BITS & BYTES

CSE NEWSLETTER

VORTEX'15....

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Bits & Bytes

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Editorial

Amidst all the hype about placements and internships, the spirit of college life seems to have disappeared. When a new company knocks at our doors, we shift our focus on getting hired and nothing else seems to matter. Are jobs the sole purpose of our education and degree? Has real education lost its value?

The students do not have requisite knowledge about all the subjects in their curriculum and prioritize only on a few that determine their fate in the interviews. The Computer Engineers, who are the products of this process, may be an expert in their field but are unskilled in others that an engineer ought to know. Being faced with continuous rejections, the students develop an obsession for jobs, and not with the knowledge required for it!

Thanks to recession, there's a dearth of quality jobs that adds to their anxiety and forces them to face a do or die situation, while in fact , there are a lot more options available. The students tend to blame the educational system for including obsolete and seemingly irrelevant topics in the curriculum. But one has to realize that college provides us with the necessary skill set which acts as a foundation in the real world.

The system does, in fact, need to be updated to be more relevant to the present hiring market-place in terms of their present requirements and the latest technologies. The scarcity of recourses at the college level prevents the inclusion of the trending technologies as a part of the college curriculum.

What we CAN do is try to develop as much as we can in the areas we are passionate about along with the college curriculum to be on par with the IT world. Life doesn't always run its course in the way we   desire, Change is Evolution!

Prasann Dubey

Content Team

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Internet of Things

You've heard the term and probably read stories about smart homes where the toaster talks to the smoke detector. But what makes it all connect? When will it become mainstream, and will it work? These frequently asked questions help explain it all.

What is the Internet of Things?

There is no agreed-upon definition, but there is a test for determining whether something is part of the IoT: Does one vendor's product work with another's? Does a door lock by one vendor communicate with a light switch by another vendor, and do you want the thermostat to be part of the conversation? Here's the scenario: As you approach the front door of your house, a remote control built into your key unlocks the door. The door's wireless radio messages the network, which prompts the hall light to turn on. The house thermostat, which was lowered after you left for work, returns to a comfort zone. Everything is acting in concert, which brings us to the elegant definition of IoT by Paul Williamson, director of low power wireless for semiconductor maker CSR: "A true Internet of Things is coordination between multiple devices."

What makes the Internet of Things almost human?
In a word: Sensors. Many IoT devices have sensors that can register changes in temperature, light, pressure, sound and motion. They are your eyes and ears to what's going on the world. Before we talk about what they do, let's describe them. These sensors are part of a device category called a micro electro mechanical system (MEMS) and are manufactured in much the same way microprocessors are manufactured, through a lithography process. These sensors can be paired with an application-specific integrated circuit or an ASIC. This is a circuit with a limited degree of programming capability and is hardwired to do something specific. It can also be paired with microprocessor and will likely be attached to a wireless radio for communications.

Can you give an example of how IoT sensors work?
Here's the scene: You are away on vacation and the house is empty. A moisture sensor detects water on the basement floor. That sensor finding is processed by an app, which has received another report from a temperature sensor that detects the flow of water in the main water pipe.

That both sensors are detecting anomalies is cause for concern. A high rate of flowing water may signal a burst pipe, triggering an automated valve shutoff; a slight water flow might be a running toilet, and the water on the basement floor by routine leakage from a heavy rain. In either case, you get a machine-generated message describing the findings. Here's how you investigate. Via a mobile app, you get two one-time codes to unlock your front door, one for your neighbor and another for a plumber. When the door is unlocked, a text alert tells you who entered. Having knowledge of the condition of your home may be a big driver of IoT adoption.

How will IoT sensors work in public spaces?
Take parking. Cities are embedding sensors in on-street parking spaces from a company called Street line that can detect if a car is parked in one. Drivers looking for a parking space use the company's mobile app, which lets them know when a space becomes available. Street line has also added sound level and surface temperature sensors to help cities determine the best times to apply salt and use noise sensors to ensure compliance with ordinances. In the public arena, a smartphone can double as a sensor. In Boston, as people drive down a road, the phone's accelerometer sensor will keep track of Bumps. An accelerometer can tell up from down, but more precisely it measures acceleration. All it took to turn a smartphone into a road condition monitoring tool, was an app that used its existing sensor in a new way.

How do IoT devices communicate?

