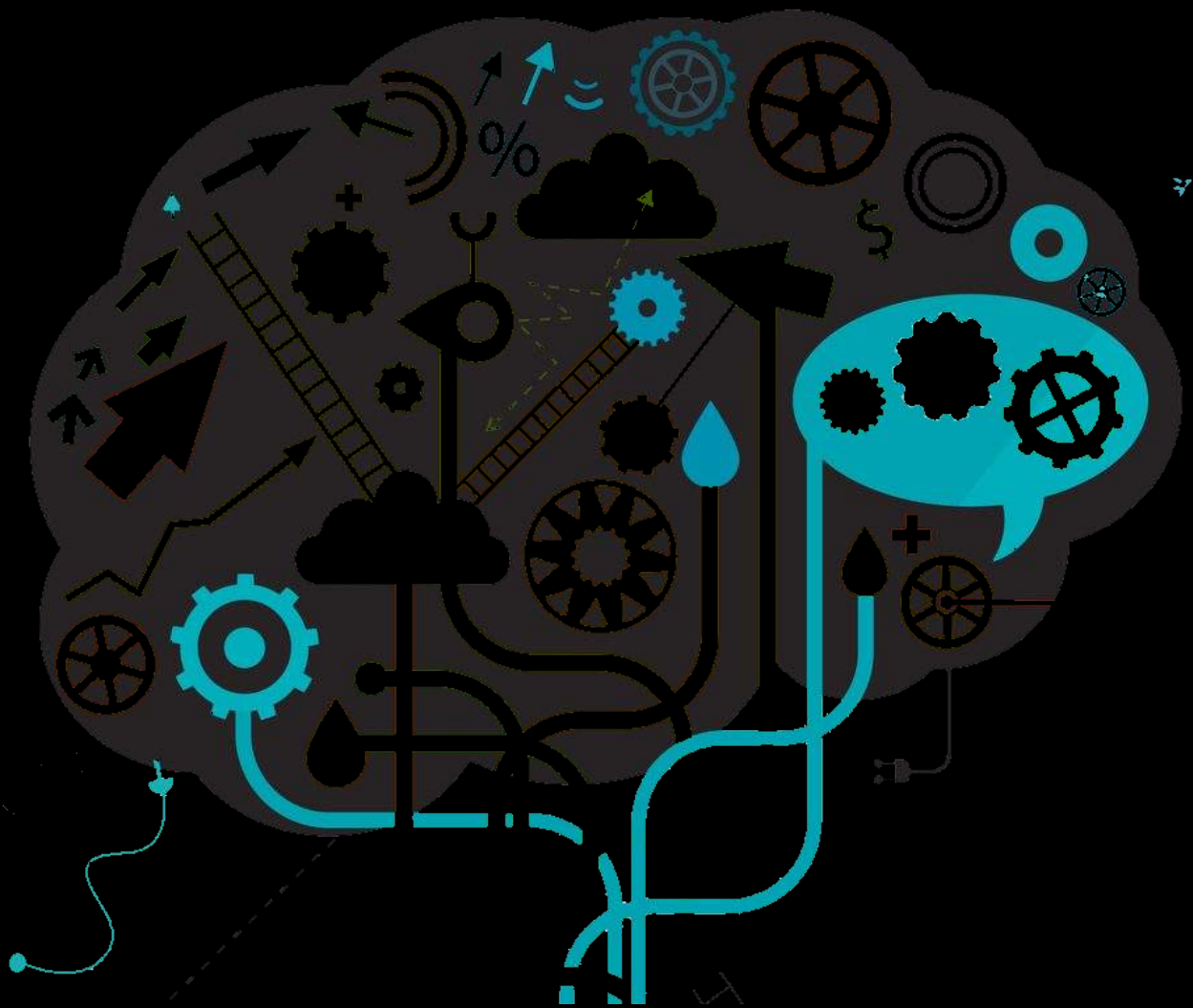
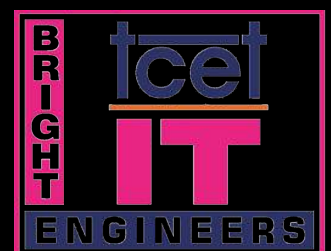


EZINE iX

Ideate. Innovate. Inspire.



April 2018





IN MEMORY OF

DR. STEPHEN HAWKING

(1942 - 2018)

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ABOUT THE DEPARTMENT

The department of Information Technology, started its journey in the year 2002 and is committed to deliver the program with rigor and with active industry participation. The Department has 120 seats intake at first year and 24 seats as lateral entry at 2nd year for engineering diploma students. The department believes in student centric approach. Its dedicated team of faculty members inculcate relevant knowledge, skills and attitude in students to become successful professionals. The U.G. programme is accredited by National Board of Accreditation (NBA), New Delhi for three years w.e.f. 16.09.2011. UG Programme has been re-accredited for 3 years by NBA w.e.f 1st July 2016. Also the programme is permanently affiliated with UOM since AY 2015-16 onwards.

VISION

“The department of IT will strive to be at the top position among the renowned providers of IT education”

MISSION

The IT department is committed to enrich students by rigorously implementing quality education with a focus to make them industry ready, while imbuing in them professional ethics and social values to become responsible citizens

PROGRAM OUTCOMES

PO 1: ENGINEERING KNOWLEDGE: Apply Knowledge of Mathematics, Science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO 2: PROBLEM ANALYSIS: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO 3: DESIGN / DEVELOPMENT OF SOLUTIONS:
Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO 4: CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions

PO 5: MODERN TOOL USAGE: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PROGRAM OUTCOMES

PO 6: THE ENGINEER AND SOCIETY: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO 7: ENVIRONMENT AND SUSTAINABILITY: Understand the impact of professional engineering solutions in societal and environmental context and demonstrate knowledge of and need for sustainable development.

PO 8: ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

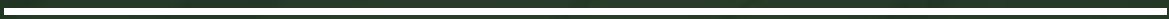
PO 9: INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO 10: COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PROGRAM OUTCOMES

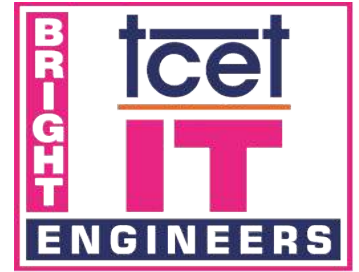
PO 11: LIFE-LONG LEARNING: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PO 12: PROJECT MANAGEMENT & FINANCE: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.



FROM THE
DEAN'S OFFICE





Dear Reader,

Engineers are one of the most important tools in shaping the development of society as a whole. Thus, here at TCET, we strive to provide students with all the knowledge that is needed and enable them with the required abilities so that they may become extraordinary engineers and diligent citizens of our country.

As the 9th edition of Ezine is being put forth, I would like to comment the contribution that the students, faculty, alumni and parents have made towards making the “Students’ Magazine” possible. Like all editions before it, Ezine IX serves as a platform for students and faculty to share and hone their knowledge and skills and for them to showcase their achievements in not just academia, but a wide spectrum of fields. Moreover, the magazine showcases the activities that the department and the institute conduct to ensure a versatile development among students. Thus, Ezine is not just about academics; it strives to serve as a beacon of inspiration for students to aim for greater heights.

We, at TCET believe that learning is a lifelong process – and that is exactly the principle that we, through Ezine, have tried our best to instil among students. Thus, Ezine is our way to make a little contribution toward the betterment of society.

Sincerely,

Dr.Kamal Shah
Dean,
R&D Cell





DR. RAJESH BANSODE

HEAD OF DEPARTMENT,
INFORMATION TECHNOLOGY

It gives me immense pleasure to lead the department of IT. We started our journey in the year of 2001. In the over 1.5 decades we have grown our expertise & competence in the core IT curriculum & research. The department has a strong program in IT including B.E, M.E and Ph.D. Programs.

The department is striving hard towards the goal of providing innovative & quality education with high standard to achieve academic excellence. The primary focus of our curriculum is to impart technical know-how to student, promote their problem solving skills and innovation of few technologies.

It offers many platforms to students including (ABL, PBL and TBL) for providing wide spectrum of options to students to pursue their interest. Our department maintains active research domain for carrying out collaborative and interdisciplinary research. The faculty members look forward to contribute in solving technological challenges of the society with active participation from all stakeholders.

“Nothing can be achieved without genuine effort.”

The department boasts of experienced faculty who are all dedicated to teaching and research making a difference in the lives of our students. In nutshell, faculty members of the department are working in the direction of shaping up the students to make them global competitive technocrats and good Samaritans of our country. I congratulate team of faculty members and students for their hard work, dedication and original efforts.

Best wishes!!!

FROM THE HEAD OF
THE DEPARTMENT

FROM THE FACULTY IN CHARGE

Dear Reader

Education is not an act of acquiring knowledge but learning a skill to lead life and forming one's personality. This is an ennobling process of growth. I can boldly say that we have excelled in every initiative that we undertook and we have stood together in facing the challenges in realizing quality education.

In today's competitive world, we do not know what the future holds for us, but we know who holds the future. This department has a rich tradition, and its growth and development rests on the shoulders of all Hibernians', past and present. Students are a great asset to the College as much as College is to them, and must grab all the opportunities provided, to get a sound education and should also remember to uphold values at all times and at all costs. The Department of Information Technology is striving hard towards the goal of providing innovative and quality education with high standard to achieve academic excellence and provides platform for the students to achieve their career goals.

Once again, I would like to express my considerable appreciation to all authors of the articles in this issue. These contributions have required a generous contribution of time and effort. It is this willingness to make the effort to share knowledge, concerns and special insights with the Bright IT Department at large that has made this issue possible. "Team EZINE" welcomes your suggestions and feedback at ezineit@gmail.com . We extend our best wishes for your continued success.

Thank you all !!

Sincerely,

**Mrs.Hetal Amrutia,
Faculty Incharge**



FROM THE EDITOR'S DESK



"If you can dream it, you can do it."
-Walt Disney

DEAR READER,

Written above, is what I believe to be one of the most empowering quotes of all time. That it comes from one of the greatest creative geniuses that the world has ever seen, just adds to its pizzazz. It defines our limits, not as our physical or mental capacity, but rather as the zenith of our creativity.

Born from such creativity, and driven by an insatiable desire to provide fellow students with an outstanding reading experience, the publication team of the TCET IT department has striven to put together the 9th edition of Ezine - the students' magazine. More than just a magazine, Ezine is a platform. A platform that lends voice to the youth, not just to share their opinions but to create a pool of knowledge that will benefit generations to come. As the world moves forward with the birth of a multitude of new technologies, we, too, must move forward with it. We hope that this magazine proves to be an effective tool in your progress towards achieving greater heights.

We at TCET, believe that development is a multi-faceted idea and so, have endeavored to not only preserve knowledge, but also showcase the achievements of our students and the wide spectrum of activities that are organised to ensure interpersonal growth. On behalf of the editorial team, I would like to thank each student, alumnus and faculty who have contributed toward making this magazine possible. And so it is that I proudly present to you, the 9th edition of the students' magazine - Ezine 2018.

Sincerely,

Advait Maduskar,
Editor-in-chief



STUDENTS WRITE

SECURITY
AND PRIVACY
ON THE
INTERNET

When any electronic device is connected to the internet or a computer, it also acquires the security problems of the internet. A computer system can be vulnerable to even the slightest error in programming. Recently in 2018, the devices working on IOS encountered a bug where a single character from the Telugu language can crash the application that tries to process the character or even the whole device. The reason that was given out by Apple was that it happened due to memory corruption due to improvised input validation. Similarly, computer devices can be manipulated for unethical reasons by many adversaries, hackers, attackers, malicious software etc.

The basis of Computer Security is to protect 3 important aspects

1. Confidentiality – The user’s privacy should be maintained. Any adversary should not be able to access the device remotely and have access to user’s private data.
2. Integrity – No attacker should be able to change the data of a device, or render it useless remotely.
3. Availability – The device should function only as per user’s command. It should work properly at the time of need.

Today all the devices are connected to each other through the Internet and hence the computers have more vulnerable security problems. It is because developers of the internet only had one aim and that was to create a network of interconnected computers around the globe. The security aspect was neglected and today we face countless threats by the adversaries. Though we have antivirus and antimalware softwares, they have a limit and should be updated regularly. But these slow down performance as it scans all the data running before execution. Also the limit of these softwares is that it cannot stay up-to-date with the creativity in making viruses. Moreover, research has been conducted that shows a specific user can be pin-pointed only by measuring the packet data sizes that he sends or receives on his device. This can be done by study of TCP/IP packets sent through the device. There is also meta-data that carries the information of the sender and receiver, time and date. By exploiting it an adversary can know the time, duration and context of conversation easily.

In 2013, NSA contractor Edward Snowden leaked surveillance programs that gave U.S. Intelligence agencies access to data of companies like Facebook, Google, Apple, etc. Though these allegations were denied, these revelations had a massive impact on the cybersecurity.

1. Tech-Giants like Google, Yahoo!, now provide encryption to the user’s email.
2. Many start-ups and developers started using security measures in their application, increasing user safety.
3. It also induced the thought of practicing security practices among the users themselves.

But still there have been countless breaches in the social networking companies leading to data leaks and compromise on user privacy which shows that there is still improvement needed. One idea to secure the internet is to build another internet from scratch along with security measures embedded in the algorithm. These measures should be ethical, reliable and respect user privacy and security. But this is a tenacious task as there is so much data over the internet that it is told to be impossible to process all of it with the technology we have right now.

In India, the citizens face the threat of identity theft due to many security flaws in Aadhar system. Cyber-security experts have criticised the Aadhar systems for its flaws and multiple security breaches happened in the couple of years. In January 2018, a racket was caught which sold Aadhar details for Rs. 500. Also, till last year, anyone could have got a thousands of Aadhar card details on the internet by simply typing a few keywords as follows: “Aadhar number name filename: xls”. This is a serious breach in National Security, as bank accounts, mobile numbers can be linked to any fake Aadhar along with fake biometrics and its advantage can be taken and all it takes to create a fake Aadhar card is a name, photo, and an address.



