

Chapter 1

Introduction

“A journey of a thousand miles must begin with a single step.” -Lau Tzu

This chapter serves as the starting point of the thesis and establishes the key concepts and vocabulary used in the rest of the document. We begin with a general introduction to social media in Section 1.1, followed by a brief description of its uses in Section 1.2. Section 1.3 provides the motivation of my work. Section 1.4 provides an overview of my dissertation. Section 1.5 highlights the research goals by articulating various research questions. We summarise the main contributions of the thesis in Section 1.6. Finally, Section 1.7 presents the layout of the rest of the thesis.

1.1 What are Social Media?

If one asks the above question anyone on the road, she will quickly get a list of several social platforms, including Facebook, Twitter, YouTube, LinkedIn, Instagram, Whatsapp, Telegram, and so on. The challenge would be to find a couple who agree on a concrete definition of a social medium. There is a consensus on what applications can be considered social media, but not on what and how to define social media, encompassing all subjects [6]. Today, social media play an important role in our daily life through sharing images,

messages, personal chat, office work, online classes etc. Several new definitions of social media have surfaced in the domain of communication and related disciplines such as public relations, informatics, and mass media. Definitions generally converge around the notion that social media refer to digital technologies, emphasizing user-generated content or interactions. Often social media are referred to by channel characteristics, either identifying the directionality of messages or using particular applications such as Facebook or Twitter to exemplify ways of interaction [7–10].

Social media (SM) introduce a wide range of Internet-based and mobile services that allow users to participate in an online exchange, contribute user-generated content, or join online communities. Several internet services commonly associated with social media (referred to as Web 2.0) include the following:

- **Social networking site (SNS):** SNS is an online platform where people create social networks or social connections with people who share similar personal or career content, interests, activities, backgrounds, or real-life connections. The most popular SNS in India are Facebook, Twitter, LinkedIn, Youtube, Instagram, etc.
- **Blogs:** A blog is a forum or an informational website published on the World Wide Web that contains discrete, often informal diary-style text entries. The information is usually displayed in reverse chronological order, with the most recent content appearing first [11].
- **Social Curation:** Social curation is the collaborative sharing of web content organized around one or more particular themes or topics. Two well-known social curation sites are Reddit and Digg. Both sites permit users to suggest links to articles and rate them through voting, for example, on Digg, by clicking the “thumbs up” icon. A new social curation site, ‘Pinterest’, is dedicated to images.

- **Microblogging:** Microblogging is a combination of content generation and instant messaging. With a microblog, share short messages with online audiences to improve engagement. Social media such as Twitter, Instagram, Facebook and Pinterest offer popular platforms for microblogging.
- **Collaborative Knowledge Sharing:** Collaborative knowledge sharing can play a critical role in bringing people together with the knowledge, experience, and skills of multiple team members to contribute to organizational development more effectively than individual team members performing their narrow tasks. It can happen within an organization or worldwide in general also like Wikipedia, Quora etc.

1.2 Why do we use Social Media?

Today, almost the entire human population is represented by social media users. People from all over the world, cutting across geographical boundaries and socio-economic layers, use social media with Americans dominating the list in per capita use. A study by [12] showed that people, especially young adults, are linked to each other via social media all the time to very frequently in their daily lives. Even though young adults were among the early adopters and continue to use it at high rates, use of social media by older adults' has substantially increased in recent years and is still on the rise. Figure 1.1¹ shows the number of users in the world as of Jan 2022.

Social media sites are inexpensive and often completely free to use. The 'freedom' has enabled people to use it for various purposes, such as communication, information sharing, marketing, promotion, etc. Social media allow individuals to stay in touch with friends and extended family. Some use various social media applications to network and find career opportunities, connect with like-minded people, and share their own thoughts,

¹<https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>(as on 13-Jul-2022)