An IoT device will have a radio that can send and receive wireless communications. IoT wireless protocols are designed to accomplish some basic services: Operate on low power, use low bandwidth and work on a mesh network. Some work on the 2.4 GHz band, which is also used by Wi-Fi and Bluetooth, and the sub-GHz range. The sub-GHz frequencies, including 868 and 915 MHz bands, may have the advantage of less interference.

Why is low power and low bandwidth important in IoT?

Some IoT devices will get power from electrical systems, but many, such as door locks and standalone sensors, will use batteries. These devices send and receive small amounts of information intermittently or periodically. Consequently, the battery life of an IoT device can range from 1.5 years to a decade, if the battery lasts that long. One IoT maker, Instead, uses both radio and power line communication, which can send data over existing electrical wiring as well as via a radio, which it says will offer an increased measure of reliability.

What's the best wireless network for the IoT?

Today, no wireless technology has a dominant market share in IoT applications. Nick Jones, an analyst at research firm Gartner, said more than 10 IoT wireless technologies will "get significant traction" in IoT applications. These wireless technologies include cellular, satellites and new communications such as Weightless, which uses "white space," or unoccupied TV channels. More importantly, no one wireless technology will meet every need and circumstance. A connected car, for instance, will use a cellular network to contact your home network.

Can open source force the big vendors to play nice?

Open source advocates are hoping they can avert a fracturing of the IoT. The Linux Foundation, a nonprofit consortium, created the All Seen Alliance and released a code stack in late 2013 that can be used by any electronics or appliance maker to connect to another product. The alliance hopes that the sheer weight of adoption of this stack, called AllJoyn, will help to push the IoT toward open standards. AllJoyn is agnostic about wireless protocols, and support for Bluetooth LE, ZigBee and Z-Wave can be added easily by the community.

What's the worst case scenario?

That a true coordination between multiple devices never comes to pass. Vendors, initially, will build islands, closed IoT environments that only work with their products and those made by selected partners. Privacy protections may be treated loosely, with users forced to opt out if they don't want their home turned into a giant spy cam for marketers.

We haven't even mentioned things like Google Glass. Imagine a scenario where people agree to share live streams as part of a Neighborhood Block Watch. A surveillance state may arrive on a flood of good intentions. But the IoT has potential to make life more efficient, safer, healthier and environmentally friendly.

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3. P. Venkata Subba Reddy and K. Viswanathan Iyer, "Enumerating and Counting D2CS of Some Graphs," 15th *Annual Conference of Gwalior Academy of Mathematical Sciences*, December 12-14, 2010, New Delhi.

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Quantum Computing

A quantum computer is any device for computation that makes direct use of distinctively quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data.

In a classical (or conventional) computer, information is stored as bits; in a quantum computer, it is stored as Qubits (quantum bits).

The basic principle of quantum computation is that the quantum properties can be used to represent and structure data, and that quantum mechanisms can be devised and built to perform operations with this data.

N quantum computational operations were executed on a very small number of Qubits.

Research in both theoretical and practical areas continues at an unimaginable pace, and many national government and military funding agencies support quantum computing research to develop quantum computers for both civilian and national security purposes, such as cryptanalysis.

If large-scale quantum computers can be built, they will be able to solve certain problems exponentially faster than any of our current classical computers (for example Shor's algorithm).

Some computing architectures such as optical computers may use classical superposition of electromagnetic waves, but without some specifically quantum mechanical resources such as entanglement, they have less potential for computational speed-up than quantum computers.

The power of quantum computers Integer factorization is believed to be computationally infeasible with an ordinary computer for large integers that are the product of only a few prime numbers (e.g., products of two 300-digit primes).

By comparison, a quantum computer could solve this problem more efficiently than a classical computer using Shor's algorithm to find its factors.

This ability would allow a quantum computer to "break" many of the cryptographic systems in use today, in the sense that there would be a polynomial time (in the number of bits of the integer) algorithm for solving the problem.

In particular, most of the popular public key ciphers are based on the difficulty of factoring integers, including forms of RSA.

These are used to protect secure Web pages, encrypted email, and many other types of data.

Breaking these would have significant ramifications for electronic privacy and security.

The only way to increase the security of an algorithm like RSA would be to increase the key size and hope that an adversary does not have the resources to build and use a powerful enough quantum computer.

It seems plausible that it will always be possible to build classical computers that have more bits than the number of Qubits in the largest quantum computer.

