

# The Luminary



## COMPUTER SECTION

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## Editorial

This edition of college magazine “The Luminary” has been judiciously compiled with the enthusiastic contribution of students and faculty members. It gives me immense pride and satisfaction to present before you the technical section of the college magazine. Nurturing creativity and innovation have become the two key aspects of the education today, and our college magazine is a perfect unification of both.

The primary focus of this technical Computer Section is to bring out the thoughts and interesting articles having relevance to the trends of the technological world. It is quite apparent that the world is majorly in control by the combined forces of the various types of technologies, with digital technology being the forerunner.

As you flip through the pages of this section, you will find that along with a sizable contribution of articles by our faculty members, an interesting compilation of intriguing reads have been creatively penned by our students as well. All of us are well aware that technology is evolving at an alarming rate and it is almost impossible to catch-up with the pace of the techno-world. But all said and done, we do hope that the featured articles lend some knowledge and learning to all the readers.

I congratulate all our students and faculty members of Computer Science Department for their efforts that have come to a fruition in the form of this enterprising section.

Thank you and Happy Reading !

**Dr Harmohan Sharm**

Department of Computer Science

## Internet of Things (IoT)

Sounds like a game that we play on your phone, right? But IoT is much bigger than that. According to Wikipedia, The Internet of Things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. IoT will change how machines interact with other machines and how humans interact with machines, forever. IoT can be observed as we see the concept of home automation growing rapidly in the field of technology.

IoT has its pros and cons. Talking about the pros, IoT has changed how we interact with machines completely. Things like home automation have enabled us to get the menial jobs get done, like switching off the lights just with a voice command. Artificial intelligence devices like Alexa, Siri and Google Home are all a part of the IoT ecosystem. In

various fields, IoT has significantly made a lot of progress, for example in the medical field, IoT is being used extensively for the purpose of data collection and analysis for research, and monitoring. IoT also has its fair share of disadvantages. The aforementioned devices like Alexa have also managed to intrude our privacy, IoT devices record and save every command or thing that you say near them all in the name of better user experience. Too much automation in the industry also has risked the jobs and livelihood of many people.

IoT will impact us in the coming years in a very huge way, but only time will tell if it is a positive impact or a negative one. For now, it is imperative that we let technology grow and prosper but it is also imperative that we do not blindly adopt all the new technology and should adopt such changes with a bit of skepticism keeping in mind the cons of a technology.

**Manpreet Singh**

Student Editor

## Impact of Mobile Phone Technology on Society

Mobile phones have become an integral part of our daily lives so much so that it is impossible to carry out our everyday chores without our phones. From communication to entertainment, everything is possible with this smart device. This mobile technology has drastically changed the cultural norms and individual behaviors. With more than 1 billion users and 2.5 million applications, the smart phones are impacting the marketplaces in surprising ways. They have a strong influence on almost all walks of human life. A smart phone is by all means a pocket sized PC with limitless potential. It has both positive and negative impacts.

In a positive way, Smartphone :-

- creates a new dimension for businesses
- improves the quality of education
- reduces stress in busy work life
- connects people around the world

On the other hand, it has also affected the society in a negative way as now people are becoming more addicted to mobiles, which has become a cause of depression for them, especially for the teens. Moreover, it distracts the students from their studies and wastes their precious time and causes various vision related problems.

We can control and minimize the negative impact of smart phones in society by reducing the time of their usage, by using it in a most beneficial manner, by communicating face to face where ever possible.

Let us not make this modern boon a curse for ourselves !

**Dr Rohit Sachdeva**

Department of Computer Science

## e-Sports

e-Sports, also known as electronic sports, includes video games, but pretty much any game with a winner and a loser that can be played as an e-sport. It covers significant ground in terms of the digital world and the technologies being developed on consumer markets. The bigger the player base and the more support it has, the better the competition. Generally, e-sports can be applied to any type of digital game that is competitive, irrespective of specific format and theme. The majority of popular e-Sports are team-based games played in leagues or tournaments throughout the year, culminating in one final event. The games themselves can come in a wide variety of formats. The most common games under this are: first-person shooter (FPS), Multiplayer Online Battle Arena (MOBA), real-time strategy (RTS), fighting and battle royale games etc. e-game of "Counter Strike-Global Offensive" normally played by players in tournaments. Association of Indian Universities (AIU) has also approved this event and is organising championships every year for the students' studying in different universities of India. e-sports is getting a lot of attention and to promote e-sports as a legitimate sport, several e-sports events have been run alongside more traditional international sport competitions.