**DIVYAM CHOUDHARY,
FE IT**

DATA SCIENCE:
THE
FUTURE OF
FINANCIAL
ANALYTICS

In an increasingly data driven world, financial data is exponentially incrementing in terms of all the 3 V's – Velocity, Variety and Volume. As global systems continue to be flooded by an unprecedented amount of mind boggling figures, Data Scientists have become the new age wizards.

When making sense of these large data sets seems like an impossible task, firms and institutions rely on these wizards for answers. What Data Scientists do is work to analyze, comprehend, simulate, predict and integrate these numbers so that these figures can be related to the more traditional, “muggle” values. Just as a wizard is powerless without his magic, Data Scientists are aided in their quests to “dumb down” the big volumes by a host of analytical tools. To name a few examples, Cloud Based Data Storage, NoSQL ^[1], Hadoop ^[2], RapidMiner ^[3], etc. In addition to these, a wide plethora of financial applications exist to help Data Scientist in their work.

Data Science as a tool for financial analytics can be broken down into several different modules. These modules include Real Time Analysis, Customer Segmentation, Predictive Analysis and very importantly, Sentiment Analysis. Let's take a brief overview of what these modules mean and how they are an important part of analysing data.

1. Real Time Analysis – RTA helps overcome issues regarding lag time between data collection and data analysis. By routinely analyzing data, RTA helps financial institutions to prevent frauds or even if there is one, detect it immediately. Furthermore, the continuous updating of data results in an improvement of credit ratings ^[4].
2. Customer Segmentation – CS allows any firm to know and to bifurcate its customers by analysing customer behaviours and detecting patterns. This allows a company to craft its products or modify its services in a way that best suit the customers. This helps to improve profits and helps increase market ratings.
3. Predictive Analysis – By combining CS, RTA and PA, banks and financial institutions can cut down on risks. This module takes into account the demographic characteristics and makes calculated predictions based on these. Early predictions can also be made with the help of predictive analysis, based on which planning for near futures and relevant trades can be made.
4. Sentiment Analysis – A big part of larger institutions is recognising how their customers feel. SA applies NLP ^[5] algorithms, Linguistics and text analysis to determine customer sentiment, thereby allowing customisation of services to best suit market needs.

As a result of the rapid rise of the field of Data Science, it has become possible to tackle the growing volumes of financial data. While the thought of relying on these tools might make some folks slightly uncomfortable, these are the only ways to safeguard finances and will eventually lead to the development of a strong economy.

Glossary –

[1] A NoSQL database provides a mechanism for storage and retrieval of data that is modelled in means other than the tabular relations used in relational databases

[2] Hadoop is a collection of open-source software utilities that facilitate using a network of many computers to solve problems involving massive amounts of data and computation.

[3] RapidMiner is a data science software platform developed by the company of the same name that provides an integrated environment for data preparation, machine learning, deep learning, text mining, and predictive analytics.

[4] A credit rating is an evaluation of the credit risk of a prospective debtor, predicting their ability to pay back the debt, and an implicit forecast of the likelihood of the debtor defaulting.

[5] Natural-language processing (NLP) is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to fruitfully process large amounts of natural language data.



**Advait Maduskar,
SE IT**

ARTIFICIAL
INTELLIGENCE:
A PEDAGOGICAL
ASPECT

Year 2030, just imagine you're sitting at your home and whatever you desire is done at your fingertips or just through your voice or maybe just through your gestures. I mean isn't it amazing and for all the lazy people out there it's a miracle or we can say blessing in disguise for them. Now you'll say that these things are available currently also but I would say no, I agree that these things are available but only to a limited number of people it has not become a part of each and everyone's lives yet especially in developing countries like India. 10-20 years down the line it's ought to be a household thing. The next big question is How's that possible? Well the answer is simple but it's implementation is very much difficult. The answer is 'Artificial Intelligence'. Basically what is Artificial Intelligence or AI? In simple language, Artificial intelligence (AI) is the ability of a computer program or a machine to think and learn. It is also a field of study which tries to make computers "smart". John McCarthy came up with the name "artificial intelligence" in 1955. In general use, the term "artificial intelligence" means a machine which mimics human cognition. At least some of the things we associate with other minds, such as learning and problem solving can be done by computers, though not in the same way as we do.

Here are six areas of AI that are particularly noteworthy in their ability to impact the future of digital products and services. I describe what they are, why they are important, how they are being used today and include a list of companies working on these technologies.

1. Reinforcement learning (RL)

RL is a paradigm for learning by trial-and-error inspired by the way humans learn new tasks. In a typical RL setup, an agent is tasked with observing its current state in a digital environment and taking actions that maximize accrual of a long-term reward it has been set.

- **Applications:** Multiple agents learning in their own instance of an environment with a shared model or by interacting and learning from one another in the same environment, learning to navigate 3D environments like mazes or city streets for autonomous driving, inverse reinforcement learning to recapitulate observed behaviors by learning the goal of a task.
- **Companies:** Google DeepMind, Prowler.io, Osaro, MicroPSI, Maluuba/Microsoft, NVIDIA, Mobileye, OpenAI.

2. Generative models

In contrast to discriminative models that are used for classification or regression tasks, generative models learn a probability distribution over training examples. By sampling from this high-dimensional distribution, generative models output new examples that are similar to the training data.

- **Applications:** Simulate possible futures of a time-series (e.g. for planning tasks in reinforcement learning); super-resolution of images; recovering 3D structure from a 2D image; generalizing from small labeled datasets; tasks where one input can yield multiple correct outputs (e.g. predicting the next frame in a video)

- **Companies:** Twitter Cortex, Adobe, Apple, Prisma, Jukedeck*, Creative.ai, Gluru*, Mapillary*, Unbabel.

3. Networks with memory

In order for AI systems to generalize in diverse real-world environments just as we do, they must be able to continually learn new tasks and remember how to perform all of them into the future. However, traditional neural networks are typically incapable of such sequential task learning without forgetting. This shortcoming is termed *catastrophic forgetting*.

- **Applications:** Learning agents that can generalize to new environments; robotic arm control tasks; autonomous vehicles; time series prediction (e.g. financial markets, video, IoT); natural language understanding and next word prediction.
- **Companies:** Google DeepMind, SwiftKey/Microsoft Research, Facebook AI Research.

4. Learning from less data and building smaller models

Deep learning models are notable for requiring enormous amounts of training data to reach state-of-the-art performance. For example, the ImageNet Large Scale Visual Recognition Challenge on which teams challenge their image recognition models, contains 1.2 million training images hand-labeled with 1000 object categories.

- **Applications:** Training shallow networks by learning to mimic the performance of deep networks originally trained on large labeled training data; architectures with fewer parameters but equivalent performance to deep models (e.g. SqueezeNet); machine translation.
- **Companies:** Geometric Intelligence/Uber, DeepScale.ai, Microsoft Research, Curious AI Company, Google, Bloomsbury AI.

5. Hardware for training and inference

A major catalyst for progress in AI is the repurposing of graphics processing units (GPUs) for training large neural network models. Unlike central processing unit (CPUs) that compute in a sequential fashion, GPUs offer a massively parallel architecture that can handle multiple tasks concurrently.

- **Applications:** Faster training of models (especially on graphs); energy and data efficiency when making predictions; running AI systems at the edge (IoT devices); always-listening IoT devices; cloud infrastructure as a service; autonomous vehicles, drones and robotics.
- **Companies:** Graphcore, Cerebras, Isocline Engineering, Google (TPU), NVIDIA (DGX-1), Nervana Systems (Intel), Movidius (Intel), Scortex

6. Simulation environments

AI's must generalize to many situations if they're to be useful to us in the real world. As such, developing digital environments that simulate the physics and behavior of the real world will provide us with test beds to measure and train an AI's general intelligence.

- **Applications:** Learning to drive; manufacturing; industrial design; game development; smart cities.
- **Companies:** Improbable, Unity 3D, Microsoft (Minecraft), Google DeepMind/Blizzard, OpenAI, Comma.ai, Unreal Engine, Amazon Lumberyard

I would now like to conclude by one the quotes of Stephen Hawking which depicts how powerful AI is “The development of full artificial intelligence could spell the end of the human race....It would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded.”



GOPI MEHTA,
SE IT

THE DESIGN
OF FACE ID
ON APPLE
IPHONE X

It has been months since the Apple iPhone X made its debut in stores all around the globe. One of the most impressive features that the phone has is the 'Face ID' recognition system used by the device to unlock and authorize payments. Just like the Touch ID used the user's fingerprints for authentication, Face ID uses the user's facial features.

Why is the Face ID better than Touch ID?

1. Ease of use

For using Face ID, all you need to do is enrol your face in the Settings of your device. On the other hand, using Touch ID requires enrolling up to 5 fingers and takes a considerably longer time and patience from you to set up. In order to use Touch ID, you need to have your fingers dry and clean so that they get the device unlocked or authorized for payments quickly. Whereas in Face ID, all you need to do is actively look at the iPhone.

2. More Screen Space

Removing the Home button from iPhone X gives more screen space. Although this could have been solved by putting the Home button at the back of the device like some Android devices, Apple decided to do something different, innovate, and move ahead.

3. Impressions of Face ID

Face ID should be able to recognize you if you are wearing a hat, glasses, a scarf and even if you grew a beard. It may have an issue with some sun glasses though.

Face ID will also work in the dark as there is a Flood Illuminator located in the TrueDepth camera, which means Face ID can see you at night and it can see you with the lights turned off.

Face ID wouldn't work if:

1. You have your eyes closed

You have to be looking directly at the camera. Giving side-eyes wouldn't work as well.

2. You are covering your face a balaclava, hijab, or masks

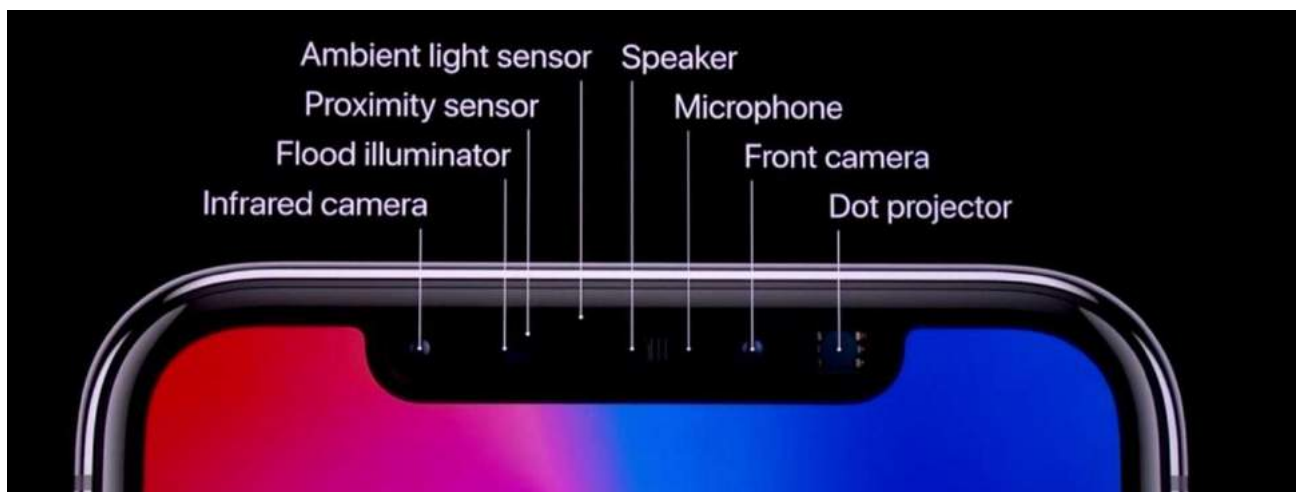
To get the best results, make sure that your face isn't covered.

3. You are still young (under 13, Apple says)

Your facial features may change with time thus affecting the accuracy.

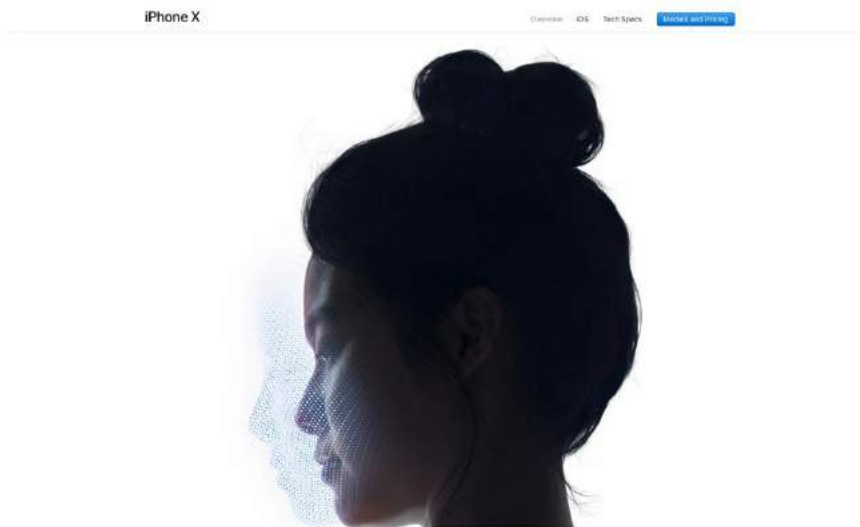
Working of Face ID

Apple developed an all new camera into the iPhone X known as the TrueDepth Camera System which successfully and efficiently builds a detailed depth map of your face to recognise you in an instant. Face ID basically compares two facial images and thus approves and authenticates the system. There are two phases of Face ID Authentication viz. Image Capture and Face Recognition system.



A. Image Capture

1. The proximity sensor and ambient light sensor help the TrueDepth camera system determine how much illumination will be needed for face recognition.
2. The flood illuminator produces infrared (IR) light, part of the electromagnetic spectrum that's invisible to the naked eye, to illuminate your face.
3. The dot projector produces more than 30,000 dots of invisible IR light to create a three-dimensional map (for area and depth) of your facial landscape.
4. The infrared camera captures images of the dot pattern and the IR light (a heat signature) that's been reflected back from your face.