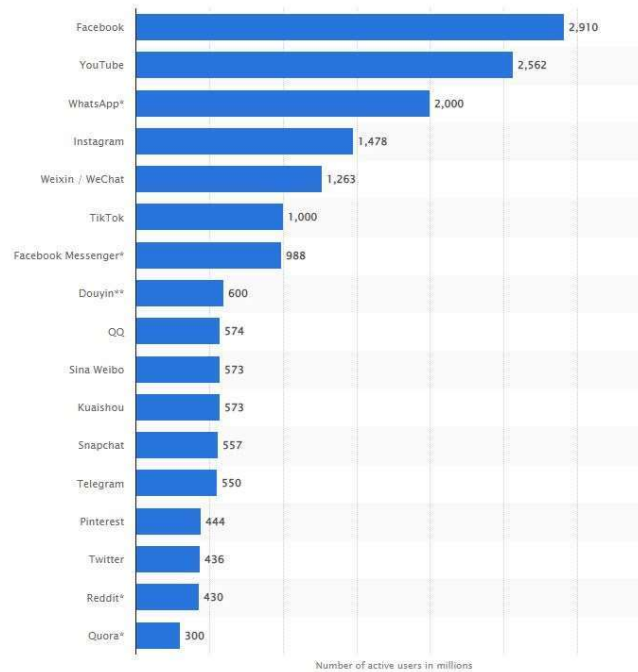


FIGURE 1.1 Users of Social Media (in millions)

feelings, and insights online. Social media sites (e.g. Facebook) are making it much easier for people to find and reconnect with old friends and acquaintances, even if they are not in touch for decades. The site is a great way to see what is happening in friend and family life and meet new people with the same interests and views.

While social media has some positive sides, there is a fair share of negatives as well. The idea of permitting users to post anything on social media contributed to a lot of inappropriate content on social media. Many people blame the platform and curse its negative attributes, comparing its overuse to an addiction. Overuse is a factor in health and psychological problems like tension, jealousy, and inattentiveness. Massive social media use is associated with depression, according to the National Center for Biotechnology Information [13]. Almost all social media platforms suffer from posts with unverified, non-factual, false information. Dissemination and proliferation of false information and lies also happen.

‘Uses and gratifications’ theory is relevant to social media because of its origins in the communications literature. Social media, as a communication mechanism, allows users to communicate with thousands, and perhaps, billions of individuals worldwide [14]. The basic premise is that individuals will seek out media among competitors that fulfills their needs and leads to ultimate enjoyment [15]. As social media applications continue to proliferate and the dynamics of online social interaction continue to evolve, communication researchers are seeking to develop a deeper understanding of how and why people use social media so that theoretically consistent models linking user motivations, social media goals, and perceptions of well-being can be constructed. As the Internet continues its inexorable march toward ubiquity, many wonder what consequences for our society’s well-being lie in its path. The question is becoming more important on the use of social media as online social networking and “social sharing” behaviors are on increase [16]. The need for such models is increasingly acute as user participation in new forms of social media introduces a potential for both positive and negative outcomes on well-being. There are many ways of using social media. Figure 1.2 shows some common uses of social media.

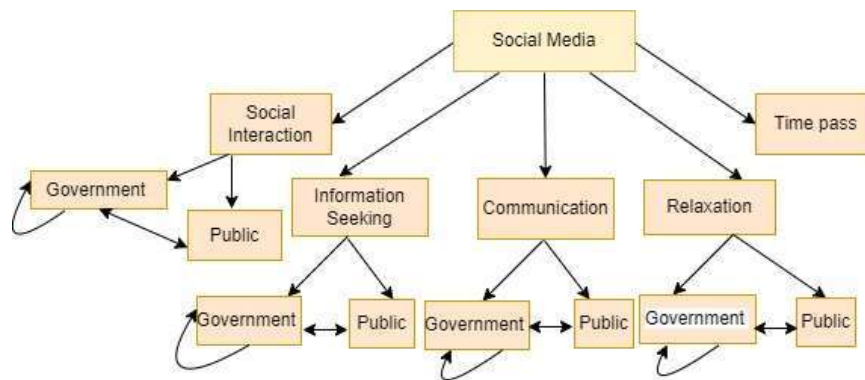


FIGURE 1.2 Usage of SM in general (and in the thesis)

- **Social interaction:**

To communicate and interact with others was the primary cause and perhaps has

been the driving force for using social media. The word “social interaction” comes from a research in 2005 on social interaction motivation and website duration where its definition included “meet people with my interests” and “keep up with what is going on” [17]. In business world, social media interaction is now an umbrella term that encompasses all the two-way conversations and touch points between companies and consumers. Whether you like a tagged post or respond to a lukewarm review, the way you interact with your followers has a massive impact on customer satisfaction and retention. Whether a consumer is asking a question, seeking support, or sharing an opinion, every interaction, even in private, is an opportunity for brands to connect and influence perception [18].