Vipin Singh  
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## Big Data

Big Data means a large chunk of raw data that is collected, stored and analyzed through various means which can be utilized by organizations to increase their efficiency and take better decisions.

Big data is a term used to refer to data sets that are too large or complex for traditional data-processing application software to adequately deal with. Data with many cases offer greater statistical power, while data with higher complexity may lead to a higher false discovery rate. In short, such a data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently.

Big data deals with both structured and unstructured data— that inundates a business on a day-to-day basis. But it is not the amount of data that is important. Big data can be analyzed for insights that lead to better decisions and strategic business moves.

Today, big data has become the capital. Think of some of the world's biggest tech companies. A large part of the value they offer comes from their data, which they're constantly analyzing to produce more efficiency and develop new products.

Various examples Big Data are:

- The New York Stock Exchange generates about one terabyte of new trade data per day.
- Statistic shows that 500+terabytes of new data gets ingested into the databases of social media site Facebook, every day.
- Single Jet engine can generate 10+terabytes of data in 30 minutes of a flight time. With many thousand flights per day, generation of data reaches up to many Petabytes.

While dealing with Big Data various aspects that one should keep in mind are:

1. **Volume:** It refers to the size of data. Data size plays very vital role in determining value out of data. It will actually tell whether the huge data can be considered as Big Data or not.
2. **Variety:** It refers to the different sources from which data is coming. Source can be structured or unstructured. For example in earlier days, the data source was only either spreadsheets or database; but now-a-days, there are variety of data sources as like emails, videos, photos, audios, PDFs, monitoring devices etc. Therefore, while dealing with Big Data, this aspect as also important.
3. **Velocity:** It refers speed at which data is generating. How fast the data is generated and processed to meet the demands, determines real potential in the data.
4. **Variability:** It refers to inconsistency in data at certain times. Values of data can vary at different times. So this aspect is also crucial while dealing with Big Data.

### Various benefits of Big Data Processing are:

1. Access to social data from search engines and sites like Facebook, Twitter are enabling organizations to fine-tune their business strategies.
2. Big Data and Natural Language Processing Technologies are being used to read and evaluate consumer responses thereby improving customer services.
3. Early risks to product/services can be determined earlier by the Big Data Processing.
4. Big Data can also provide better operational data efficiency. Big Data technologies can create data space for the new data by examining infrequently accessed data, passing it to data warehouse.

Big Data platforms and Big Data Analytics software provides efficient analytics for extremely large datasets. These analytics helps the organizational benefits by turning data into high quality information.

### List of Best Big Data Analytics Tools in 2018

1. **Microsoft HDInsight:** Azure HDInsight is a Spark and Hadoop service in the cloud. It provides big data cloud offerings in two categories, Standard

and Premium. It provides an enterprise-scale cluster for the organization to run their big data workloads.

2. **Skytree:** Skytree is a big data analytics tool that empowers data scientists to build more accurate models faster. It offers accurate predictive machine learning models that are easy to use.
3. **Talend:** It is a big data tool that simplifies and automates big data integration. Its graphical wizard generates native code. It also allows big data integration, master data management and checks data quality.
4. **Splice Machine:** It is a big data analytic tool. This architecture is portable across public clouds such as AWS, Azure, and Google.
5. **Spark:** Apache Spark is a powerful open source big data analytics tool. It offers over 80 high-level operators that make it easy to build parallel apps. It is used at a wide range of organizations to process large datasets.
6. **Plotly:** It is an analytics tool that lets users create charts and dashboards to share online.
7. **Lumify:** It is a big data fusion, analysis, and visualization platform. It helps users to discover connections and explore relationships in their data via a suite of analytic options.
8. **Elasticsearch:** It is a JSON-based Big data search and analytics engine. It is a distributed, RESTful search and analytics engine for solving numbers of use cases. It offers horizontal scalability, maximum reliability, and easy management.
9. **R Programming:** R is a language for statistical computing and graphics. It also used for big data analysis. It provides a wide variety of statistical tests.
10. **IBM SPSS Modeler:** It is a predictive big data analytics platform. It offers predictive models and delivers to individuals, groups, systems and the enterprise. It has a range of advanced algorithms and analysis techniques.