B. Face Recognition

1. The IR images are sent from the camera to iPhone X's 'Neural Engine' computer processor that can perform over 600 billion operations per second to build a 3D mathematical model (map) of your face.

2. The 3D model or 'verification image' is presented to the computer's algorithms and compared against your stored template or 'enrolment image'.

3. The processor calculates whether the verification and enrolment images match, based on a comparison score of similarity between your images.
4. The phone authenticates your identity and unlocks (or authorises a payment) if the comparison score is higher than a certain threshold value.

This is how Face ID works on the iPhone X and it is the first 3D face recognition technology with the best results ever observed. The TrueDepth camera system is a new step towards achieving a lot of remarkable progress in the human-machine interaction system technology. In the near future, we may observe the TrueDepth Camera System being able to recognise hand gestures of the users to control various controls on your iPhone and possibly other iOS and MacOS devices. It may help the user express themselves in a better and in a more user friendly manner to their Apple devices.



VEDANT SHRIVASTAVA,
TE-IT



BATTERY-FREE CELLPHONE



Cellphone is the device we depend on most today. So if there were one device you'd want to be able to use without batteries, it is the cellphone. Imagine a phone that requires no battery — a major leap forward in moving beyond chargers, cords and dying phones. Instead, the battery-free cellphone takes advantage of tiny vibrations in a phone's microphone or speaker that occur when a person is talking into a phone or listening to a call. The phone harvests the few microwatts of power it requires from either ambient radio signals or light.

The team of computer scientists and electrical engineers eliminated a power-hungry step in most modern cellular transmissions, converting analog signals that convey sound into digital data that a phone can understand. The design can sense speech, actuate the earphones, and switch between uplink and downlink communications, all in real time. The system optimizes transmission and reception of speech while simultaneously harvesting power which enables the battery-free cellphone to operate continuously. This process consumes so much energy that it's been impossible to design a phone that can rely on ambient power sources. An antenna connected to those components converts that motion into changes in standard analog radio signal emitted by a cellular base station. This process essentially encodes speech patterns in reflected radio signals in a way that uses almost no power.

To transmit speech, the phone uses vibrations from the device's microphone to encode speech patterns in the reflected signals. To receive speech, it converts encoded radio signals into sound vibrations that are picked up by the phone's speaker. In the prototype device, the user presses a button to switch between these two "transmitting" and "listening" modes.

The team designed a custom base station to transmit and receive the radio signals. But that technology conceivably could be integrated into standard cellular network infrastructure or Wi-Fi routers now commonly used to make calls. You could imagine in the future that all cell towers or Wi-Fi routers could come with our base station technology embedded in it.



HARSH KHANNA,
BE IT



FACULTY ARTICLES

INTRODUCTION TO LINQ QUERIES

A query is an expression that retrieves data from a data source. Queries are usually expressed in a specialized query language. Different languages have been developed over time for the various types of data sources, for example SQL for relational databases and XQuery for XML. Therefore, developers have had to learn a new query language for each type of data source or data format that they must support. LINQ simplifies this situation by offering a consistent model for working with data across various kinds of data sources and formats. In a LINQ query, you are always working with objects. You use the same basic coding patterns to query and transform data in XML documents, SQL databases, ADO.NET Datasets, .NET collections, and any other format for which a LINQ provider is available.

Three Parts of a Query Operation

All LINQ query operations consist of three distinct actions:

1. Obtain the data source.
2. Create the query.
3. Execute the query.

The following example shows how the three parts of a query operation are expressed in source code. The example uses an integer array as a data source for convenience; however, the same concepts apply to other data sources also. This example is referred to throughout the rest of this topic.

```
class IntroToLINQ
{
    static void Main()
    {
```

```
// The Three Parts of a LINQ Query:
```

```
// 1. Data source.
```

```
int[] numbers = new int[7] { 0, 1, 2, 3,
4, 5, 6 };
```

```
// 2. Query creation.
```

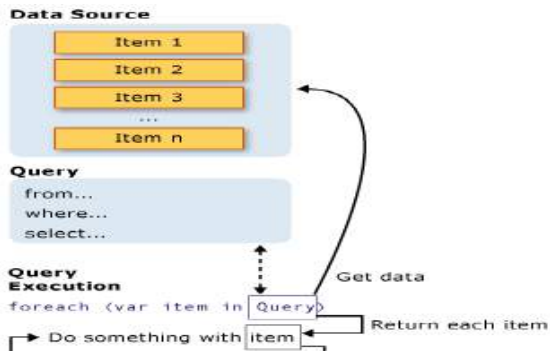
```
// numQuery is an IEnumerable<int>
```

```
var numQuery =
    from num in numbers
    where (num % 2) == 0
    select num;
```

```
// 3. Query execution.
```

```
foreach (int num in numQuery)
{
    Console.WriteLine("{0,1} ", num);
}
}
```

The following illustration shows the complete query operation. In LINQ the execution of the query is distinct from the query itself; in other words you have not retrieved any data just by creating a query variable.



The Data Source

In the previous example, because the data source is an array, it implicitly supports the generic `IEnumerable<T>` interface. This fact means it can be queried with LINQ. A query is executed in a `foreach` statement, and `foreach` requires `IEnumerable` or `IEnumerable<T>`. Types that support `IEnumerable<T>` or a derived interface such as the generic `IQueryable<T>` are called queryable types.

A queryable type requires no modification or special treatment to serve as a LINQ data source. If the source data is not already in memory as a queryable type, the LINQ provider must represent it as such. For example, LINQ to XML loads an XML document into a queryable `XElement` type:

```
// Create a data source from an XML document.
```

```
// using System.Xml.Linq;
```

```
XElement contacts = XElement.Load(@"c:\myContactList.xml");
```

With LINQ to SQL, you first create an object-relational mapping at design time either manually or by using the LINQ to

SQL Tools in Visual Studio in Visual Studio. You write your queries against the objects, and at run-time LINQ to SQL handles the communication with the database. In the following example, `Customers` represents a specific table in the database, and the type of the query result, `IQueryable<T>`, derives from `IEnumerable<T>`.

```
Northwnd db = new Northwnd(@"c:\northwnd.mdf");
```

```
// Query for customers in London.
```

```
IQueryable<Customer> custQuery =
    from cust in db.Customers
    where cust.City == "London"
    select cust;
```

The Query

The query specifies what information to retrieve from the data source or sources. Optionally, a query also specifies how that information should be sorted, grouped, and shaped before it is returned. A query is stored in a query variable and initialized with a query expression. To make it easier to write queries, C# has introduced new query syntax.

The query in the previous example returns all the even numbers from the integer array. The query expression contains three clauses: `from`, `where` and `select`. (If you are familiar with SQL, you will have noticed that the ordering of the clauses is reversed from the order in SQL.) The `from` clause specifies the data source, the `where` clause applies the filter, and the `select` clause specifies the type of the returned elements.

These and the other query clauses are discussed in detail in the LINQ Query Expressions section. For now, the important point is that in LINQ, the query variable itself takes no action and returns no data. It just stores the information that is required to produce the results when the query is executed at some later point.

Query Execution

- Deferred Execution

As stated previously, the query variable itself only stores the query commands. The actual execution of the query is deferred until you iterate over the query variable in a `foreach` statement. This concept is referred to as deferred execution and is demonstrated in the following example:

C#Copy

```
// Query execution.
foreach (int num in numQuery)
{
    Console.WriteLine("{0,1} ", num);
}
```

The `foreach` statement is also where the query results are retrieved. For example, in the previous query, the iteration variable `num` holds each value (one at a time) in the returned sequence.

Because the query variable itself never holds the query results, you can execute it as often as you like. For example, you may have a database that is being updated continually by a separate application. In your application, you could create one query that retrieves the latest data, and you could execute it

repeatedly at some interval to retrieve different results every time.

- Forcing Immediate Execution

Queries that perform aggregation functions over a range of source elements must first iterate over those elements. Examples of such queries are `Count`, `Max`, `Average`, and `First`. These execute without an explicit `foreach` statement because the query itself must use `foreach` in order to return a result. Note also that these types of queries return a single value, not an `IEnumerable` collection. The following query returns a count of the even numbers in the source array:

C#Copy

```
var evenNumQuery =
    from num in numbers
    where (num % 2) == 0
    select num;

int evenNumCount =
    evenNumQuery.Count();
```

To force immediate execution of any query and cache its results, you can call the `ToList` or `ToArray` methods.

C#Copy

```
List<int> numQuery2 =
    (from num in numbers
     where (num % 2) == 0
     select num).ToList();

// or like this:
// numQuery3 is still an int[]

var numQuery3 =
```

```
(from num in numbers
 where (num % 2) == 0
 select num).ToArray();
```

You can also force execution by putting the `foreach` loop immediately after the query expression. However, by calling `ToList` or `ToArray` you also cache all the data in a single collection object.

Language Integrated Query (LINQ)

Language-Integrated Query (LINQ) is the name for a set of technologies based on the integration of query capabilities directly into the C# language. Traditionally, queries against data are expressed as simple strings without type checking at compile time or IntelliSense support. Furthermore, you have to learn a different query language for each type of data source: SQL databases, XML documents, various Web services, and so on. With LINQ, a query is a first-class language construct, just like classes, methods, events.

For a developer who writes queries, the most visible "language-integrated" part of LINQ is the query expression. Query expressions are written in a declarative query syntax. By using query syntax, you can perform filtering, ordering, and grouping operations on data sources with a minimum of code. You use the same basic query expression patterns to query and transform data in SQL databases, ADO .NET Datasets, XML documents and streams, and .NET collections.

The following example shows the complete query operation. The complete operation includes creating a data source, defining the query expression, and executing the query in a `foreach` statement.

class LINQ Query Expressions

```
{
    static void Main()
    {
        // Specify the data source.
        int[] scores = new int[] { 97, 92, 81, 60
    };

        // Define the query expression.
        IEnumerable<int> scoreQuery =
            from score in scores
            where score > 80
            select score;

        // Execute the query.
        foreach (int i in scoreQuery)
        {
            Console.Write(i + " ");
        }
    }
}
// Output: 97 92 81
```

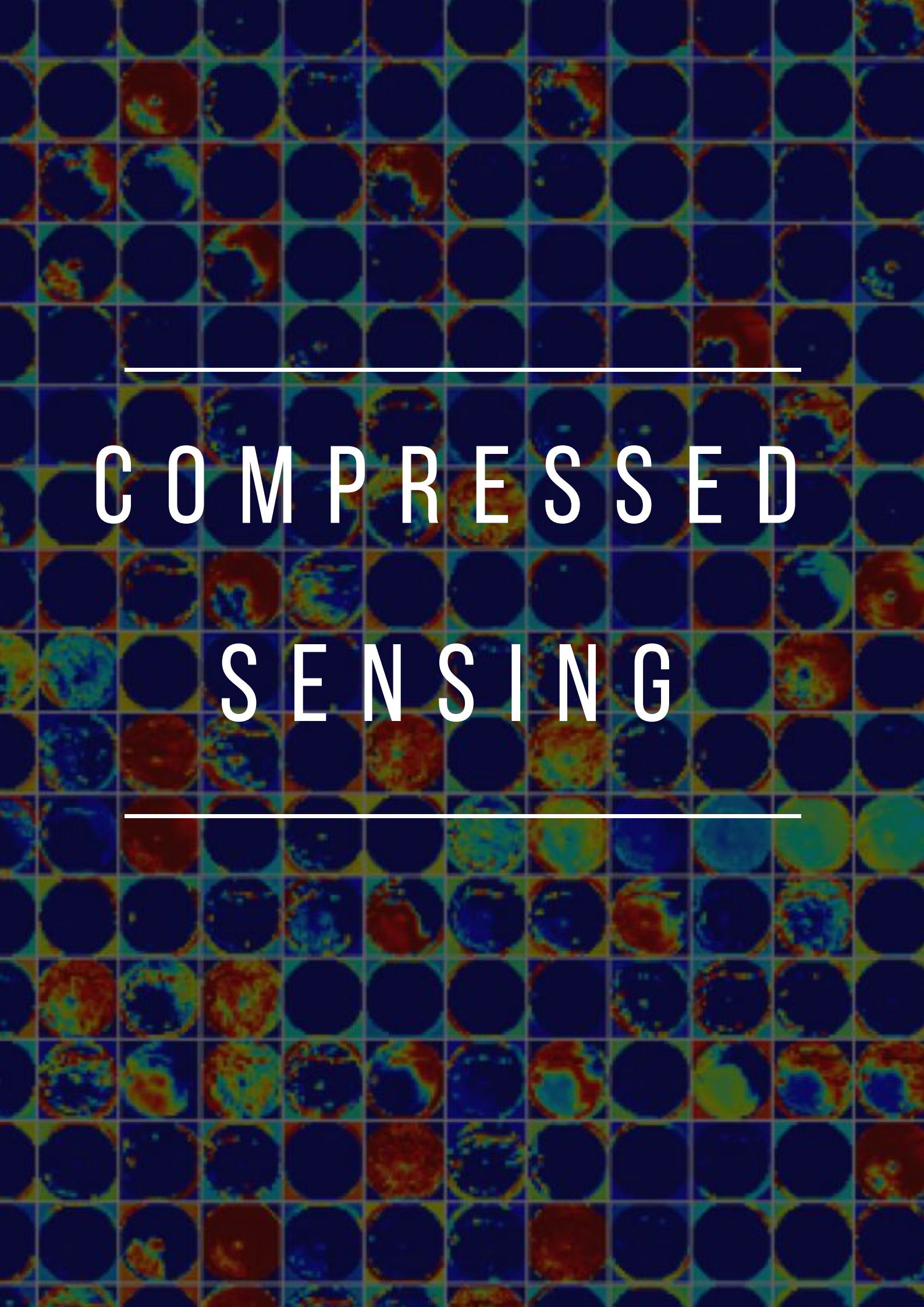
Query expression overview

- Query expressions can be used to query and to transform data from any LINQ-enabled data source. For example, a single query can retrieve data from a SQL database, and produce an XML stream as output.