Alumni Interaction

Coffee With Ajay Shankar Sharma

Mr. AJAY SHANKAR SHARMA is the alumni of NITT, pass out of 1996 batch. Apart from this he is the Founder of **Srishti Software** & an Entrepreneur too.

What was your experience in NIT Trichy as a part of CSE Department and apart from CSE Department?

My experience with CSE department was good. We learned a lot about principles of programming concepts not very specific to any language. That helped me remaining at the edge of programming even when newer languages came to market. Same way underlying concepts of Networking, OS, Compiler etc. kept me ahead of the crowd. My experience apart from Department of Computer Science and Engineering in NIT Trichy was a added Advantage to my career. NIT Trichy molded me up to peruse the dreams of my life. It gave great platform for enriching the entrepreneur in me. To me NITT is not a word but an Emotion that drives me.

Tell us about the inception of Srishti Software and the challenges you faced in its development.

The challenges faced in inception and growth of Srishti were many fold. However those challenges were not very specific to us. Those were generally faced by any new startup in IT space. Although there were many hurdles in the path of Srishti Software each hurdle turned to be a Stepping stone towards success.

How was your experience as a entrepreneur?

As an entrepreneur it is always roller coaster ride. When you are almost settled and feels at ease another surprise twist and turn awaits you. So journey is always fun but many times very scary also. As a whole it is awesome ride in a tide that I wish each and every one should take the taste in the flavor of it.

How has NITT helped you in reaching your current position?

Apart from regular curriculum that we underwent other co curricular and extracurricular activities helped in learning lots of skills related to taking initiatives and about dealing with other human beings. That came very handy and is very helpful. All the co curricular and extra curricular activities that were part of NITT showed me various ways to handle situations that turned to be most useful in my career. NITT served as major cause in me reaching this position. There was always some experience I had as a part of NITT that helped me out of difficult situations.

What is the role of NITT professors in shaping your future?

Their encouragement and their belief that we are good and good enough instilled lot of confidence in me to take on bigger challenges in life. Their guidance and approach towards life helped me out in making courageous decisions in life. They did not treat us as Clay to be molded but as a Tree to be nurtured, which indeed shaped us in our own good ways.

What are the various opportunities in CSE department according to you?

More exposure to real life issues and problems will bring extra edge to students when they enter professional life. In this world where Information Technology plays a vital role in computerizing each and every sector CSE Department gives the tools to build such a world which eases everyone's life style.

What message would you like to give for current batch of students?

Don't be scared of taking on new work and challenges. Repeating what already someone has done yields very limited results. Taking on something new and challenging moves you to new orbit where rewards and sense of fulfillment both are extraordinary. It is because trying out something new in life is always the key to success. Life is not running towards the direction every one runs, it is an experience of walking in a path that no one ever has experienced before.

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Volume 1, Issue 2 Crossword Solution

Gizmo Talk

G-Tech G-Speed Studio R Thunderbolt 2

The G-Tech G-Speed Studio R Thunderbolt 2 is one of the fastest storage devices on the market and ready to work right out of the box. It has a nice design with a great power-management feature.

With up to 24TB of storage space, the four-bay G-Speed Studio R Thunderbolt 2 is a top-tier storage RAID system. The G-Speed has a nice design, looking like a large Apple Mac Pro, and better power management.

As a RAID system that hosts four internal hard drives on the inside, the G-Speed is a bit noisy when working and, like its competitors, it's very expensive. It is available in 12TB, 16TB and 24TB capacities. But if you have already had the new Mac Pro and now need an ultimate storage device that's both superfast, enough to easily handle 4K video editing in real time -- and capacious, the G-Speed Studio R Thunderbolt 2 is an excellent option. The bottom line is, professionals who need a powerful storage device for their data-intensive tasks will find that the G-Tech G-Speed Studio R Thunderbolt 2 is an excellent investment

GoPro HERO4 Black

With the ability to capture 4K at 30 fps (4K30), the GoPro HERO4 Black allows you to move beyond HD when capturing POV style footage either wearing the camera or mounting it in a number of creative ways. For remote monitoring and operation, the camera is equipped with Wi-Fi and Bluetooth connectivity letting you pair it with a mobile device or the separately available Smart Remote. There is also a USB port for file transfer, charging, or to connect the included 3.5mm mic adapter. In addition to the bundled flat and adhesive mounts, the camera is also adaptable to a wide range of separately available mounts from GoPro and third-parties to accommodate just about any scenario imaginable.