Disseminating *content* over social media is the basis of social interaction. The posts, pins, and tweets that grab audience’s attention and showcase your posts as best as possible, maybe with all possible data types (text, image, audio and video). However, social media interaction can be divided into two major data types: text content and image content.

In this thesis, social interaction with the government and the public is a central component. We consider interactions among different government entities and the public (specifically interaction among the ministries and ministries with the public) and between different stakeholders of the society at different time points. We choose specific interaction times, such as the time of the general election in India (IGE 2019) in 2019 and disasters (COVID-19).

- **Information seeking:** Information seeking is another driving force for using social media. People often seek out information for a particular object or to self-educate on a topic in general. Information seeking behaviour is discussed in Papacharissi and Rubin’s (2000) research on information seeking and internet usage [19].
- **Communication:**

Social media communication is defined as communication facilitation and providing information to share with others. Korgaonkar and Wolin (1999) investigated this form of usage as a construct labeled socialization inspiration for using the Internet. They describe their construct as a facilitator of interpersonal communication and actions and its usefulness in terms of conversational value [20].

- **Relaxation and entertainment:**

Use of social media also often happens to relieve day-to-day stress. Relaxation provides relief from stress while entertainment focuses on enjoyment.

- **Time pass:**

Timepass means to spend time joyfully which is otherwise boring. Social media is often used as timepass activity to avoid boredom. Papacharissi and Rubin (2000) used the concept of "pass time" to analyze the motivations behind internet use. Statements like "I use the internet when I have nothing better to do" and "to pass the time" were among the items on their scale.

Our work in this thesis, touches few social interaction, information seeking, communication and relaxation purposes focusing on some aspects and events of India.

1.2.1 Use of Social Media in E-governance

E-Governance encompasses more than just "electronic" government. It is an "enabled" government, or government that provides new and improved services and programs through the use of information and communication technologies (ICT). E-Government is described as "the use of ICT (Information and Communication Technology), and especially the Internet, as a medium to gain excellent administration" [21]. People are at the heart of e-government requiring new skill sets, mindsets, and leadership techniques. It can change the way government employees work, interact with one another, do business,

and engage citizens and others. E-government is a process that necessitates a long-term commitment of political will, resources, and collaboration between the government and industry. Richard Heeks (2001) investigated the impact of new ICT and how they might contribute significantly to the attainment of good governance goals. E-governance has three major contributions: enhancing government operations (e-administration), integrating citizens (e-citizens and e-services), and fostering external connections (e-society) [22]. With the introduction of e-services delivery, a government may give information and services at lower prices, in less time and with better ease. Different Web 2.0 applications are, therefore, being used to maintain relations with citizens while serving office [23, 24].

In recent years, electronic government or e-government has been a subject of great curiosity and thus gaining momentum, especially after the arrival of Web 2.0 technologies. Use of social media is growing as one of the significant wings of e-government initiatives. The use of online SM tools by government ministries is becoming more common in India. Different government departments in India are becoming more active on social media. They issue notifications, inform citizens about government initiatives, and solicit public feedback on a variety of issues. People in government, particularly ministers, keep a personal profile on social media and try to connect with the public on a personal level. They frequently listen to people and address their concerns. A thorough investigation is required to assess the breadth and depth of such connectedness and outreach.

1.2.2 Social Media during Elections

In many fields, including politics, social media have become an indispensable tool. Many political decisions, particularly those related to governance or elections, have been informed and influenced by SM. The use of social media in politics has changed the game, allowing incumbents and beginners alike to talk directly to voters about everything from their own party's policies to those of their opponents. Almost all Indian politicians have used social

media, primarily Facebook and Twitter, to convey themselves without being filtered by the mainstream media. Posters and banners are not the only thing used in political campaigns. Infomercials, advertisements, blog posts, and tens of thousands of tweets, Instagram and Facebook posts are all part of social media campaigns. Politicians can now use endless infomercials to convey their message and gauge their communication by looking at direct responses to their actions on social media platforms. Brayer et al. [25] showed the power of social media for all political candidates as well as elected officials worldwide. Social media is considered to be a component of the Web 2.0 evolution, distinguished by user-generated content, online personality making, and relational networking [26]. In this thesis, I make a dataset of IGE-2019 based on hate speech and offensive and ironic content identification for two languages, Hindi and English. I did multi-task learning with emotion for hate speech and offensive content identification for Hindi and English language. I applied the technique of domain adaptation with irony identification for the English language.