- Query expressions are easy to master because they use many familiar C# language constructs.
- The variables in a query expression are all strongly typed, although in many cases you do not have to provide the type explicitly because the compiler can infer it.
- A query is not executed until you iterate over the query variable, for example, in a `foreach` statement.
- At compile time, query expressions are converted to Standard Query Operator method calls according to the rules set forth in the C# specification. Any query that can be expressed by using query syntax can also be expressed by using method syntax. However, in most cases query syntax is more readable and concise.
- As a rule when you write LINQ queries, we recommend that you use query syntax whenever possible and method syntax whenever necessary. There is no semantic or performance difference between the two different forms. Query expressions are often more readable than equivalent expressions written in method syntax.
- Some query operations, such as Count or Max, have no equivalent query expression clause and must therefore be expressed as a method call. Method syntax can be combined with query syntax in various ways.
- Query expressions can be compiled to expression trees or to delegates, depending on the type that the query is applied to. `IEnumerable<T>` queries are compiled to delegates. `IQueryable` and `IQueryable<T>` queries are compiled to expression trees.



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COMPRESSED
SENSING

Compressed sensing (also known as compressive sensing, compressive sampling, or sparse sampling) is a signal processing technique for efficiently acquiring and reconstructing a signal, by finding solutions to underdetermined linear systems. This is based on the principle that, through optimization, the sparsity of a signal can be exploited to recover it from far fewer samples than required by the Shannon-Nyquist sampling theorem. There are two conditions under which recovery is possible. The first one is sparsity which requires the signal to be sparse in some domain. The second one is incoherence which is applied through the isometric property which is sufficient for sparse signals.

Compressive Sensing Richard Baraniuk Rice University [Lecture Notes in IEEE Signal Processing Magazine] Volume 24, July 2007

- **Scope**

The Shannon/Nyquist sampling theorem tells us that in order to not lose information when uniformly sampling a signal we must sample at least two times faster than its bandwidth. In many applications, Such as digital image and video cameras, the Nyquist rate can be so high that we end up with too many samples and must compress in order to store or transmit them. In other applications, including imaging systems (medical scanners, radars) and high-speed analog-to-digital converters, increasing the sampling rate or density beyond the current state-of-the-art is very expensive.

In this article, we will learn about a new technique that tackles these issues using compressive sensing [1, 2]. We will replace the conventional sampling and reconstruction operations with a more general linear measurement scheme coupled with an optimization in order to acquire certain kinds of signals at a rate significantly below Nyquist.

- **Relevance**

The ideas presented here can be used to illustrate the links between data acquisition, linear algebra, basis expansions, inverse problems, compression, dimensionality reduction, and optimization in a various of courses, such as digital signal processing to statistics and applied mathematics. Therefore, the prerequisites required for understanding linear algebra, basic optimization, and basic probability.

4 Problem Statement

Nyquist-rate sampling completely describes a signal by exploiting its bandlimitedness. Our goal is to reduce the number of measurements required to completely describe a signal by exploiting its compressibility. The twist is that our measurements are not point samples but more general linear functionals of the signal.

Consider a real-valued, finite-length, one-dimensional, discrete-time signal x , which we view as an $N \times 1$ column vector in \mathbb{R}^N with elements $x[n]$, $n = 1, 2, \dots, N$. We treat an image or higher-dimensional data by vectorizing it into a long one-dimensional vector.

Any signal in \mathbb{R}^N can be represented in terms of a basis of $N \times 1$ vectors $\{\psi_i\}_{i=1}^N$. For simplicity, assume that the basis is orthonormal. Forming the $N \times N$ basis matrix $\Psi := [\psi_1 \ \psi_2 \ \dots \ \psi_N]$ by stacking the vectors $\{\psi_i\}$ as columns, we can express any signal x as

$$x = \sum_{i=1}^N s_i \psi_i \quad \text{or} \quad x = \Psi s \quad (1)$$

where s is the $N \times 1$ column vector of weighting coefficients $s_i = \langle x, \psi_i \rangle = \psi_i^T x$ and where \cdot^T denotes the (Hermitian) transpose operation. Clearly, x and s are equivalent representations of the same signal, with x in the time domain and s in the Ψ domain.

We will focus on signals that have a sparse representation, where x is a linear combination of just K basis vectors, with K

$\ll N$. That is, only K of the s_i in (1) are nonzero and $(N - K)$ are zero. Sparsity is motivated by the fact that many natural and manmade signals are compressible in the sense that there exists a basis Ψ where the representation (1) has just a few large coefficients and many small coefficients. Compressible signals are well approximated by K -sparse representations; this is the basis of transform coding [3]. For example, natural images tend to be compressible in the discrete cosine transform (DCT) and wavelet bases [3] on which the JPEG and JPEG-2000 compression standards are based. Audio signals and many communication signals are compressible in a localized Fourier basis. Transform coding plays a central role in data acquisition systems like digital cameras where the number of samples is high but the signals are compressible. In this framework, we acquire the full N -sample signal x ; compute the complete set of transform coefficients $\{s_i\}$ via $s = \Psi^T x$; locate the K largest coefficients and discard the $(N - K)$ smallest coefficients; and encode the K values and locations of the largest coefficients.

Unfortunately, the sample-then-compress framework suffers from three inherent inefficiencies: First, we must start with a potentially large number of samples N even if the ultimate desired K is small. Second, the encoder must compute all of the N transform coefficients $\{s_i\}$, even though it will discard all but K of them. Third, the encoder faces the overhead of encoding the locations of the large coefficients.

As an alternative, we will study a more general data acquisition approach that condenses the signal directly into a compressed representation without going through the intermediate stage of taking N samples. Consider the more general linear

measurement process that computes $M < N$

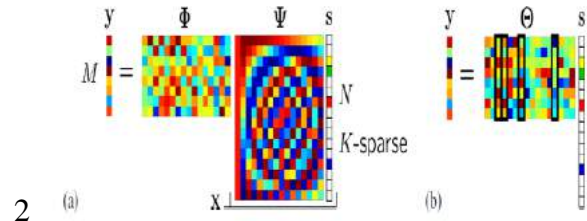


Figure 1: (a) Compressive sensing measurement process with (random Gaussian) measurement matrix Φ and discrete cosine transform (DCT) matrix Ψ . The coefficient vector s is sparse with $K = 4$. (b) Measurement process in terms of the matrix product $\Theta = \Phi \Psi$ with the four columns corresponding to nonzero s_i highlighted. The measurement vector y is a linear combination of these four columns.

Inner products between x and a collection of vectors $\{\phi_j\} \Phi_{j=1}^M$ as in $y_j = \langle x, \phi_j \rangle$. Stacking the measurements y_j into the $M \times 1$ vector y and the measurement vectors ϕ_j^T as rows into an $M \times N$ matrix Φ and substituting in (1), we can write

$$y = \Phi x = \Phi \Psi s = \Theta s \quad (2)$$

where $\Theta := \Phi \Psi$ is an $M \times N$ matrix. See Figure 1(a) for a pictorial depiction of (2). Note that the measurement process is non-adaptive; that is, Φ does not depend in any way on the signal x .

Our goal in the following is to design a measurement matrix Φ and a reconstruction algorithm for K -sparse and compressible signals that require only $M \approx K$ or slightly more measurements, or about as many measurements as the number of coefficients encoded in a traditional transform coder. Our approach is based on the theory of compressive sensing introduced recently in [1, 2].

5 Solution The solution consists of two steps. In the first step, we design a stable measurement matrix Φ that ensures that the salient information in any K -sparse or

compressible signal is not damaged by the dimensionality reduction from $x \in \mathbb{R}^N$ down to $y \in \mathbb{R}^M$. In the second step, we develop a reconstruction algorithm to recover x from the measurements y . Initially, we focus on exactly K -sparse signals.

• **Practical Example**

Consider the “single-pixel” compressive digital camera of Figure 2(a) that directly acquires M random linear measurements without first collecting the N pixel values [9]. The incident light-field corresponding to the desired image x is not focused onto a CCD or CMOS sampling array but rather reflected off a digital micromirror device (DMD) consisting of an array of N tiny mirrors. (DMDs are found inside many computer projectors and projection televisions.) The reflected light is then collected by a second lens and focused onto a single photodiode (the single pixel). Each mirror can be independently oriented either towards the photodiode (corresponding to a 1) or away from the photodiode (corresponding to a 0). Each measurement y_j is obtained as follows: The random number generator (RNG) sets the mirror orientations in a pseudorandom 0/1 pattern to create the measurement vector ϕ_j . The voltage at the photodiode then equals y_j , the inner product between ϕ_j and the desired image x . The process is repeated M times to obtain all of the entries in y . Figure 2(b) and (c) illustrate a target object and an image x_b taken by a prototype single-pixel camera [9] using about 60% fewer random measurements than reconstructed pixels. Here the reconstruction was performed via a total variation optimization [1], which is closely related to ℓ_1 reconstruction in the wavelet domain. A major advantage of the single-pixel, compressive sensing approach is that this camera can be adapted to image at wavelengths where it is difficult or expensive to create a large array of sensors.

It can also acquire data over time to enable video reconstruction [9].

8 Conclusions In this lecture we have learned that sampling is not the only way to acquire signals. When the signals of interest are compressible or sparse, it can be more efficient and streamlined to employ random measurements and optimization in order to acquire only the measurements we need.

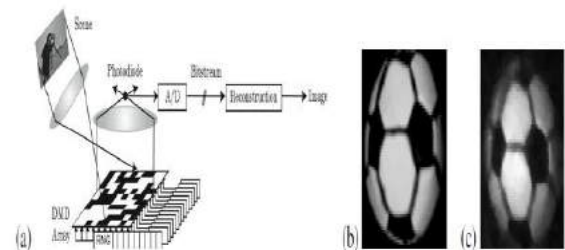


Figure 2: (a) Single-pixel, compressive sensing camera. (b) Conventional digital camera image of a soccer ball. (c) 64×64 black-and-white image x_b of the same ball ($N = 4096$ pixels) recovered from $M = 1600$ random measurements taken by the camera in (a). The images in (b) and (c) are not meant to be aligned.

We have also learned that for reconstruction our old friend least squares fails us, and that we need to look to other flavors of convex optimization like linear programming (see also [4, 10]).



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The image features a large, semi-transparent Bitcoin logo in the center. The background is a dark blue and black grid pattern with concentric circles, resembling a stylized globe or a digital network. Two horizontal white lines are positioned above and below the text.

BITCOIN
A BRIEF
OVERVIEW

There are technologies and then there are technologies that, despite their initial rejections, are referred to as landmark developments in the history of technological advancements and innovations. If the PC's introduction changed the way we used to manage our data and files, the Internet took it to another level by allowing us to transfer the data/information anywhere across the globe. Then came the Internet of Things (IoT) that changed the course of operation. The way things were getting managed at remote sites. IoT allowed the companies to monitor and control its remote operations in real time with literally having 'no men at work'. These innovations and technologies have either changed or touched almost every human life. Similar to the ranks of IoT, there is another technology called 'Internet of Money (IoM)' or cryptocurrency (cryptos = secret) or Bitcoin, designed to change the way of transactions, the way we trade.

As most people still have no idea about the importance of IoM technology, speaking about how disruptive it could be, Charles Lee, also known as Coblee in Bitcoin world, creator of Litecoin and Ex-Director of Engineering at Coinbase opined, "Cryptocurrency is such a powerful concept that it can almost overturn governments."

The concept of cryptocurrency or Internet of Money is difficult to understand, but easy to use. Difficult, mostly because it is entirely different from the conventional currencies that people are using since ages. What's more interesting is that there is no central or mid-way authority like Central or Reserve Banks that control the flow of these currencies. It is completely decentralised.

When asked by many bitcoin cryptocurrency enthusiasts to help explain the bitcoin architecture, the founder of bitcoin cryptocurrency, a peer-to-peer

electronic payment system, popularly known by his pseudonym Satoshi Nakamoto responded in his blog forum P2P Foundation, 'Sorry to be a wet blanket. Writing a description for (bitcoin) for general audiences is bloody hard. There's nothing to relate it to.' In response, Rick Falkvinge, another bitcoin enthusiast and Founder of the Swedish pirate party, came back with an interesting analogy, "Bitcoin (BTC) will do to banks what email did to the postal industry."

Whether it does or it does not, remains to be seen.

The Current Transaction System And The 'Double Spending' Problem

The first cryptocurrency ecash system was developed by a cryptographer at the University of California, David Chaum in 1983. The system, despite every effort, could not succeed. Its subscription hardly ever crossed 5,000.

In late 2008, Satoshi Nakamoto who was equally brilliant in mathematics published a research paper called Bitcoin: A Peer-to-Peer Electronic Cash System. In the paper, he introduced bitcoins as a virtual currency that could essentially work as online cash. The word – Bitcoin – is made up of 'bit' + 'coin' that literally stands for digital/virtual currency. Implemented as an open source code, the Bitcoin technology is the world's first-ever completely decentralised digital payment system. The technology soon became an interesting affair for developers across the globe.

The idea of Bitcoins is based on the elimination of third-party gateway and regulation. For example, currently, if Ram is booking his IRCTC tickets under the 'tatkal' quota, in order to get one ticket, he would often end up spending two-three times more than the required ticket payments, owing to third-party gateway

involvements – Paypal, bill-desk, Visa/Mastercard etc. It takes a week or two to get the surplus amount back. Third-party gateway also increases the total transaction timeline.

Authors of BITCOIN: A Primer for Policymakers, Jerry Brito and Andrea Castillo, explained the situation,

Intermediaries like PayPal keep a ledger of account holders' balances; deduct the amount from the sender's account and add it to the receiver's account. In computer science, this is known as the "double-spending" problem.

