours or days or weeks.
- Synchronous systems, like chat, instant messaging, videoconferencing, multiplayer games and graphical worlds, require that partners interact at the same time, as in face-to-face interactions and telephone calls.

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TABLE 2.2 Examples of social media categorized by the pace of interaction and the granularity of control over content

Pace of interaction	Granularity of control		
	Fine	Medium	Coarse
	Users can directly control smallest units of content (characters, pixels, bytes)	Users control medium-sized blocks of content (objects, attributes, tracks, players) that they can only indirectly alter or that can be altered by other users	Users control large block of content (documents, messages, blog posts, photos), rarely edited or modified by others
Synchronous	Real-time shared canvas	Virtual worlds, multiplayer games, real-time networked musical jamming	Chat, instant messaging, texting, Twitter
Asynchronous	Shared documents (e.g., Google Docs), source code, Wikipedia	Contribution to collected works like an album, anthology, report section, discussion group, or photosets	Email; blog posts and comments; sharing of links, photos, videos, and documents; turn-based games

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- **Genre of basic elements**
- Digital objects, the basic elements of social media systems, vary in size and type.
- Twitter posts (i.e., tweets) are limited to 280 (initially 140) characters, whereas email messages are typically a few lines to a few paragraphs in length but can be even longer.
- This difference in size produces dramatically different patterns of interaction.
- Instant messaging design choices such as the size of the text box and messaging window promote brevity.
- Short messages are often directed to other people who are assumed to be busy and engaged in other activities.

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- **Control of basic elements**
- Social media systems provide different levels of control over their basic elements.
- They can restrict who can create, edit, read, invite, respond to, subscribe to, and share content of various types.
- Some systems differentiate between anonymous users, registered users, and those with special privileges such as administrators.
- For example, some discussion forums require that users log in before they post, but they allow anyone to read the messages created by the community.

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- **Types of connections**
- There are many ways that the basic elements of social media systems can be connected.
- It is important to understand these connections or “ties” in order to construct and understand networks from each kind of social media system.
- Implicit connections can be inferred when a user sends another user an email message, “favorites” content (and by extension its author), replies to a discussion post, or “Likes,” “Loves,” or “Upvotes” another user or their content as some sites allow.

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- **Retention of content**
- Social media systems also vary in how long content is retained.
- On one end of the spectrum are systems like wikis that typically create a permanent history of all actions that occurred in the system.
- Not only is each action recorded and stored, it is made available on article history pages and user contribution pages.

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TABLE 2.3 Types of social media listed with example services

Social media type	Examples
ASYNCHRONOUS THREADED CONVERSATION	
Email	Gmail, Hotmail, MS Outlook
Email lists, Discussion forums, Q&A sites	Listserv, Facebook Groups, Reddit, Quora, StackOverflow
SYNCHRONOUS CONVERSATIONS	
Chat, instant messaging, texting	IRC, Facebook Messenger, Skype, WeChat, WhatsApp, Slack, GroupMe
Audio and video conferencing	Skype, Zoom, Google Hangouts, Adobe Connect
WORLD WIDE WEB	
Websites and documents	Faculty member websites, artist portfolio website, Ford.com , umd.edu , SMRFoundation.org , Prevent.org
COLLABORATIVE AUTHORING	
Wikis	Wikipedia, WikiHow, Docuwiki, Wikia
Shared documents	Google Docs, Zoho, Office 365
BLOGS AND PODCASTS	
Blogs	WordPress, Tumblr, Medium
Microblogs and activity streams	Twitter, Sina Weibo, Facebook feed
Multimedia blogs, podcasts, and Livestreams	YouTube vlogs, Instagram photo vlogs, iTunes, SoundCloud, Facebook Live, Instagram Live, Twitch

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SOCIAL SHARING

Video and TV	YouTube, Hulu, Netflix, Vimeo
Photo, images, and art	Flickr, Instagram, Pinterest, DeviantArt
Music	Spotify, Pandora, iTunes
Bookmarks, news, and books	Mix, Reddit, Twitter, Facebook, Goodreads

SOCIAL NETWORKING SERVICES

Social and dating	Facebook, eHarmony, Match
Professional	LinkedIn, Zerply
Niche networks	AllTrails, Strava, Untappd, Life Cake, Ravelry

ONLINE MARKETS AND PRODUCTION

Financial transaction	eBay, Amazon, craigslist, Kiva, Kickstarter, Indiegogo
User-generated products and services	GitHub, Mechanical Turk, Etsy, fiverr
Review sites	Amazon, Yelp, Angie's List, Google Local Guide Reviews

IDEA GENERATION

Idea generation, selection, and challenge sites	IdeaConnection, Chaordix, IdeaScale, Imaginatik, Kaggle, TopCoder
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VIRTUAL WORLDS

Virtual reality worlds	Second Life, Webkinz, Habbo, IMVU
Massively multiplayer games	World of Warcraft, Lord of the Rings Online, Fortnite, The Sims

Social Network Analysis

- Social networks are structures that represent how individuals, groups, or entities are connected to each other, and they can be physical or virtual.
- Nodes and Edges:
 - In a social network, individuals or entities are represented as nodes, and the connections or relationships between them are represented as edges.
 - Nodes can be people, organizations, websites, or any other entity that can interact or connect with others.