1.2.3 Social Media during Disaster Management

During disasters (natural or man-made), the use of social media increases manifold. People try to communicate with their family and friends during disasters and inquire about the safety and security of their lives. They seek or share information about food, shelter, transportation, medical and other needs. While many phone networks cannot deal with a sudden surge in calls (thousands of people trying to call simultaneously) or text immediately after a disastrous event, online social media like Facebook and Twitter can serve the people. These media can deal with an enormous traffic, stay online and serve as a medium of communication. It can also overcome the barrier of one-way communication of television and radio. In fact, in the case of natural calamities, when electricity is cut-off or gets disconnected, these channels of communication (radio/ television) can also be disrupted.

Even then, through smartphones, tablets, and other devices, people can reach social media for real-time information exchange [27]. They can share their well-being and location with friends and family. In an emergency, everyone is a potential source of important information that collects and distributes content [28]. Online social media, thus, can play an all-important role during crises and emergencies, and its use is, in fact, on the rise [29]. In this work, I focus on a disaster and its effect in India only. I created a SM dataset on COVID-19 and performed sentiment analysis on the data.

1.3 Motivation and Challenges

Quite a few works exist in the literature centered on use and/or impact of social media in our life including the field of e-governance, election and disaster management. For any events, people post and react on social media. Often they use positive and negative sentiments or emotions while expressing opinions. Verbal irony, an utterance that conveys a spirit completely opposed to the surface meaning expressed, is usually understood by body language and the context of the conversation. It is challenging to detect irony in a limited amount of text automatically. Hate speech and offensive content are on the rise in social media. Although a number of works have already been done in many languages, there are not many in Hindi. Hence, work on Hindi deserves special attention.

Issues such as automatic detection of irony, hate speech, offensive, cheerful, and harmful content are of paramount importance where sentiment analysis can be applied. Even though sentiment analysis has been studied in various disciplines like linguistics, philosophy, and psychology, it is not very easy to define in formal terms. However, most theorists would agree that emotions play a role in the use of hate speech, offensive, and irony in different aspects. The vital role of affected information for irony and Hate and/or offensive (HOF) communication-comprehension has also been emphasized by recent psychological

findings as [30, 31]. A collection is an essential asset for any supervised classification task. For sentiment analysis, several previous initiatives have created corpora that have been used for research. Significant work has been done in English, also in some other non-English languages, like Bengali and Tamil. But no such domain-specific standard Hindi dataset is available. We create one such dataset, named Sentiment Analysis For Hindi (SAFH) with necessary annotations. This SAFH attempts to plug the gap and is primarily focused on COVID-19 related Hindi posts during the nationwide lockdown due to pandemic. The emergence of social media and abundance of textual data presented a unique opportunity to study and investigate the community responses, opinions, and experiences. The disaster response for cyclonic storms and floods in India and Pakistan was carried out through sentiment analysis in English language [32]. India is a multilingual society with over 22 official languages. Early researches in these languages for the sentiment analysis task have not addressed the task at the contextual and aspect level [33, 34]. The primary reason behind it is the sparsely annotated dataset available in resource-poor Indian languages, morphological variations in the languages, and unavailability of lexical tools [35].

For any systems developed, performance evaluation is an important part. Machine learning techniques take more time compared to multitask learning. In machine learning, one task is learnt at a time followed by another but in multitask learning, several tasks perform simultaneously. Multitask learning system performance is better than machine learning systems. In multitask learning, the objective is to use learning from multiple tasks to improve its performance. There have been several tasks on sentiment analysis reported in many languages but for Hindi, there are very few. Our work focuses on Hindi language. Hate speech and offensive content are increasingly spread with malicious intention on social media [36]. Detecting such content is critical to understanding and predicting conflicts, understanding polarization among communities, and providing the means and

tools to filter or block inappropriate content. We explore the use of multi-task learning in sentiment analysis task on Indian language dataset.