Bitcoin cryptocurrency solve the double-spending issue by skipping third-party involvements and introducing peer-to-peer (P2P) transactions.

The Bitcoin Transaction

Bitcoin doesn't work through email ids, physical addresses, or 16 bits encryption of online accounts. Instead, Bitcoin accounts are random QR codes of 160 bits. The accounts are made accessible through NFC (near field communication) chips. Since the system allows the peer-to-peer transfer, there is no gateway in between that could delay or control the transactions. The transaction uses public-key cryptography to halt malicious users' attempts to manipulate the data. The verification of the transfer is done separately using the payee's private key, another code. (However, it must be noted that all Bitcoin exchange platforms do ask for real identities like email ids for Bitcoin conversion.)

Hesham Rehman, CEO and co-founder, Indian Bitcoin startup Bitxoxo says, "International transactions involve currency transfers. The process not only costs 2.5% conversion tax but also takes much longer time to get the money transferred. In comparison, the Bitcoin technology hardly involves any transfer charge (INR 10-200). And, also the

transfer of money takes place in real time; you will get the confirmation within 5-30 minutes."

The transparency of BTC transfers is unprecedented, as far as currency transactions are concerned. Once a transaction takes place, the list that is in the public domain gets updated and everyone comes to know about the exact amount just transacted. Thus, the transparency guarantees the safety and security, as nobody can challenge the legitimacy of the transfer. This is one of the biggest reasons that make it harder for hackers to commit any fraud. "I think this is the first time we're trying a decentralised, non-trust-based system," said Satoshi while responding to a query at his Bitcoin forum, in 2009.

There are other benefits too. In contrast to the regular currencies where Central/Reserve Banks spend a huge chunk of money on their (currency) printing, transportation and regulation process, Bitcoin generation does not cost a penny; instead, a rewarding affair, as the miners get rewarded for generating Bitcoin cryptocurrency. Furthermore, steps like demonetisation won't affect the market and users at all. This makes a huge difference overall.

Bitcoin Technology: Anonymous Or Pseudonymous?

As explained, the Bitcoin accounts are QR codes. People are often wary over the transactions' anonymity. Recent is the Ransomware Attack. Ransomware is a malicious crypto-worm that has been attacking Microsoft PCs worldwide since May 2017. The crypto-worm encrypts any users' data and demands some ransom payment in Bitcoin cryptocurrency. This has been a genuine users' and governments' concern across the globe. Debating the issue, award-winning British author Charles Stross raised a number of concerns in his blog, "Bitcoin's utter lack of regulation permits really hideous markets to emerge, in commodities like

assassinations.” Governments, too, are suspicious over Silk Road and ISIS’ possible presence in the Bitcoin world. Heesham clarifies, “It is not an anonymous transaction. The IP addresses are trackable.”

Recent Ransomware attacks helped raise bitcoin values

Sandeep Goenka, co-founder & COO Zebpay questions the efficacy of conventional currency in that case, “I fail to understand the accusations. Neither the attacks have occurred for the first time nor have such markets emerged only because of Bitcoins. The hideous markets have been present and evolving for centuries despite all the regulating authorities. Why impute few years’ old Bitcoins as the real blemish behind their evolution?”

Since the launch, leading world dailies New York Times, Guardians, WSJ and other print and electronic media continued to debate over the anonymity concerns present in BTC. Finally, in 2014, Gavin Andresen, Chief Scientist Bitcoin Foundation, later appointed by Satoshi as the lead developer clarified the degree of the anonymity while speaking to Twit TV, “BTC transfers are anonymous to a certain degree. The degree of anonymity is more than that of current online transactions but still less than hard cash payments. This is because IP addresses of nodes can be easily tracked.”

The most worrisome point is the safety and security of currencies like the US dollar, Indian Rupee or any other conventional currency that we use. The credit/debit cards’ data could be hacked easily leading to the transfer of money to unknown accounts. Also, the very basic idea of these currencies’ regulations through Central or Reserve Banks, “security through obscurity” is debatable, as this makes way for duplicate currencies too. Enthusiasts at the Bitcoin Forum have addressed the safety and security of Bitcoins in detail. The currency is not foolproof and there are instances where private keys have been

stolen. However, given that the entire technology has got no room for duplicate Bitcoins, storing personal information, the cryptocurrency is more safe and secure, compared to the conventional currencies.

Despite these great features, the very basic idea of P2P transaction worries many economists, who want everything to be regulated. Reacting to cryptocurrency technology, Nobel Laureate Economist Prof. Paul Krugman termed Bitcoin technology, as anti-social and evil. Debunking Krugman’s comments, Satoshi, at his Bitcoin forum, averred, “The root problem with conventional currency is all the trust that is required to make it work. The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust. Banks must be trusted to hold our money and transfer it electronically, but they lend it out in waves of credit bubbles with barely a fraction in reserve. We have to trust them with our privacy, trust them not to let identity thieves drain our accounts.” Thus, Bitcoin technology, also raised an important question that was never asked before, “Why should a currency behave as some boogeyman to the government authorities?”

Bitcoin Mining The State-of-the-art set up for bitcoin mining

Bitcoins can be bought and sold by anyone through bitcoin wallets or exchange platforms such as Bitcoin Core, Zebpay, Unocoin or Bitxoxo and so on in India. However, in order to generate Bitcoins, a user/nodal computer needs to find numerical solutions to some specific mathematical operations (part of bitcoin mining script), and get it verified. These bitcoin mining scripts are based on US-NSA’s Secure Hash Algorithms (SHA256 algorithm) that involves a lot of computation and, hence, electricity. In other words, bitcoin mining scripts consist of some cryptographic problems that are

recursive in nature. Once installed, the nodal computer keeps guessing and checking billions of times until it finds an answer. The verification/matching the solution is comparatively easier and fast, called Proof-of-Work.

However, unlike other digital currencies, Satoshi has already emulated the maximum Bitcoin cryptocurrency that could ever get generated, 21 Mn. The idea was to keep Bitcoins as valuable as the natural resources. Natural resources are found in limited quantities. The more humans dig; the less remains and, hence, their value rises with every unit being mined.

As of June 1 2017, 16,366,275BTC has been already mined. “However, the limitation will never affect the transaction, as can be denominated in smaller sub-units of a Bitcoin, such as bits – there are 1,000,000 bits in 1 Bitcoin. The smallest unit is called 1 Satoshi,” says Sandeep. To upkeep the mining work, Satoshi has introduced a function called halving. The bitcoin generation gets halved in every four years. The last block halving occurred on July 2016 and the next one will be in 2020. Currently, new bitcoins are getting generated roughly every 10 minutes in batches of 12.5 coins, with each coin worth around \$3,500. Miners are required to maintain the blockchain – a list of validated transactions – the most crucial part of BTC technology.

A payee receives Bitcoins as a code digitally signed by the payer, called hash. Once payee confirms the payment receipt, and signs it; the transaction gets grouped with the hash called block. Once a block is formed, it gets recorded in the blockchain and becomes available for everyone who can see the new block. Only the ‘longest’ chain of blocks is accepted by the client as valid. Here, the ‘longest’ refers to the chain with the most-combined difficulty, not the one with the most blocks. According to bitcoin.org,

The idea is to prevent someone from forking the chain and creating a large number of low-difficulty blocks, and having it accepted by the network as ‘longest’.

Sandeep informs, “Miners get rewarded in two ways. One is bitcoin rewards once the PoW is done. The second is through transaction fees which are usually paid by senders to receive confirmation of successful transactions. Here, it is noted that besides the increasing electricity cost, miners don’t get affected from halving much, as in four years, the value of bitcoins goes up by tenfold. These days, as more and more transactions are happening, miners get more incentives.”

Bitcoin Volatility: A Bubble Or A Good Thing?

Initially, when very few coins were generated, Satoshi encouraged developers and miners to donate more Bitcoins to help bring more users into the loop and raise the overall value. “Lost coins only make everyone else’s coins worth slightly more. Think of it as a donation to everyone,” said Satoshi while rolling out the open source code. Believing him, Gavin even donated 10,000 coins once, to raise the bitcoins value from then \$0.3 to \$3. However, trading at its maximum value – \$4,233/Bitcoin on August 28, 2017 – it is highly unlikely that anyone would make big donations to the community to affect the cryptocurrency’s volatility and, even if one does, it would hardly affect the bit value, so the bubble game won’t be in play anymore.

In the case of usual currencies, neither demand nor supply meets real-time estimated value. As both demand and supply are completely market-dependent, Countries’ Reserve banks are left with a lot of work and the banks often take authoritarian decisions to bridge the gap.

In contrast, Bitcoins' supply is completely known. "The good thing about bitcoins is that everyone is aware of the supply rate. Currently, what's less clear to us is that, how the demand would be. How many people would use it? So, based on supply and demand, the volatility is determined. However, unlike other currencies, the bitcoin market and government policies affect only the demand curve. Hence, as a chunk of the coins have been generated, the volatility is now as less as currencies like Brazilian Reais and US Dollar are. The current volatility index of bitcoins somewhere stands at 4. In 2-3 years, it will be more stable, as we expect more trades on a daily basis," says Sandeep.

Recently, the Japanese government decided to lift transaction tax on Bitcoins. Such developments also help move the price up.

Sathvik Vishwanath, co-founder & CEO, Unocoin Technologies says, "This is a predetermined math regarding the supply of bitcoin. Whenever this has happened, we have seen that the price of bitcoin increases as the supply is significantly reducing. On the other hand, as of now, more than 80% of the bitcoin that could ever exist is already in circulation. So the halving event may have less impact in the future."

Bitcoin Cryptocurrency: Technological Glitches

Symmetry And Performance Issues

Technology is like medicine that comes with an expiry date. And, the Bitcoin technology too, has several glitches that are still under removal phase or under research phases. In recent times, many cryptocurrencies including Ethereum and Bitcoin have undergone a hard fork, creating new cryptocurrencies. This adds more volatility to the Internet of Money.

As pointed out by Alex Biryukov, Professor of Cryptography and

Information Security, University of Luxembourg and Dmitry Khovratovich, post-doctoral researcher, CryptoLUX cryptography research group-University of Luxembourg,

Proof-of-work is a central concept in modern cryptocurrencies and denial-of-service (Sending lots of data to a node may make it so busy that it cannot process normal bitcoin transactions.) protection tools, but the requirement for fast verification so far has made it an easy prey for GPU-, ASIC-, and botnet-equipped users. The attempts to rely on memory-intensive computations in order to remedy the disparity between architectures have resulted in slow or broken schemes.

The researchers in their paper "Equihash: Asymmetric Proof-of-Work Based on the Generalized Birthday Problem" introduced algo binding as the ultimate solution, "Our scheme has tunable and steep time-space tradeoffs, which impose large computational penalties if less memory is used. Our solution is practical and ready to deploy: a reference implementation of a proof-of-work requiring 700MB of RAM runs in 15 seconds on a 2.1 GHz CPU, increases the computations by a factor of 1000 if memory is halved, and presents a proof of just 120 bytes long." Proof-Of-Work Or Proof-Of-Waste?

Intuitively with the libertarian view – I want my free lunch and eat it too – Satoshi stated in his design, "The proof-of-work involves scanning for a value that, when hashed, such as with SHA-256, the hash begins with a number of zero bits. The average work required is exponential in the number of zero bits required and can be verified by executing a single hash."

In the beginning, as the difficulty parameter 'n' was low and PoW rewards were 50 Bitcoins, PoW was nothing fun for developers. Later, while researching for 'Can We Stabilise the Price of a Cryptocurrency?' Mitsuru

Iwamura-Waseda University; Yukinobu Kitamura-Institute of Economic Research; Tsutomu Matsumoto-Yokohama National University and Kenji Saito-Keio University observed, “The difficulty parameter ‘n’ for the proof of work was 32 in January 2009, raised to 40 in December 2009, raised to 62 in December 2013, and is 64 as of June 2014. These changes cannot be explained by increases in computational technological change but must reflect the fact that many new miners entered in mining competition by the end of 2013 and they almost stopped after 2014. However, difficulty parameter ‘n’ is nothing to do with the quality of validation of a block. That’s why ‘n’ can be raised and reduced flexibly without affecting a validation process.”

Storage

A blockchain grows linearly, as the number of blocks increases. According to bitinfocharts, the current size of Bitcoin blockchain is over 140GB. For an average user, thus, maintaining hard disks with large storage might be an issue. However, to reduce storage dependency, lightweight Bitcoin wallets have also been launched which do not store the entire chain.

Conclusion

Technology brings solutions, but hardly succeeds in driving the market. While some economists believe “Bitcoin is evil,” some others believe the quite opposite. This leaves investors in confusion. As the making of global laws and regulations is still under process for the cryptocurrency / Internet of Money, how should investors treat Bitcoins? Gavin kept it simple and grounded. “As of now, Bitcoins in every country should be treated like foreign currency notes. The bubbles and chaos have not settled down yet; but are slowly settling down. And, in the long-term, I am very optimistic.”

Currently, neither the developers nor the authorities could assure the 100%

legitimacy of Bitcoins. Having said that, Indian cryptocurrency startups, investors and developers are definitely looking forward to the cryptocurrency as a gateway to the future market. Bitcoins happens to be the current one, the most popular Internet of Money.

Meanwhile, India’s Inter-Disciplinary Committee has submitted its report regarding cryptocurrency to the Finance Minister, Arun Jaitley. Based on the report, the next article would discuss Bitcoin’s future in India, either as an asset or currency; or what if, the government just decides to make it illegal?



COMPOSED BY

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BIG DATA: ARE YOU READY FOR THE BLAST OFF?

What is big data exactly?

We've always had large amounts of data, from loyalty card schemes, till receipts, medical records, tax returns and so on.

As Laurie Miles, head of analytics for big data specialist SAS, says: "The term big data has been around for decades, and we've been doing analytics all this time. It's not big, it's just bigger."

But it's the velocity, variety and volume of data that has merited the new term.

So what made it bigger?

Most traditional data was structured, or neatly organized in databases. Then the world went digital and the internet came along. Most of what we do could be translated into strings of ones capable of being recorded, stored, searched, and analyzed.