Recent technological breakthroughs have exponentially reduced the cost of data storage and computing, making it easier and less expensive to store more data than ever before. With an increased volume of big data now cheaper and more accessible, you can now make more accurate and precise business decisions.

**Ms. Priyanka Singla**

Department of Computer Science

## Computer and Education

Computer is the most powerful and versatile tool created by human beings. In today's scenario,

computer plays a major role in almost every aspect of life and influences our lives in one way or the other. Today, we hardly find any area which is not influenced by computer. Computers have been employed within the field of education for many years. Education has no limits, and Artificial Intelligence (AI) can help to eliminate boundaries. AI has already played a major role in the development of education system. Technology brings drastic changes by facilitating the learning of any course from anywhere any time across the globe. AI-powered education equips students with fundamental IT skills. With inventions and research, there is a wider range of courses available online and with the help of AI, students are learning from wherever they are. There are many more AI applications for education that are being developed including Smart Content, Intelligent Tutoring Systems, Virtual Facilitators and Learning Environments, and a new method of personal development for educators through virtual global conferences. Education might be a bit slower to the adoption of artificial intelligence and machine learning, but the changes are beginning and will continue.

**Nishu Chaurasia**

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## Learning Online

There are several easily accessible (and mostly free) avenues for you to take when it comes to learning the skills you have selected for yourself. There are of course, ways to find out about offline courses in universities. But if you feel like sitting at home and learning at your own pace, here are a few ideas for you:

iTunes University is an interesting place to rummage for interesting things to learn online. It has a vast collection of lectures and talks on subjects ranging from comic books to cooking and everything else under the sun. Sometimes, you end up finding things you would have never considered learning, but is interesting in itself. It is a great place to scroll through in case you want to learn something new or pick up a hobby but are not sure what you want to tackle. iTunes University also has several channels dedicated to lectures and speeches during events from some of the illustrious colleges of the world. This is indeed a great way to listen to people at the peak of their fields talk about subjects, of course pertaining to your interests.

Khan Academy has been picking up supporters from all across the nation. The online teaching website set up by Salman Khan (not the Bollywood actor) has risen since its inception back in 2006. Its primary



method of teaching entails “micro lectures” on YouTube explaining facets of any subjects ranging from sciences to basic mathematics. It is a great resource for learning about academic subjects or improving your knowledge of specialized of any subject. If you have fear of Calculus, Khan Academy is a good place to start.

Coursera is an online e-learning website. The website hunts down reputed teachers across the world for online courses on practically anything under the Sun. Coursera would probably have an international expert of some renown to take some time off and teach to people on the website. Coursera follows up their courses with certificates of merits, provided that the participants have done well in the course. Some of the courses are free, though the most interesting, sought-after courses are paid.

**Ms. Honey**

Department of Computer Science

### **Sentimental Analysis**

Ongoing years have seen the hazardous advancement of online internet based life. The advent of social media is transforming the way in which people connect with each other and the manner in which information is shared and distributed. In recent times, Social Media has become synonymous with Social Networking sites such as Facebook, Twitter, WhatsApp, Instagram and YouTube. In the broader term, social media can be defined as any web or mobile based platform that enables an individual or organisations to communicate interactively and enables exchange of user generated content. A huge number of messages in the form of text are posted everyday on Social networking sites. An ever increasing number of users of social media tend to share their reviews and responses for a particular event online. Such information can be used to adjust marketing and to improve customer service etc. Such large number of messages posted is the rich source of information for analysis purpose. Sentiment analysis is a technique of finding the judgements of people towards a particular topic that is positive, negative or neutral. With this technology, sales revenue, customer service and product quality etc. can be improved. Sentiment Analysis also known as Opinion Mining, is contextual text mining tool which identifies and extracts a piece of text according to the tone conveyed by it. This text can be tweets, comments, feedback, and even random texts with positive, negative or neutral sentiments associated with them. In other words, the way toward identifying the relevant polarity of Social Medias' posts, e-commerce websites and some other blogging sites. It decides if a