Social Network Analysis

- Network Analysis:
 - Social network analysis (SNA) is a research methodology that focuses on examining the structure and patterns of relationships within a network.
 - Researchers use various techniques and metrics to analyze networks, such as centrality measures, clustering, and network visualization.
- Centrality:
 - Centrality measures identify the most important nodes in a network.
 - Nodes with high centrality can play crucial roles in information flow, influence, or control within the network.
 - Common centrality measures include degree centrality, betweenness centrality, and eigenvector centrality.

Social Network Analysis

- Connectivity:
 - The degree of connectivity in a social network refers to how easily information or influence can spread through the network.
 - Highly connected networks can facilitate rapid information dissemination.
- Small World Phenomenon:
 - The small world phenomenon suggests that most people in a social network are connected through a relatively small number of intermediaries or friends of friends.
 - This concept is often associated with the idea of "six degrees of separation."

Social Network Analysis

- Clustering and Communities:
 - Social networks often exhibit clustering, where nodes form tightly-knit groups or communities.
 - Identifying and studying these clusters can reveal substructures within a network.
- Information Diffusion:
 - Social networks are integral to the spread of information, ideas, and behaviors.
 - Understanding how information spreads within a network can have implications for marketing, public health, and social change efforts.

Types of Networks

- **Egocentric Network:**
- **Focus:** The egocentric network, also known as an ego network, centers around a single individual, referred to as the ego. It explores the immediate social environment and relationships of that ego.
- **Scope:** In an egocentric network analysis, the primary focus is on the ego and their direct connections (alter nodes), such as friends, family members, and acquaintances. This type of analysis provides a snapshot of the ego's social interactions but does not examine the relationships among the ego's alters.
- **Use Cases:** Egocentric network analysis is often used in social psychology and qualitative research to understand an individual's social support network, information sources, or the structure of their close relationships.

Types of Networks

- **Partial Network:**
- **Focus:** A partial network extends beyond the ego but is still limited in scope compared to a full network analysis. It explores a subset of individuals or relationships within a larger social network.
- **Scope:** A partial network analysis may include specific individuals or nodes of interest within a larger network, such as studying the interactions among employees in a particular department of a company or members of a particular community within a larger social network.
- **Use Cases:** Partial network analysis is valuable when researchers want to focus on specific subgroups or relationships within a larger network. It allows for a more targeted examination of interactions while reducing the complexity of analyzing the entire network.

Types of Networks

- **Full Network:**
- **Focus:** A full network analysis, also known as a complete network analysis, examines all possible relationships within a given network. It provides a comprehensive view of the connections and interactions among all nodes in the network.
- **Scope:** In a full network analysis, researchers consider every node and the relationships between them, without excluding any connections. This type of analysis allows for a thorough understanding of the network's structure, properties, and dynamics.
- **Use Cases:** Full network analysis is often employed in social network analysis research to study the overall structure of social networks, information flow, network cohesion, and centrality measures.

Types of Networks

- **Unimodal Networks:**
- **Definition:** Unimodal networks, also known as one-mode networks, are the most common type of social network. In unimodal networks, all nodes belong to the same category or entity, and edges (connections) exist only between nodes of that same category.
- **Use Case:** Unimodal networks are used to represent relationships among individuals or entities of the same type. For example, a friendship network on a social media platform, where all nodes represent users, is a unimodal network.
- **Examples:**
 - Facebook friendship network: Nodes represent users, and edges represent friendships between users.
 - Collaboration network among researchers: Nodes represent researchers, and edges represent collaborations on research projects.

Types of Networks

- **Multimodal Networks:**
- **Definition:** Multimodal networks, also known as two-mode or bipartite networks, involve two different categories of nodes and connections exist only between nodes of different categories.
- **Use Case:** Multimodal networks are useful when analyzing relationships between two distinct types of entities. They help explore interactions or associations between different groups of nodes.
- **Examples:**
 - Movie actor-movie network: One set of nodes represents actors, and another set represents movies. Edges connect actors to the movies they have acted in.
 - Author-paper network: One set of nodes represents authors, and another set represents academic papers. Edges connect authors to the papers they have written.

Types of Networks

- **Affiliation Networks:**

- **Definition:** Affiliation networks, also known as one-mode projected networks or affiliation matrices, are derived from multimodal networks. They focus on the relationships between nodes of one category based on their shared connections with nodes of the other category.
- **Use Case:** Affiliation networks are used to analyze patterns of affiliation or co-membership among nodes of the same category. They help identify groups or clusters within the same category of nodes based on their shared interactions with the other category.

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Types of Networks

- **Affiliation Networks:**

- **Examples:**

- Co-authorship network: Derived from an author-paper multimodal network, an affiliation network among authors focuses on authors who have co-authored papers together. Nodes represent authors, and edges indicate co-authorship relationships.
 - Social club affiliation network: In a social club, nodes represent members, and edges represent shared club memberships. An affiliation network among members identifies which members belong to the same clubs.