1.4 Dissertation Overview

The overarching goal of this dissertation is to study the use and effect of social media in the society, in the light of three chosen fields: E-governance, Elections in India, and disaster management. We also explore application of different models and algorithms that can improve the usability of SM in the above fields.

First, we analyze how government ministries in India use SM, particularly Twitter and Facebook, to disseminate information, engage with different stakeholders and take feedback on government initiatives. Second, considering the Parliamentary Election of India 2019, we create two SM datasets (PEI-2019 and IGE-2019) by crawling Twitter. We propose an emotion based multi-task learning with the convolution network (MTL-CN) method for the multi-label classification of hate speech and offensive content identification in Hindi and English language (on PEI-2019 dataset) which improves the performance than state of the art. Third, we propose an ensemble model of machine learning and deep learning approaches for irony identification and test it on IGE-2019. The model trained using a combined word embedding representation obtained from two techniques: Bidirectional Encoder Representations from Transformers (BERT) and Embeddings from Language Models (ELMo). Lastly, we describe the process of collecting, creating, annotating the corpus, and sentiment classification. The claims have been verified using different word embedding with a deep learning classifier through a proposed model. All the algorithms in this dissertation are based on machine and deep learning. We discuss the role and necessity of using these machine learning and deep learning approaches. We also compare these techniques with other existing techniques. Figure 1.3 summarizes these contributions.

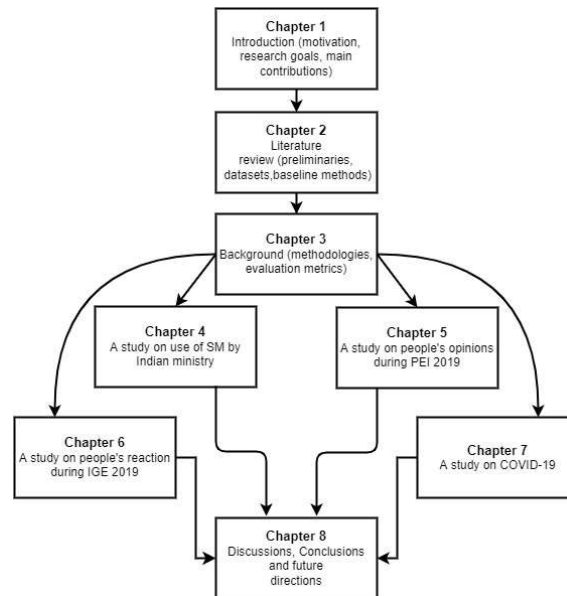


FIGURE 1.3 Illustration of thesis structure

1.5 Research Goals

The broad objective of the research presented here is to study the use and impact of SM in the society and explore application of various techniques to develop classification systems with improved performance. We focus on three aspects: e-governance, elections, and disaster management. Specifically, we attempt to found answers to the following research questions (RQs) as part of our study.

1. **RQ1:** What roles do SM play in e-Governance and public interaction with the government?
2. **RQ2:** How politics affect society?
3. **RQ3:** How do people react to political campaigns?
4. **RQ4:** How disaster affect people's life?

RQ1 was based on a data downloaded, cleaned and processed by us from Facebook and Twitter that provide a lot insights on the use of SM by government ministries.

RQ2 and RQ3 were based on another SM data collected from Twitter during the run-up of General Election of India 2019.

RQ4 was studied on the SM posts collected during nationwide lockdown due to COVID-19 pandemic.

Other than exploring the RQs in particular, creation of standard benchmark SM datasets in Indian languages was another important research motivation to foster further research.

1.6 Contribution and Impact

This thesis is devoted to the development of effective text analysis systems from social media text on e-Governance, elections, and disaster management. The main contributions of this thesis are related to the data creation, implementation, and evaluation of the performance of the text analysis system, where we address several existing issues using novel models and methods. This dissertation makes several fundamental contributions in terms of analysis of social media use in the Indian government, elections, and disaster management. We believe, our contributions are instrumental in advancing the state-of-the-art by creating new datasets: IGE-2019, PEI-2019 and SAFH for various sentiment analysis tasks. Data on Indian General Election 2019 has two different parts for two specific tasks: one for identification of hate speech and offensive content (both Hindi and English, Parliamentary Election of India 2019 or PEI-2019 dataset), another for irony detection (containing English tweets, IGE-2019 dataset). SAFH dataset contains COVID-19-related posts from SM that can be used for sentiment analysis in Hindi.