writer's outlook towards a post is positive, negative or neutral. An elective term is opinion mining, as it determines the assessment, or emotional state of posts. This technique helps to predict how individuals' feel about a specific point. Sentiment Analysis is one field of Natural Language Processing which is drawing in extraordinary consideration from specialists. Sentiment analysis has many other names: Opinion extraction, Opinion mining, Sentiment mining, Subjectivity analysis. News and web journals are typically great wellsprings of information for sentiment analysis, wherein individuals can express their views and sentiments on such discussions. The applications of Sentiment Analysis are wide and great. Numerous organizations utilize it to track their items, services or reputation by and large. For instance, on the off chance that somebody is assaulting your mark via web-based networking media, sentiment analysis will score the post as to a great degree negative, and you can make alarms with the post with hyper-negative assessments score. Organizations can get comment on how glad or disappointed the client is, and utilize this understanding to pick up an aggressive edge. Political parties also might want to be informed about whether public is supporting their plans or not.

**Rajbir Singh**  
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### **Phases of Character Recognition System**

The process of character recognition of any script framework has several phases but first and foremost it is decided whether approach is online or offline. Phases involved in the character recognition includes Image Acquisition, Pre-processing, Segmentation, Feature Extraction and Classification or Identification. **Image Acquisition** - The digitization step is related to the image acquisition, which is usually performed using a scanner or digital camera. Scanned images are then stored in the formats like bmp, jpeg etc. **Preprocessing** - The images may contain noise due to dust on scanner, low quality paper etc. Low quality images may produce the low quality result. So, there is a need to preprocess the images. Preprocessing is the data cleaning stage in which irrelevant information is removed from the data. In this phase, binarization, normalization and noise removal are applied on handwritten samples using image processing techniques. **Segmentation** - Segmentation is an important stage in the identification process as it directly affects the identification rate. In order to extract features from the text image, it should be segmented into separate lines of text. These lines are

then further segmented into words and finally into individual symbols or sub-symbols for the purpose of recognition. **Feature Extraction** - The robustness of writer identification system depends on the feature extraction phase. In feature extraction phase, the relevant features are extracted from the image and the database is trained with these features. Various feature extraction methods are available which can be used to extract the features from input image. **Classification** - Classification phase is the decision making phase of the Character Recognition System. In classification phase, the classifiers are used to recognize the image based on the feature extracted.

**Manish Singh**  
PGDCA

## WhatsApp as a Teaching-Learning Tool

With the emergence of new information technology, education system has also adopted new methods and tools to impart education to the seekers. WhatsApp has emerged as a new tool for education. It is a popular multimedia communication application which is used throughout the world. It is very simple to use and the user can easily share information with others. The application has become popular among the youngsters, specially students as a mode of communication for multimedia messages like photos, audios and videos. Nowadays, almost every student has WhatsApp installed on his mobile phone. WhatsApp supports sharing of knowledge among students, and between students and teachers. Particularly in India, today, WhatsApp is far more widely used application than the other social media applications like Facebook, Instagram, etc. As per the latest surveys and statistic, WhatsApp is the most used social media application around the world. The statistic represents the share of social media apps users in India, by reach. During 2017, WhatsApp had a reach of 91.7 percent across the country, while Google Hangouts had a reach of about 9.4 percent during the same time period. WhatsApp is popular among students due to many features such as:

- **Multimedia:** allows the students to exchange videos, text messages, images and voice notes.
- **Unlimited messages:** students can share unlimited messages on WhatsApp. The continuous data transmission across platforms requires an internet data plan or Wi-Fi connection.
- **Offline messages:** When the device is off or outside coverage area, WhatsApp automatically saves the messages and a student may get these messages once the device is inside the coverage area.

- **Group chat:** supports the interaction of up to 256 group members.
- **Cost effective:** WhatsApp requires no additional costs except the cost of the internet connection on the device they are using, it may be either Wi-Fi or mobile data packages.

**WhatsApp as a teaching aid:** Teachers can create a group of students of the class. Teachers can provide subject related videos, pictures and voice notes which makes WhatsApp, a new and convenient tool for a teaching-learning activity. During teaching-learning sessions, more interaction between teachers and students is in the forms of questions, answers, sharing of learning material as well as different emotional gestures of thank you, well done etc. It increases the flexibility of accessing a variety of resources for learning independently anytime and anywhere. Students can express themselves freely in a non-restricted environment thus it can remove the low participation constraints.