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Types of Networks

- **Multiplex Network**

- Multiplex networks, also known as multilayer networks, are a type of complex network that allows for the representation of multiple types of relationships or interactions among the same set of nodes (entities).
- In social network analysis, multiplex networks are particularly valuable for capturing the diverse and layered nature of human interactions.

Network analysis metrics

- Social network analysis (SNA) involves the examination of social networks to understand the patterns of relationships, information flow, and influence among individuals or entities.
- Various metrics and measures are used to analyze social networks.
- **Degree Centrality:**
- Degree centrality measures the number of connections or links a node (individual or entity) has in the network.
- Nodes with high degree centrality are often considered central or influential in the network.

Network analysis metrics

- **Betweenness Centrality:**
- Betweenness centrality measures the extent to which a node lies on the shortest paths between other nodes in the network.
- Nodes with high betweenness centrality can act as bridges or connectors between different parts of the network.
- **Closeness Centrality:**
- Closeness centrality quantifies how close a node is to all other nodes in the network in terms of the shortest paths.
- Nodes with high closeness centrality are well-positioned to access and disseminate information efficiently.

Network analysis metrics

- **Eigenvector Centrality:**
- Eigenvector centrality considers not only a node's direct connections but also the quality of its connections (i.e., the centrality of its neighbors).
- Nodes connected to other central nodes receive higher eigenvector centrality scores.
- **PageRank:**
- PageRank is a link analysis algorithm used by search engines, and it can also be applied to social networks.
- It measures the importance of a node based on the number and quality of links pointing to it.

Network analysis metrics

- **Clustering Coefficient:**
- The clustering coefficient of a node quantifies the degree to which its neighbors are connected to each other.
- High clustering coefficients indicate that the node's neighbors are well-connected, suggesting the presence of a close-knit community.
- **Community Detection:**
- Community detection algorithms identify groups or clusters of nodes that are more densely connected to each other than to nodes outside the group.
- Metrics related to community structure, such as modularity, are used to evaluate the quality of identified communities.

Network analysis metrics

- **Centrality Prestige:**
- Centrality prestige measures a node's importance based on its connections to other nodes with high centrality.
- Nodes that are connected to central nodes gain prestige themselves.
- **Density:**
- Network density measures the proportion of actual connections in the network compared to all possible connections.
- High network density suggests a tightly connected network, while low density indicates a sparser network.

Network analysis metrics

- **Reciprocity:**
- Reciprocity measures the extent to which pairs of nodes reciprocate connections.
- In social networks, a high level of reciprocity may indicate mutual relationships.
- **Homophily:**
- Homophily measures the tendency of nodes with similar attributes (e.g., age, gender, interests) to connect with each other.
- It helps assess whether individuals prefer to interact with others who share their characteristics.

Network analysis metrics

- **Assortativity:**
- Assortativity measures the tendency of nodes to connect to nodes with similar characteristics.
- Assortative networks have nodes that preferentially connect to similar nodes, while disassortative networks connect dissimilar nodes.
- **Reachability:**
- Reachability metrics assess the ease with which information or influence can propagate through the network.
- It considers the number of nodes that can be reached from a given node within a certain number of steps.

Network analysis metrics

- **Core-Periphery Analysis:**
- Core-periphery analysis identifies a core group of densely connected nodes and a periphery of less connected nodes.
- This analysis helps reveal the structure of influence within a network.
- **Temporal Metrics:**
- Temporal network analysis metrics consider the dynamics of network relationships over time, including measures like tie strength changes, turnover, and temporal motifs.

Tools for Network Analysis

- Network analysis in social networks involves the use of specialized software and tools to collect, analyze, visualize, and interpret data about social interactions and relationships.
- **Gephi:** Gephi is an open-source network analysis and visualization tool that offers a user-friendly interface for exploring and analyzing networks. It provides a range of network metrics, layouts, and visualization options.
- **Cytoscape:** Cytoscape is another open-source platform for visualizing and analyzing complex networks. It is highly extensible and offers a wide range of plugins and apps for network analysis tasks.

Tools for Network Analysis

- **UCINet:** UCINet (University of California, Irvine Network) is a widely used software package for network analysis. It supports a variety of network metrics, data import/export formats, and visualization options.
- **Pajek:** Pajek is a program for large network analysis and visualization. It is particularly useful for handling large and complex social networks and offers various clustering and community detection algorithms.
- **NodeXL:** NodeXL is an Excel add-in that simplifies network analysis for users familiar with Excel. It offers a straightforward way to import data, calculate network metrics, and create visualizations.

Node Link Diagram

- Node-link diagrams are a common visualization technique used in social network analysis to represent and communicate the structure and relationships within social networks.
- In a node-link diagram, nodes represent individual entities (such as individuals, organizations, or webpages), and links (or edges) represent the relationships or interactions between these entities.