There was a proliferation of so-called unstructured data generated by all our digital interactions, from email to online shopping, text messages to tweets, facebook updates to YouTube videos.

As the number of mobile phones grows globally, so does the volume of data they generate from call metadata, texts, emails, social media updates, photos, videos, and location. And the number of gadgets recording and transmitting data, from smart phones to intelligent fridges, industrial sensors to CCTV cameras, has also proliferated globally, leading to an explosion in the volume of data. These data sets are now so large and complex that we need new tools and approaches to make the most of them.

How much data is there?

Nobody really knows because the volume is growing so fast. Some say that about 90% of all the data in the world today has been created in the past few years.

Where is it all stored?

The first computers came with memories measured in kilobytes, but the latest smartphones can now store 32GB and many laptops now have one terabyte (1,000GB) hard drives as standard. Storage is not really an issue anymore.

A number of open source platforms have grown up specifically to handle these vast amounts of data quickly and efficiently, including Hadoop, MongoDB, Cassandra, and NoSQL.

Do you know your big data numbers?

1,000 bytes	= 1 kilobyte (kB)
1,000 kB	= 1 megabyte (MB)
1,000 MB	= 1 gigabyte (GB)
1,000 GB	= 1 terabyte (TB)
1,000 TB	= 1 petabyte (PB)
1,000 PB	= 1 exabyte (EB)
1,000 EB	= 1 zettabyte (ZB)
1,000 ZB	= 1 yottabyte (YB)

Why is it important?

Data is only as good as the intelligence we can glean from it, and that entails effective data analytics and a whole lot of computing power to cope with the exponential increase in volume.

"Big data is not just historic business intelligence," says Mr Carr, "It's the addition of real-time data and the ability to mash together several data sets that makes it so valuable."


Practically, anyone who makes, grows and sells anything can use big data analytics to make their manufacturing and production processes more efficient and their marketing more targeted and cost-effective.

It is throwing up interesting findings in the fields of healthcare, scientific research, agriculture, logistics, urban design, energy, retailing, crime reduction, and business operations.

So, prepare yourself for the blast-off !



COMPOSED BY
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AGILE
PROJECT
MANAGEMENT

Introduction

Agile is a project management methodology that uses short development cycles called sprints to focus on continuous improvement in the development of a product or service. UDB will adopt Agile Approach to project management as it may be successfully scaled to complex and large organization without the governance of the project. In Agile approach, value is delivered to the customer in the shortest time to market having most efficient cycle time. Agile principles followed by UDB are: rendering greatest priority to customer satisfaction by continuous and early delivery of services; welcoming changing needs, efficiency and effectiveness in information exchange in a development team, sustainable development, simple operations, self-organizing teams, constant attention to technical excellence and better designs enhancing agility. The agile approach has greater flexibility facilitating production of deliverables without alterations and reworking. Agile values interactions and individual over tools and processes, working products over documentation, responding to the change over following the plan.

Compare the advantages and disadvantages of two Project/program Management Frameworks of your choice.

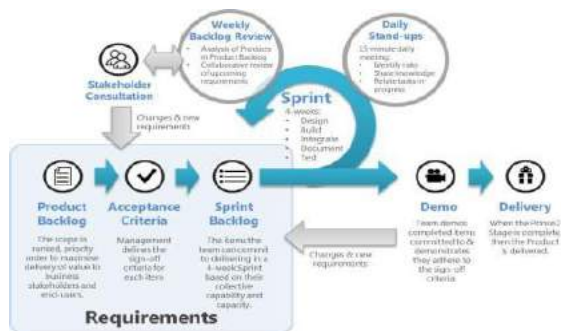
Agile approach is utilized in website, technology, software and marketing and creative industry. In this approach, Project is perceived to be a series of comparatively small activities undertaken and conceived for managing according to the conditioned in the adaptive way, contrary of having the pre-planned process (Pichler, 2012). The most outstanding characteristic of the Agile management approach is its ability of being wrapped around the other approaches of management. Agile has a drawback of less traceability as documentation is less and

creation of unavoidable expectations. PRINCE2 is that project management framework that is applied to all kinds of project scales, organizations, types, culture or geography. It is principle based, plans are structures and there is clarity of roles and responsibility. It is supported by techniques, components as well as processes. Everything is defined and clear with proper documentation and procedures. Disadvantages of PRINCE2 are that there is need for lots of documentation that adds lesser value in project's overall performance. Though, the documentation definitely helps in traceability as well as accountability throughout cycle of the project. PRINCE2 framework is too strict to use with no consideration for effectiveness of delivery. In such situations, this may become the case of delivering framework for the framework's sake, than to focus on delivering products in the suitable adapted implementation of PRINCE2. Agile pragmatic and effective application may avoid making these costly mistakes. PRINCE2 structure is perceived as increasing the project's cost, length, delaying returns on investments, failure risks and probability of actual needs, objectives as well as expected standards not being fulfilled.

Critically justify your choice of frameworks and why?

UDB is a financial organization dealing in a wide portfolio of services. It requires a proper regulatory framework and project governance in IT Outsourcing and Retail Banking Expansion as it saw various failures following Scrum and acquisitions with other retail bankers. Thus Agile alone will again be failed framework for UDB, thus an integrated framework reaping advantages of both the frameworks is recommended for UDB. Agile may be integrated with PRINCE2 as it may be tailored; considering

tailoring to be one among 7 principles of PRINCE2. Thus an integrated framework is our choice. PRINCE2 and Agile may fit well with each other as agile may be utilized as agile delivery framework with the PRINCE2 to be used as project governance framework. Thus Scrum framework that is a part of agile framework would be integrated with PRINCE2 as Scrum alone was a failure in the past due to non compliance with regulatory framework and no focus on core activities of UDB. Now the previous shortcomings would be removed through integrating Scrum (one of Agile framework) with PRINCE2. Agile overlaps in few areas with PRINCE2 yet agile is particularly contrasted and compared to waterfall approach to delivery whilst PRINCE2 is the framework for managing the projects. Working of Scrum is as under.



approach of PRINCE2 of adopting its methods for suiting projects and its environment facilitate Scrum and its Sprints to have easy operations within the Stage Boundaries as well as within phase of Managing Product Delivery. Implementation of governance and delivery frameworks is not regarding doing framework in perfect manner. Rather, that is regarding utilizing frameworks in most efficient way which would work in reality towards improving delivery and thereafter constantly transforming to accurately, consistently and predictably attain the finest that the programme / team/ business/ project can achieve.

Key for unlocking Scrum with Prince2 is for utilizing Scrum in stage of Managing Product Delivery where Scrum facilitates team to concentrate on delivery of each Sprint which coincides with PRINCE2 management reporting needs and the project committee meeting cycles.

Conclusion

Experiencing the previous failure of Scrum method, UDB will now put PRINCE2 and Scrum together. Thus the advantages of both the frameworks would be reaped by UDB. Focus of PRINCE2 is on managing projects through the stages having appropriate governance levels and the mandated



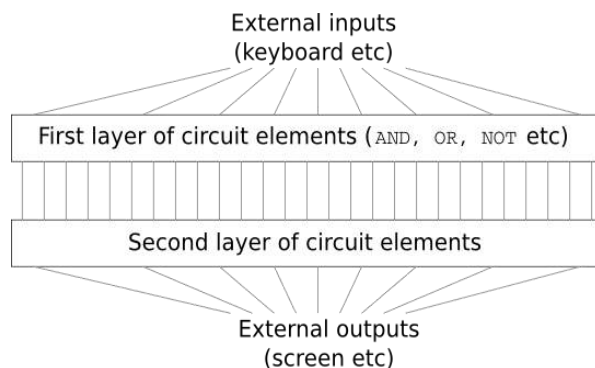
COMPOSED BY
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WHY ARE DEEP
NEURAL
NETWORKS
HARD TO
TRAIN?

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Imagine you're an engineer who has been asked to design a computer from scratch. One day you're working away in your office, designing logical circuits, setting out AND gates, OR gates, and so on, when your boss walks in with bad news. The customer has just added a surprising design requirement: the circuit for the entire computer must be just two layers deep:



You're dumbfounded, and tell your boss: "The customer is crazy!"

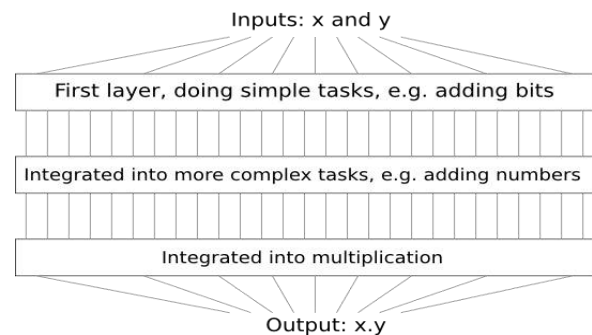
Your boss replies: "I think they're crazy, too. But what the customer wants, they get."

In fact, there's a limited sense in which the customer isn't crazy. Suppose you're allowed to use a special logical gate which lets you AND together as many inputs as you want. And you're also allowed a many-input NAND gate, that is, a gate which can AND multiple inputs and then negate the output. With these special gates it turns out to be possible to compute any function at all using a circuit that's just two layers deep.

But just because something is possible doesn't make it a good idea. In practice, when solving circuit design problems (or most any kind of algorithmic problem), we usually start by figuring out how to solve sub-problems, and then gradually integrate the solutions. In other words, we build up to

a solution through multiple layers of abstraction.

For instance, suppose we're designing a logical circuit to multiply two numbers. Chances are we want to build it up out of sub-circuits doing operations like adding two numbers. The sub-circuits for adding two numbers will, in turn, be built up out of sub-sub-circuits for adding two bits. Very roughly speaking our circuit will look like:



That is, our final circuit contains at least three layers of circuit elements. In fact, it'll probably contain more than three layers, as we break the sub-tasks down into smaller units than I've described. But you get the general idea.

So, deep circuits make the process of design easier. But they're not just helpful for design. There are, in fact, mathematical proofs showing that for some functions very shallow circuits require exponentially more circuit elements to compute than do deep circuits. For instance, a famous series of papers in the early 1980s showed that computing the parity of a set of bits requires exponentially many gates, if done with a shallow circuit. On the other hand, if you use deeper circuits it's easy to compute the parity using a small circuit: you just compute the parity of pairs of bits, and then use those results to compute the parity of pairs of pairs of bits, and so on, building up quickly to the overall parity. Deep circuits

thus can be intrinsically much more powerful than shallow circuits.



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WORDCLOUD
GENERATION
USING
PYTHON

A WordCloud (wordcloud or weighted list in visual design) is a visual representation of text data, typically used to depict keyword metadata (tags) on websites, or to visualize free form text. Tags are usually single words, and the importance of each tag is shown with font size or color. This format is useful for quickly perceiving the most prominent terms and for locating a term alphabetically to determine its relative prominence. When used as website navigation aids, the terms are hyperlinked to items associated with the tag.

WordCloud is a great way to quickly visualise chunks of words. From a data enthusiast perspective, a WordCloud generated from personal conversations makes a great gift. They are personal, simple to create and aesthetically pleasing.



Figure 1: Sample WordCloud

I have generated the cloud using python, with the package "WordCloud ". Packages required for doing this task are as follows:

- pandas
- numpy
- WordCloud

To get the whatsapp conversation as a text file, simply email the conversation to yourself. Steps to be followed for WordCloud generation:

1. Download the conversation from your email

2. Write a source code for extracting and pre-processing WhatsApp text data
3. Import the text file:
4. Split the message further into: name and original message
5. Saving the messages which are in the time column instead of message column
6. Delete rows where name includes an activity on group
7. Store the text in a variable
8. Remove stopwords if any (you can add more to this list)
9. Use a masked image to create good looking word clouds
10. Generate WordCloud using generate() method.