**Challenges:** Challenges faced by learners on using WhatsApp as a teaching learning tool:

- **Requirement of smart phone:** Cost of smart phone is an overhead to students.
- **Cost of Internet:** Inspite of the fact that WhatsApp itself doesn't cost any amount, but Internet is required to run the WhatsApp is still a costly affair.
- **Message flooding:** Unwanted messages flooded into network overload the smart phone memory.
- **Time consuming:** Overuse of WhatsApp may consume a student's study time.
- **Eye strain:** Smart phones screens have high brightness and emit blue light that may cause eye strain to students for using it for a long time.
- Huge amount of learning material makes it confusing

WhatsApp as a teaching-learning tool has many educational benefits like immediate feedback to the problem, revision of previously learned topics, learning from other's problems, learning on move, deeper clarity on issues, healthy discussions and availability of learning material all the time. It enables the learning beyond the borders of classrooms. It also enables easy and quick transference of links to study materials. On the other hand it has few challenges such as cost of smart phone and Internet availability, relevance of study material, lack of communication and health issues. Limited use of WhatsApp may prove to be very useful but its overuse may affect students adversely.

**Dr. Monika Pathak**  
Department of Computer Science

## Robotics

The field of computer science and engineering concerned with creating robots, devices that can move and react to sensory input. According to Wikipedia, Robotics is an interdisciplinary branch of engineering and science that includes mechanical engineering, electronic engineering, information engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.

Robotics has impacted many fields like agriculture, medical sciences and even space exploration. Robotics has been growing tremendously, and since it has been combined with artificial intelligence, it has enhanced and evolved in many ways. Robotics has brought a new wave of automation in various industries. These days various manufacturing enterprises, with help of robotics, have adopted automation which has resulted efficient and effective production. The medical field has also reaped the benefits of robotics, from complex medical procedures to data analysis; robotics is being extensively used in the medical field. Even humanoid assistants have changed the game, which are primarily a mix of robotics and artificial intelligence. But robotics has also resulted in a lot of people losing their jobs. The large scale automation is to be blamed for the same. Robotics has also done a lot of harm as it has made humans lazy and dependent on robotics which has affected all of us, adversely.

In the coming years, robotics is going to change how we perceive technology. Robotics has many benefits but it also has its share of disadvantages. Only time will tell how and at what scale will robotics affect us.

**Rahul**  
M.Sc. IT

## Automatic System for Writer Identification

Writer Identification System is the field of artificial intelligence and an important area of research now-a-days. It is the process of identifying a person through his/her handwriting. Handwriting is an art that is developed by birth in nature and can not be imitated. Thus, no two persons can generate exactly the same handwriting and that even an individual cannot exactly reproduce his own handwriting. It is a very strong identifying characteristic of a person and plays a significant role for forensic document experts in proving someone's authenticity.

Handwriting is one of the most common types of questioned writing encountered and frequently

attracts the attention in litigation. It belongs to the category of behavioral biometric thus no two individuals with mature handwriting are exactly alike or an individual cannot produce the others writing exactly. Writing behavior and individualities are examined for similarities for both specimen and questioned document, thus, it is very efficient and effective strategy for biometrics.

The idea to automate Writer Identification System came due to its wide variety of applications in various fields like Forensic Science, Security, Banking, Personal Identification and Historical Document Analysis etc. The handwriting of a person is concerned with the feelings, behavior and the brain of an individual. Writer Identification System can effectively be used in security applications. It can produce documents as evidence in court. Writer Identification System is based on the concept of machine learning. In this system, a model is trained with the handwritten text documents and the writer is identified by matching the test document with the documents present in training database.

The Writer Identification is the process of finding the authentic writer from a record of other registered writers based on the similarities between their handwritings. In writer identification framework, databases with handwritten samples of known personalities are taken as the training dataset, and later the questioned handwritten sample is compared with that training dataset to recognize the identity of the writer.

Depending on the acquisition of writing samples, writer identification is classified into two categories: Dynamic (Online) and Static (Offline). In the online method, handwriting samples are taken through tablets, Personal Digital Assistant (PDAs), smart phones and touch screens etc. On the other hand, the off-line identification systems use scanners to convert the handwritten data to produce corresponding binary data in the form of black & white images or alternatively images in 256 gray levels. One more property of the images is the resolution which affects accuracy of a identification system. The resolution represents the number of pixels per inch and is expressed in dpi (dots per inch). The larger the number of pixels per inch in a scanned image, the greater is its resolution. The higher the resolution, the better is the quality of scanned text. Modern scanners are capable of scanning an image at resolution ranging from 50 dpi to 2400 dpi or more, but the most common scanning resolution is 300 dpi.