The experiments performed on a number of machine learning and deep learning techniques on all three datasets provide some insights on usefulness of different techniques.

1.6.1 A study on use of SM by Indian ministries

The usage of online social media by government departments is becoming more common in India. Different government ministries in India are becoming more active on social media. They send notices, inform residents about government efforts, and solicit public feedback on a variety of subjects. People in government, particularly ministers, keep a personal profile on social media and aim to be engaged and linked with the public. They frequently listen to individuals and answer their concerns. We discovered 46 accounts on social media belonging to several ministries under the Government of India (GoI) and its top officials through web searches. Specifically, we attempt to study the following sub-research questions (SQs).

- SQ1. How many ministries use social media platforms, and which of them are preferred by them?
- SQ2. What type of topics do they discuss on social media?
- SQ3. How active are different GoI ministries and their officials in social media? How often do they post?
- SQ4. How do the departments interact among themselves through social media? Outside the officialdom, do they mutually refer to each other in the public domain through social media?
- SQ5. How is the public participation in social media with the ministries or Government departments? How do these two stakeholders of e-Governance interact or exchange through social media?

We discover eight social media platforms utilised by ministries; just one ministry used all channels, while the remainder relied heavily on Facebook and Twitter. Ministries mostly address government programmes, meetings, budgets, development, agriculture,

and events during subject discussions. We find that 70% of ministries are quite active on Twitter, whereas just roughly 12% are on Facebook. However, over 35% of ministries are quite active on Facebook, whereas just 12% are on Twitter. When we look into the communication among the ministers on Twitter, they are found to be well-connected with each other on the SM platforms as well. Furthermore, the general public are also seen to avidly follow ministries or government agencies on social media. Facebook and Twitter are being used not only for informal communication among the public, but also for formal communication by Government departments in India for information dissemination, as well as seeking public opinion and participation.

1.6.2 A study on people’s opinions during IGE 2019

During general election of India 2019 event, we collected tweets and Facebook messages from social media in two languages Hindi and English. IGE-2019 data was annotated using a hierarchical three-level annotation model introduced by Zampieri et al. (2019) and Mandl et al. (2019). The size of the data corpus is nearly 2000 posts for both English and Hindi separately.

The dataset is used for studying hate speech and offensive content identification. We follow a hierarchical framework here with 3 layered tasks. At the first level, Task A is a coarse-grained binary classification in which posts are classified into two classes, namely: Hate and Offensive (HOF) and Non-Hate or offensive (NOT). Task B is a fine-grained classification of Task A. Only posts labeled as HOF in Task A are considered here and further classified into three categories: HATE contains Hate speech content and OFFN contain offensive material and PRFN contain posts with profane words (swearwords and/or cursings). Task C is also a further classification of Task A (HOF posts) into Targeted Insult (TIN) and Untargeted (UNT) posts. TIN posts hold an abuse/threat to a person, group, or others in particular. UNT posts contain untargeted hate speech and offensive.

Hate speech and offensive language (HOF) detection is often considered as a classification task in which the model is asked to determine if a text includes HOF. Various explicit and tacit means of physically abusing / insulting the targeted individual or group is not present in written text - capturing the emotion from the text is thus not trivial. We attempt the task HOF identification in the context of India's general election in 2019. We explore the application of multi-task learning (MTL) technique that merges learning for many tasks simultaneously into a single model. We present an emotion-based multi-task learning with convolution network (MTL-CN) technique for multi-label classification for HOF identification in Hindi and English. The MTL- CN extracts the shared and private latent characteristics from the text. We demonstrate that the shared knowledge acquired by our proposed technique may be transferred to other tasks. The results obtained on the LREC-2020 (IGE-2019), FIRE-2019, FIRE-2020, and SemEval-2019 datasets showcase that multi-task learning provides better performance for all tasks, regardless of languages.