Source Code for WordCloud generation from Whatsapp Chat Data is as follows:

```

Sample.py
import pandas as pd
from PIL import Image
from os import path
import numpy as np
import matplotlib.pyplot as plt
from WordCloud import WordCloud, STOPWORDS
#Import the text file
df1 = pd.read_csv('whatsapp.txt', sep=r'[\ap]m', names=['time', 'message'], engine='python')
#Split the message further into: name and original message
df2 = df1['message'].str.split(":", expand=True, n=1)
df_all = pd.concat([df1, df2], axis=1)

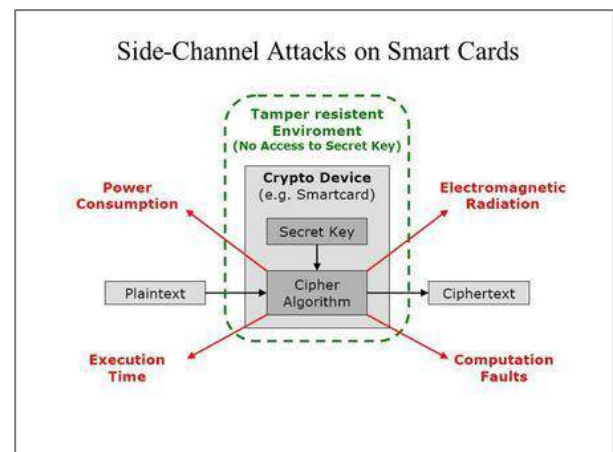
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IMPORTANCE OF
TIME ENCRYPTION
AS A
COUNTERMEASURE
TO SIDE CHANNEL
ATTACKS

Data security has a major role in the development of communication system, where more randomization in the secret keys increases the security as well as the complexity of the cryptography algorithms. The side-channel attacks are a class of physical attacks in which an adversary tries to exploit physical information leakages such as timing information, power consumption, or electromagnetic radiation. Since they are non-invasive, passive and they can generally be performed using relatively cheap equipment, they pose a serious threat to the security of most cryptographic hardware devices. Such devices range from personal computers to small embedded devices such as smart cards and RFIDs (radio frequency identification devices). Their proliferation in a continuously larger spectrum of applications has turned the physical security and side-channel issue into a real, practical concern.

In the recent years network security has become an important concern. Cryptography plays a vital role in the information security system against various attacks. Efficient and newer versions of cryptography techniques can help to reduce this security threat. The Advanced Encryption Standard is a strong symmetric key cryptographic algorithm which uses a number of table look ups to increase its performance. The Cache Timing Attack correlates the timing details for encryption under a known key with an unknown key to infer the unknown key.

It can be noted that a typical side channel attack on time can be avoided by encryption the time and masking it so that the attacker gets wrong timing information. Running a dummy for-loop or a thread sleep for a random time is enough to mask the timing data.



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IS THERE A
SIMPLE
ALGORITHM FOR
INTELLIGENCE?


There has been much debate about whether it's even possible for computers to match human intelligence. I'm not going to engage with that question. Despite ongoing dispute, I believe it's not in serious doubt that an intelligent computer is possible - although it may be extremely complicated, and perhaps far beyond current technology - and current naysayers will one day seem much like the vitalists. Rather, the question I explore here is whether there is a simple set of principles which can be used to explain intelligence? In particular, and more concretely, is there a simple algorithm for intelligence?

The idea that there is a truly simple algorithm for intelligence is a bold idea. It perhaps sounds too optimistic to be true. Many people have a strong intuitive sense that intelligence has considerable irreducible complexity. They're so impressed by the amazing variety and flexibility of human thought that they conclude that a simple algorithm for intelligence must be impossible. Despite this intuition, I don't think it's wise to rush to judgment. The history of science is filled with instances where a phenomenon initially appeared extremely complex, but was later explained by some simple but powerful set of ideas. Consider, for example, the early days of astronomy. Humans have known since ancient times that there is a menagerie of objects in the sky: the sun, the moon, the planets, the comets, and the stars. These objects behave in very different ways - stars move in a stately, regular way across the sky, for example, while comets appear as if out of nowhere, streak across the sky, and then disappear. In the 16th century only a foolish optimist could have imagined that all these objects' motions could be explained by a simple set of principles. But in the 17th century Newton formulated his theory of universal gravitation, which not only explained all these motions, but also explained terrestrial phenomena such as the tides and the behavior of Earth-bound projectiles. The 16th century's foolish optimist seems in retrospect like a pessimist, asking for too little.

Of course, science contains many more such examples. Consider the myriad chemical substances making up our world, so beautifully explained by Mendeleev's periodic table, which is, in turn, explained by a few simple rules which may be obtained from quantum mechanics. Or the puzzle of how there is so much complexity and diversity in the biological world, whose origin turns out to lie in the principle of evolution by natural selection. These and many other examples suggest that it would not be wise to rule out a simple explanation of intelligence merely on the grounds that what our brains - currently the best examples of intelligence - are doing *appears* to be very complicated. Contrariwise, and despite these optimistic examples, it is also logically possible that intelligence can only be explained by a large number of fundamentally distinct mechanisms. In the case of our brains, those many mechanisms may perhaps have evolved in response to many different selection pressures in our species' evolutionary history. If this point of view is correct, then intelligence involves considerable irreducible complexity, and no simple algorithm for intelligence is possible.



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TECHNOLOGY
INTELLIGENCE

About Technology Intelligence:

Technology Intelligence (TI), by definition, is “a tool to assist with long term strategic planning”. It helps to identify relevant strategic knowledge about the competitor’s technical position, size of effects and trends in the market. TI is also an activity that enables companies to identify the technological opportunities and threats that could affect the future growth and survival of their business. TI aims to capture and disseminate the technological information needed for strategic planning and decision making.

Companies actually install an Intelligence system to collect and analyze information on market, product and technology changes and on other environmental transformations in order to increase their decision-making quality and competitiveness.

Types of Technology Intelligence:

Technology Intelligence could be both internal as well as external. Internal technology intelligence is called technology audit. External technology is called technology mapping.

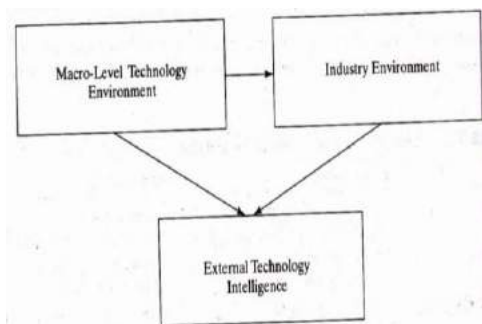


Figure: Mapping of internal and external Technology Intelligence

It is quintessential to map internal and external technology intelligence with each other. Mapping technology environment refers to the process of gathering external data and analyzing it to derive the intelligence for major strategic decisions. The process of mapping the technology environment consists of four interlinked steps:

1. Scanning the environment trends and patterns
2. Monitoring specific environment trends and patterns
3. Forecasting the future direction of technological changes
4. Assessing the current and future environmental changes for understanding their strategic and organizational implications

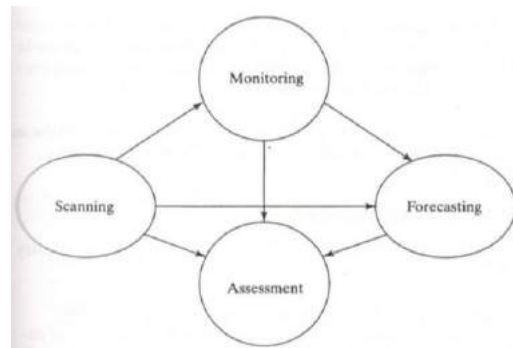


Figure: Process of mapping the technology environment

Applications of Technology Intelligence:

How Does it Fit with the Company’s Business Strategy

- a. Provides foresight into strategic activities
- b. Entering new business areas
- c. Acquiring new technologies

- d. Evaluating competitor's business moves
- e. Project guidance
- f. Developing partnerships

Example:

Computer Assisted TI: Text Mining

- A) Relies on unstructured or semi-structured data
- B) Term extraction takes place based on semantic based AI algorithms

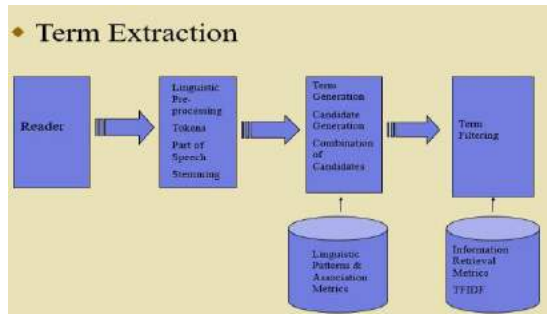


Figure: Term Extraction

Documents containing similar concepts can be organized together (Classification)
 Documents containing overlapping concepts can be placed together geographically (Clustering)

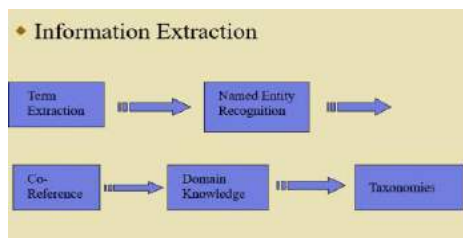


Figure: Information Extraction



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INTERACTING WITH THE ALUMNI

This semester, we had an opportunity to interact with one of the commended alumni that have graduated from the IT department at TCET. Mr. Pralam Shah, after completing his graduation, pursued his masters at the University of Illinois at Urbana Champaign and now works as Big Data Developer at Expedia. Following are excerpts of his interview, conducted over e-mail.

1. Elaborate upon the subject you chose to pursue for your Masters and what drew you to it?

I selected subjects mainly in the domain of Distributed Systems, Machine Learning, Data Mining and Information Retrieval.

I selected University of Illinois at Urbana Champaign mainly for the reason that it was the best public research university which had tremendous opportunities for me to learn about Distributed Systems. My passion and increasing interest to process Big Data in Real time was the main driving force for the selection of courses and my university.

2. How was the faculty at our college instrumental in your achievements?
How was the atmosphere at TCET?

Atmosphere at TCET was very positive in encouraging students to pursue higher studies. Teachers and faculty were very supportive and played an instrumental role for developing a strong desire and passion for Computer Science. I always got my due grades for my efforts and that was very motivational to develop a liking for what I was studying.

3. What are some of the things you've experienced at University of Urbana Champaign that you think should be inculcated into the system of education that you experienced while pursuing your bachelor's degree?

If I were to select one thing, I would opt for increasing opportunities for research

and exchange programs. Creating opportunities for students to intern outside the country or study in an exchange program in a university outside the country will give them right exposure of the outside world and would further develop a liking for research in them. We need more PhD's in our country.

4. Where did you stand with respect to what you wanted to do later on when you entered the field of engineering and how did the four year journey shape those ideas?

It was quite a journey. Coming from Diploma, doing Engineering was like going over all the concepts again with a new level of understanding and a different perspective. What I have learned through this journey is that, the hunger should never die. I don't think I'm even half done with what I aspire to achieve. With the technology developing each day and my domain being Machine Learning and Systems, every day is a new opportunity to learn and to get better at what I am doing. I aspire to complete my PhD (I am still a thesis away before I can achieve that) and complete a full Computer Science circle from Diploma to PhD.

5. What do you think should be done to encourage a more positive attitude towards higher education and research in colleges?

What is required is the exposure to the cutting-edge technologies being adopted in the industry and educating the students about the importance to be the best out there. Level of education has to increase; internship opportunities have to be in place. If the College manages to establish tie-ups with foreign universities, students would get that motivation that if they focus on research more, they can reach the best universities in the world.

6. What were your expectations while pursuing your masters? What kind of job profile or career did you

wish to pursue? What do you do now?

For me my main expectation from my Masters was only to learn as much as I could. As mentioned above, I wanted to learn more about Distributed Systems, mainly Hadoop, Spark and Storm. I aspired to be an open source committer and work towards writing my own Distributed Framework. I am happy that I am on the path, I have 2 papers published on Hadoop and I do open source commits for Spark. I work for Expedia in their Big Data Framework Service where I spend most of my time in creating highly scalable frameworks to ingest Terabytes of data and creating container pipelines to process the data and enable the Business to make decisions, all in real time.

7. You're a software developer working in Big Data, so if you have to explain it simply, what is it that you do?

I work for Expedia in their Big Data Framework Service where I spend most of my time in creating highly scalable frameworks to ingest Terabytes of data and creating container pipelines to process the data and enable the Business to make decisions, all in real time. Cloud adoption is the future and I mainly work to setting up the framework container on the cloud in a robust and scalable manner. I work with external partners mainly Facebook and Google to set up a real-time Bidding Framework to help make Bidding decision to target advertisements such that they generate increase in revenue.

8. What is the scope of distributed systems and big data in the near future of the IT industry?

Distributed Systems and Big Data processing is the future according to me. Everything revolves around data and how well you understand data. For that new and new technologies have to be created in a way that Data ingestion and Data Analysis is enhanced. Real time decisions are the

key and for that response time has to be as low as possible and that depends mainly on how optimally you store the data, something which is controlled by the Distributed Framework you select as per the data requirements.

9. What is some advice you would like to share with engineering students based on your own experiences?

“Always be hungry”, take Engineering as a career only when you’re passionate about it because if your heart is not in it, mind is not going to matter. Software Development is a field where we have to learn and grow each day, the hunger has to be there no matter how far you’ve reached in life. For me Software Development is a passion, I enjoy life, I visit places, I go to concerts but I also spend sleepless nights at work. For me it is not a 9-5 job and Weekends don’t matter because every day is a workday. This is only possible if you love what you do. Computer Science has bunch of streams, find what interests you the most and that is NOT going to be at the start of you journey but make sure you know it when you’re about to graduate because that is when it will actually start. Consider Engineering as an opportunity to learn and make most of your professor’s time because they love to teach you and you’re Smart only if you make the most of everything you have on your plate. Good Luck! Work Hard because there are no shortcuts!



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**A WORD
FROM THE
PARENTS**



IT -
IN THE INDIAN
CONTEXT

IT in India