On the basis of content writing content, offline writer identification is categorized as: text-dependent and text-independent. In text dependent, each writer is



restricted to write the same text document as that of the text document in the training database. On the other hand, in text independent, a writer may write any text without any restrictions. The text document in the testing phase differs from the text document present in the training phase.

Applications of Automatic Writer Identification System

1. **Forensic Document Analysis:** Handwriting analysis falls into the questioned documents section of forensic science. Thus, handwriting is as unique as a fingerprint. Handwriting analysis looks for differences between the writing of a sample where the writer is known and a writing sample where the writer is unknown.
2. **Criminal Justice System:** Evidence is the key element in determining the guilt or innocence of an individual accused of crime against society in a criminal court of law. Written documents are used as evidence. An automatic handwriting identification system can assist for relating a document to accused.
3. **Biometric Modality:** Biometric identification refers to a technology that uses scanned graphical information from many sources for personal identification purposes. The biometric technology helps the libraries to ensure safety and security to its invaluable collections, infrastructure and human resources.
4. **Validation and Authentication as Signature Identification:** There is a need for adequate protection of signatures and a need for systems that can identify who is the signatory with a great degree of certainty. Automatic signature verification, a sub-domain of writer identification, is of great importance for validating and authenticating an individual.
5. **Personal Identification:** Because each person's handwriting is unique and different, it can be used to verify a document's writer.
6. **Property Security:** By using the handwriting recognition technology to confirm user identity and manage security of the door.
7. **Authentication of Document in Court of Law:** Document authentication is the process used by an authorized government body to certify the authenticity of a document. The automated process helps in authenticating a document in court of law.
8. **Historical Document Analysis:** Writer identification is used in the analysis of historical documents. The authorship of historical documents can be predicted by analyzing the handwriting of individuals.

**Dr Ganesh K Sethi**  
Department of Computer Science

## e-Waste : A Challenge and Threat

e-waste usually includes discarded computers, motherboards, Cathode Ray Tubes (CRT), Printed Circuit Board (PCB), mobile phones and chargers, compact discs, headphones, white goods such as Liquid Crystal Displays (LCD)/ Plasma televisions, air conditioners, refrigerators and so on. It is growing at an alarming Compound Annual Growth Rate (CAGR) of about 30% in the country. ASSOCHAM (The Associated Chambers of Commerce of India) estimated that the e-waste generation was 1.8 million metric tons (MT) per annum in 2016 and would reach 5.2 million metric tons per annum by 2020.

As per the report of 'Global E-waste Monitor 2017', India's electronics industry is one of the world's fastest growing industries and plays an "important role" in the domestic generation of e-waste, producing 2 metric tonnes (Mt) in 2016.

The Ministry of Electronics and Information Technology has initiated a pilot project 'Awareness Program on Environmental Hazards of Electronic Waste' under Digital India initiatives, along with industry associations, to aware the public and reducing the impact of e-waste on the environment and health.

Different environmental and health issues are involved in the informal recycling activities as the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame retardants beyond threshold quantities make e-waste hazardous in nature. About 80 per cent of e-waste workers in India suffer from respiratory ailments and children are usually among the most exposed to toxic fumes on a daily-basis, the study noted.

A mere 5% of India's total e-waste gets recycled due to absence of proper infrastructure, legislation and framework, which lead to a waste of diminishing natural resources, irreparable damage of environment and health of the people working in industry. Over 95% of e-waste generated is managed by the unorganised sector and scrap dealers in this market, dismantle the disposed products instead of recycling it.

The issue of proper e-waste management is very critical to the protection of livelihood, health and environment. It constitutes a serious challenge to the modern societies and requires coordinated efforts to address it for achieving sustainable development.

It's time to Recycle Reduce Reuse! Find out how you can recycle and reuse your trash to reduce the burden.

**Source :** Global e-Waste monitor 2017 report, Newspaper The Hindu, e-Waste in India Research Unit, Rajya Sabha Secretariat.

**Manpreet Singh**  
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