1.6.3 A study on people's reaction during IGE 2019

General elections in a large democracy cause huge waves in society that also create turbulence in social media. SM sees surge in its usage with posts and counter-posts in a charged atmosphere. There are frequent and intense postings from the government, political parties, and the general public. India, being a multi-party democracy of diverse linguistic and religious population of large socio-economic as well as regional disparities, sees lot of unholy and mischievous plans to influence people. Political parties and their supporters resort to frequent use of propaganda (sometimes false and baseless), accusations, counter-accusations, denials, hate speech, irony, and sarcasm. We focus here on automatic identification of hate and offensive speech, irony and sarcasm. In the physical world, body language and the context of conversation help us understand verbal irony as irony is an utterance that conveys a spirit entirely at odds with the surface meaning of the utterance.

But, in written form, irony can be difficult to automatically spot, especially from small amounts of text, like SM posts. We gathered information from social media posts made during the 2019 Indian general election to study the problem. We then create a standard collection with annotations (Indian General Election 2019 or IGE 2019 dataset) and then perform a series of experiments on irony detection, including a domain adaptation with the SemEval-2018 Task-3 (Sub-task A) dataset (SE-2018 T3 data). We study the issue of irony detection from social media posts collected during the 2019 general election in India. We use various machine learning and deep learning (Bidirectional Encoder Representations from Transformers (BERT) and Embeddings from Language Models (ELMo)) models to classify them into irony and non-irony. We propose an ensemble model of machine learning and deep learning approaches. The classifiers are trained using a combined word embedding representation obtained from BERT and ELMo. Our experiments on IGE 2019 and SemEval-2018 Task-3 data show results comparable to the state-of-the-art performance for irony identification.

1.6.4 A study on COVID-19

When a disaster (man-made ones like shootings, bomb blasts, war, or natural calamities like floods, cyclones, tsunamis, or earthquakes) strikes, people suffer and/or get panicked and react emotionally. SM sees a sudden surge in the flight of emotions. During the COVID-19 pandemic, the whole world saw SM full of emotive posts. Social distancing caused serious dearth of social interactions. The physical void led to increased online interaction among users on social media platforms. Sentiment analysis of such interactions can help us analyze the human psychology during a crisis like the pandemic. However, the lack of data in non-English and low-resource languages like ‘Hindi’ makes it difficult to study it among native and non-English-speaking masses. We create a collection of ‘Hindi’ tweets on COVID-19 during the pandemic containing 10,011 posts for sentiment

analysis (named sentiment analysis for Hindi or SAFH dataset). We create a corpus of Hindi text with annotations for sentiment analysis. The corpus consists of 10,011 tweets with three standard emotions: positive, negative, and neutral. We propose three settings for classifying the sentiment and analyzing the impact of the concatenation of the embeddings. The settings are BiLSTM with BERT + fastText, BiLSTM + fastText with self-attention, and BiLSTM with fastText. Experimental results show an improvement in overall sentiment analysis performance, especially for positive reviews.

1.7 Structure of the Thesis

The thesis consists of 8 different chapters. Figure 1.3 provides an overview of the thesis and interconnection among chapters.

Chapter 1 starts with a brief introduction to social media and its types. The motivation, research goals, and contributions of our work are also discussed.

Chapter 2 covers the literature review of the existing work on use of ICT in the field of e-Governance, elections, and disaster management in general, use of SM in particular.

Chapter 3 provides the necessary theoretical background including the methodologies and evaluation metrics used in the thesis.

Chapter 4 describes our study on the adoption and penetration of social media (SM) in government sector. The study focuses on different ministries of the Government of India (GoI) (46 ministries).

Chapter 5 proposes an ensemble model of machine learning techniques (EMLT) and ensemble of BERT and ELMo models (EBEM) for irony identification during Indian General Election 2019 (IGE 2019 data).

Chapter 6 explores the use of multi-task learning with the convolution network (MTL-CN) method for hate speech and offensive content identification on parliamentary election 2019 of India (PEI data-2019).

Chapter 7 describes the process of collecting, creating, annotating the corpus, and performing sentiment classification task on COVID-19 tweets in Hindi.

Chapter 8 summarizes the entire thesis work, highlighting the key insights obtained along with discussion and limitations. It also concludes with directions of future work.