Information technology (IT) is an example of a general purpose technology that has the potential to play an important role in economic growth, as well as other dimensions of economic and social development. It considers the unexpected success of India's software export sector and the spillovers of this success into various IT enabled services. Attempts are made to make IT and its benefits available to India's rural masses, e-commerce for the country's growing middle class. The use and impacts of IT in India's manufacturing sector, and various forms of e-governance, including internal systems as well as citizen interfaces have been immense so far. IT can have a special role to play in the growth and development simply because of its empirical characteristics that can be applied in current time. Particularly the recent continuing rapid innovation in IT makes it a dynamic sector. It can attract many aspiring candidates as a contributor to growth .

Present IT Scenario

In India the current IT scenario is very competitive as well as reviving. Every sector, it may be Manufacturing, Infrastructure, Pharmacy, Automobile , Banking, Education, Farming, Research-Development ,Health-hospitality, Environment, Communication, Travel, Share-Marketing has a dependency on IT Services without which their survival is difficult.

We can mainly classify IT sector in two parts.

Government IT-Sector

Private IT -Sector

The major Government's enterprises in information technology are, Software Technology Parks (STPs), Special Economic Zones (SEZs), Electronics Hardware Technology Parks (EHTPs), Export Oriented Units (EOUs), Export Promotion Capital Goods (EPCGs) etc.

Whereas Private IT -Sector consists of the areas of satellite based communication wireless, software development, IT-BPO, IT-enabled services, IT-enabled education, Optic Fiber cables, communications, Gateways, server farming etc. The top most IT companies in India are Tata Consultancy Services Ltd, Wipro, Infosys, and Satyam computers. Other than this IBM, HCL, Patni, Cisco, Cognizant, Polaris and many more leading IT companies are in India.

The top IT hubs in India are:

- Silicon Valley of India at Bengaluru
- IT-park-Pune
- Andhra Pradesh Industrial Infrastructure Corporation's IT-parks at Hyderabad and other cities
- Eastern IT hub at Kolkata.
- Software exporter companies are Chennai
- BPO/ITES sectors at Coimbatore
- IT and BPO industries at Mumbai, Jaipur and Bhubaneswar
- National Capital Region (NCR) consists of Delhi etc.

About future of IT in India:

Last 20 years performance and progress of Information technology in India clearly shows how India's economy is emerging in the world podium. India's revenue from IT-BPO is more than 50 billion US dollar, which is utmost in Asian countries. As per the IT experts' prediction, e-commerce the internet rebellion, is changing the world's business pattern. The Indian emerging economy is also threatening US and European countries; as they're fighting to resolve their debts caused by high unemployment and growing businesses by Indian conglomerates. Now Indian IT sectors are expanding their presence very fast & now moving towards middle east and Asian countries in these days.

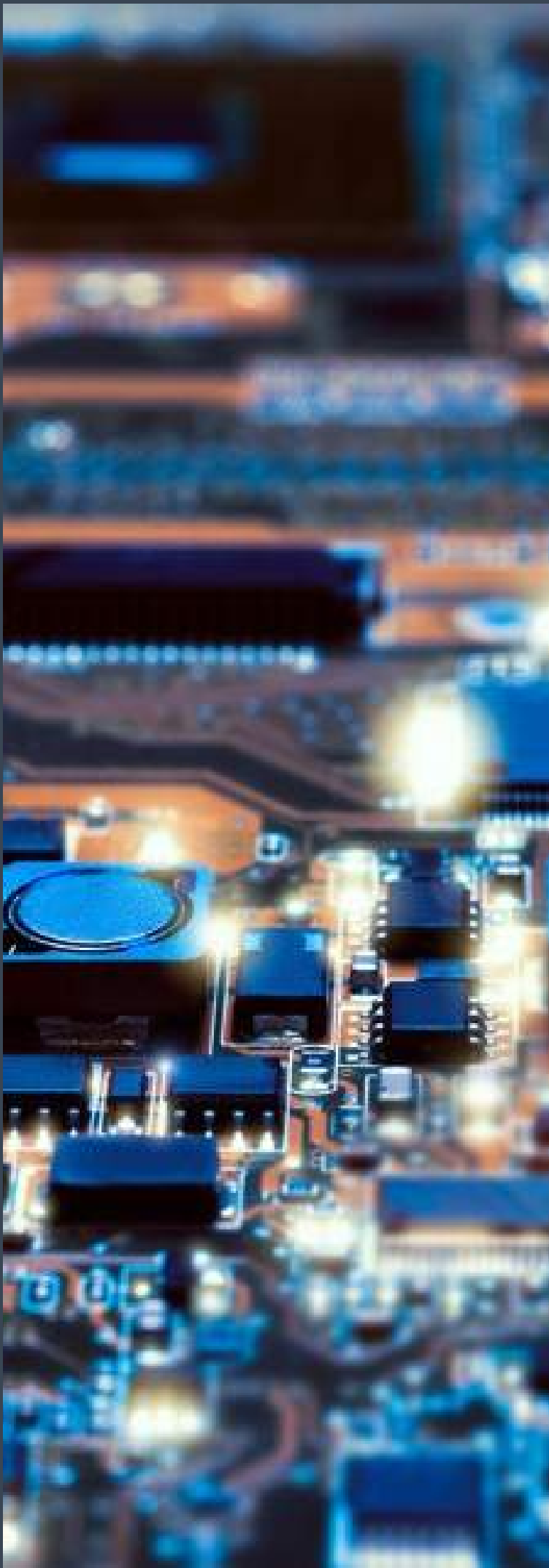
Infosys Chief N. R. Narayan Murthy recently said as the Indian IT sector is going to reach \$300 billion and also reduced the Foreign Direct Investment (FDI), science and technology is expanding in the fields of research and education in India. Many courses such as computer management, computer engineering, computer application, computer science are being offered through various institutions in India and abroad. The vigorous rising in IT features creates a hope to the students to be a part to perform and get a standard profession.

As far as the job opportunities are concerned the IT degree holders have better job opportunities There are many openings in private and govt. sector for various positions such as software programmers, hardware engineers, design engineers, web designers, system analysts, animators, webmasters, multimedia

creators, senior managers in IT companies. Nowadays many IT-enabled services companies are developing franchisees/companies in the areas like- web hosting , BPOs, banking, financing, entertainment, education, research, web science etc.



MOHAN LADUKAR,
IBM Global Services,
Father of Aniket Ladukar



INDUSTRY INSIGHT

The IT Industry is the single largest industry in the world in terms of resources, manpower and turnover. As a result, a good IT engineer is a great resource for any organisation. We had an opportunity to interview one such remarkable individual – Mr. Milan Tank, IT engineer and Junior Consultant at Capiot Software. Following are excerpts from the interview, conducted over email.

1. Why did you decide to choose IT engineering and what do you think about your choice looking back now?

Answer: My background had been of computer science in my junior college, it created a strong base for IT engineering. Due to which I could focus on extra-curricular activities and I did not have to put as much efforts as my fellow classmates. Due to the background, I was able to grasp easily. My interest for the subject kept me engrossed in the field and it helped me in various different ways. The choice couldn't be any better as I can't possibly think of any more suitable stream. My work doesn't feel like a burden because of the liking I have developed for the subject.

2. How did you manage to take out time for extra-curricular activities from the hectic schedule of engineering academics?

Answer: Schedules are never hectic unless planned wisely. Despite of being a dancer, I am an artist. I paint, I make movies. I am an actor, director and an editor. Of course I don't do all of these in a single day. Planning is very necessary when you know that you are highly occupied with your academics, passion, friends, hobbies etc. I

manage and plan my week which would have a good balance between the two. Weekends are the days when you can go off track, your mind is calm, and that's the good time to plan your schedule, to think about your future plans or to chill out with friends. Although, things don't go according to your plan sometimes but as someone said, hope for the best and prepare for the worst. It's always a good thing to keep a backup plan. If the things don't go according to the secondary plan as well, then simply go with flow.

3. You worked in the technical field for 1 year after graduation how was your experience? What positive aspects did you find in the industry?

Answer: It's said that theory learnt is rather not same as the practical field work; this was the foremost thing I experienced after starting the professional life. With the theory knowledge I could explore and learn so many new things that were not even in the books. Dealing and managing work with so many different people, although being a fresher I had vital roles in the assigned projects. These all contributed to the positive aspects of my work life.

4. How would you describe the corporate culture you work in now?

Answer: The corporate culture is very friendly which makes work fun and not a burden. Everyone is super straight forward and helpful, there are no superior feelings, we can directly approach to the director and it will not be a big deal. Team work has a new definition for me now, because people here are always on the same page as you. There is healthy competition which keeps a scope of growth alive. This working environment is a dream for many.

I feel fortunate enough to be a part of this amazing family of CAPIOT Software. I am here for a long run, enriching my life with the experience. As TCET says we should help, learn and grow, that's my exact motto right now.

5. How did you maintain the balance between family and having a career following your passion?

Answer: Maintaining balance becomes 10 times easier when you have super supportive family like I do. My family has not only supported me but also understood my passion and gave me my space to explore my dreams. Lucky enough my company is flexible and employee friendly around whom I can have time to do things I like. Weekends are very vital for me because this gives me time to spend with my family and loved ones, I take time off and plan for the future projects that I would want to commence shortly. The key to balancing everything is PLANNING.

6. What do you enjoy doing in your nonworking hours?

Answer: I engage myself with my hobbies. I meet friends. Working on me and bettering is what I do and is always my priority.

7. What message you would like to give to the newly graduated IT engineers before stepping into the industry?

Answer: After reading this interview it might feel like I have an easy to go life but the reality is slightly different than what it appears to be. Behind all the popularity and a good job is a lot of hard work and effort that was put which has helped me come a long way. Sticking to only what is assigned will not make you stand out, a

little more is needed to enhance your own shine and also to be recognized. I went a little further with my academics and did many more courses which helped me polish my skills and stand out of the crowd. It's important to have an external hobby which will keep you on toes and have a balance with academics and social life. Don't rush for the mediocrity, step up for the unusual.



MILAN TANK,
Junior Consultant,
Capiot Software



STUDENT ACHIEVEMENTS



OUR TOPPERS

ODD SEMESTER 2017-18

MITESH AGARWAL
FE IT A
GPA: 9.07



PRIYANKA SHARMA
FE IT B
GPA: 9.22



SEJAL CHANDAK
SE IT A
GPA: 9.62





OUR TOPPERS

ODD SEMESTER 2017-18

AMISH PUNMIYA
SE IT B
GPA: 10



PRIYANK SINGH
SE IT B
GPA: 10



SNEHA JAISWAL
TE IT A
GPA: 10





OUR TOPPERS

ODD SEMESTER 2017-18

VRUNDALI CHITRODA
TE IT A
GPA: 10



KIRAN YADAV
TE IT B
GPA: 10

RADHIKA GOKANI
BE IT A
GPA: 9.11





OUR TOPPERS

ODD SEMESTER 2017-18

ISHETA TILARA
BE IT B
GPA: 9.19



CONGRATULATIONS!



INTERVIEW
WITH THE
TOPPER

GATE – The Graduate Aptitude Test in Engineering is the gateway for admission to graduate and post – graduate programs in some of the most premier institutes in the country. Shubham More, a final year student has proven that he has what it takes by earning an all India rank of 1976 in GATE 2018. In the following interview, he tells us what preparing for one of the world’s most competitive exams was like and how he made it to the top.

1. Firstly, I would like to start off by congratulating you on your achievement. How does it feel?

It definitely feels good to have cracked the GATE exam in first attempt however it wasn't as much as I expected so I'm hoping to do better on my next attempt.

2. When and how did you start preparing for GATE? How did the IT department contribute?

I started preparing a bit late, around the last week of October and since the subjects were those which were covered during the initial years of engineering the teachers helped a lot in understanding and clearing the doubts several times.

3. How did you come to the realisation that you wanted to pursue higher studies post engineering?

Doing Masters was always the one thing that I had in my mind since I started engineering having heard that the post grad degree always teaches you a new way to approach things, it may be the research work that you do there or even the project and honestly who doesn't want to enjoy 2 more years of college life.

4. Keeping GATE in mind, which of the topics that the IT students learn in the four years of undergraduate studies, should they focus on?

Gate requires all the core subjects especially the ones which were done in the second and third year. I think subjects like algorithms, data structures, database, operating systems, computer network, Computer Organisation and architecture should be done thoroughly since the beginning when introduced in the Academics.

5. What is some advice that you would like to share with students who are aspiring to get into a prestigious institute for their higher studies?

Talking about prestigious institutes, getting all the good things in life is always difficult and has a lot of hard work associated with it. Once you've made up your mind what you want to pursue give it all that you have and never let any self doubt stop you from doing so because the only thing that limits us is our mind not our capabilities.



SHUBHAM MORE
AIR 1976
GATE 2018

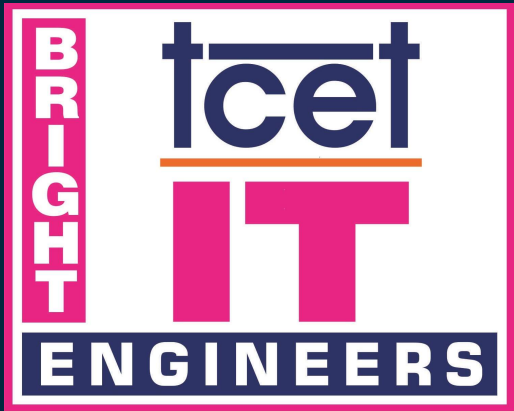
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DEPARTMENTAL

ACTIVITIES

ENGINEER

DEPARTMENTAL ACTIVITIES



ACTIVITIES FOR STUDENT DEVELOPMENT

ACM – TCET has conducted a workshop and a conclave to introduce students to the paradigms of ethical hacking, server – side scripting and use of Laravel and Hadoop frameworks. Students were provided with opportunities to interact with and learn from highly skilled individual in the domains of information technology and computing. Three seminars were also conducted under ACM TCET; One – to help students realize the importance of higher education and the steps that need to be taken for it, the second – to familiarize students with software defined networking, and the third – to introduce students to the basics of competitive programming.



TECHNICAL DEBATE



LARAVEL/HADOOP CONCLAVE



DEBATE ON DATA SECURITY ON CLOUD



TECHNICAL QUIZ COMPETITION



SEMINAR ON SOFTWARE DEFINED NETWORKS

INDUSTRIAL VISIT



An Industrial Visit for students of 2nd and 3rd year IT undergraduates was conducted by the ACM TCET to enable students to directly communicate with industry persons and understand the implementation and applications of the subjects that they study in their curriculum. The Industrial Visit lasted for 8 days, starting from January 3rd till January 11th, 2018. Over the course of this excursion, students visited the cities of Amritsar, Chandigarh and Delhi. At Amritsar, the industry visited was “Hansa Blanket Manufacturing” and at Delhi, “Software Technology Park India”. The experience was enriching for all students as everyone got to learn new things about the domain of Information Technology and its use in industry.



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Krupal Vora: Sponsorship Head
Gaurav Gupta: Treasurer
Advait Maduskar: Publication Head
Esha Vijayvargiya: HOC Student Coordinator

CODE OF ETHICS

The Department of Information Technology of TCET believes that IT Engineers make a direct impact on almost all aspects of Human Life for its betterment. IT engineers should strictly adhere to the highest principles of ethics of ethical conduct. In order to inculcate high standards in professional behavior, the department advocates the following code of ethics for all the students, Faculty members, & staff of the department.

1. Strive to be professional competent to provide high quality product & services.
2. To responsibly make decisions, minimizing hazards to society and to disclose potential factors that may be a threat to health and society.
3. Be fair to all individuals and not discriminate between individual based on religion, race, sex, age, disability, national, origin, etc.
4. Give credits to contribution of others viz. copyrights, patents, intellectual property.
5. Protect and respect privacy and ensure confidentiality of information whenever appropriate.
6. The Knowledge gained during the course of study will not be misused for carrying out any illegal activities, intruding and hacking of networks.