KEY FEATURES:

- 2x Faster Processor than HERO3+ Black Edition
- 12-Megapixel Photos at up to 30 fps Burst
- Built-In Wi-Fi and Bluetooth
- High Fidelity Sound
- Auto Low Light Mode
- HI Light Tag
- QuikCapture
- Protune for Photo and Video
- SuperView

MATCHSTICK DONGLE

Mozilla, best known for Firefox, and a startup company Matchstick, has announced the Chromecast-like Matchstick HDMI streaming stick.

Just like the Chromecast dongle, Matchstick can be plugged into an HDMI port on a television or a monitor and it lets users stream content (movies, music, games, and more) over Wi-Fi. Apart from mirroring or streaming content from Chrome and Firefox browsers, users will be able to 'fling' content from Android and iOS devices via sender apps. Since the Matchstick project is still in the development stage, both Matchstick and Mozilla are seeking more developers to create apps, and have launched a developer program, apart from a "Matchstick for Apps" program for qualified developers, and providing prototypes to 250 developers.

Algorithm

The AVL Tree is named after the inventors Adelson, Velsky & Landis .

A tree in computer science is a data structure which is used to represent data in an efficient manner with respect to certain function complexities.

For instance, a search function in an array would take O(N) to traverse through the entire tree and make decisions of search. Sure, a binary search would do the job in O(logN) but this needs the array to be sorted as a pre-requisite.

This calls for a tree structure (binary) where we take an average of O(logN) to find any element as all keys smaller than the root key are stored in the left subtree and greater is stored in the right subtree.

However, in a worst case scenario, the keys could be inserted in a tree in ascending order (for instance), which would lead to a linear structure. In such a scenario, search and insert function complexities reach that of a common array or linear linked list, i.e, O(N). This completely overides the concept of a tree.

Thus, it becomes important to maintain the left and right subtrees at any point to be of almost same heights. This is called a height balanced tree. Keeping a binary tree height balanced ensures its property of a O(logN) search and insert operations.

An AVL tree is a height balanced tree which was developed by Adelson, Velsky and Landis. The concept is to maintain balance after every insert.

AVL trees maintain balance property after insertion in O(1) time. (constant)

The algorithm goes as follows:

♦ Insert the key into the existing balanced tree using binary search tree properties.

♦ Traverse up the tree from this inserted node, till a node with height imbalance is found.

[(Height of left subtree) – (Height of right subtree) > mod(1)]

♦ If no such node is found, the tree is balanced and insertion is complete.

♦ If an imbalanced node is found, call it the grandparent node (G) and its children along the path traversed will be called parent (P) and child (C) respectively.

♦ The next steps depend on the structure of G-P-C nodes.

♦ If they are arranged as L-L, perform 'Right Rotation' about G-P.

♦ If they are arranged as R-R, perform 'Left Rotation' about G-P.

♦ If they are arranged as L-R, perform 'Left Rotation' about P-C followed by a 'Right Rotation' about G-C

♦ If they are arranged as R-L, perform 'Right Rotation' about P-C followed by a 'Left Rotation' about G-C.

♦ This ensures the tree is in a balanced state.

```
if (balance_factor(L) == 2) { //The left column
  let P=left_child(L)
  if (balance_factor(P) == -1) { //The "Left Right Case"
    rotate_left(P) //reduce to "Left Left Case"
  }
  //Left Left Case
  rotate_right(L);
} else { // balance_factor(L) == -2, the right column
  let P=right_child(L)
  if (balance_factor(P) == 1) { //The "Right Left Case"
    rotate_right(P) //reduce to "Right Right Case"
  }
  //Right Right Case
  rotate_left(L);
}
```
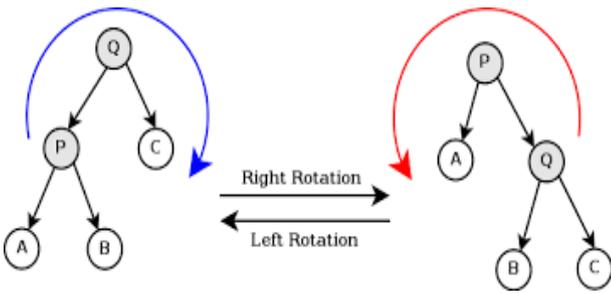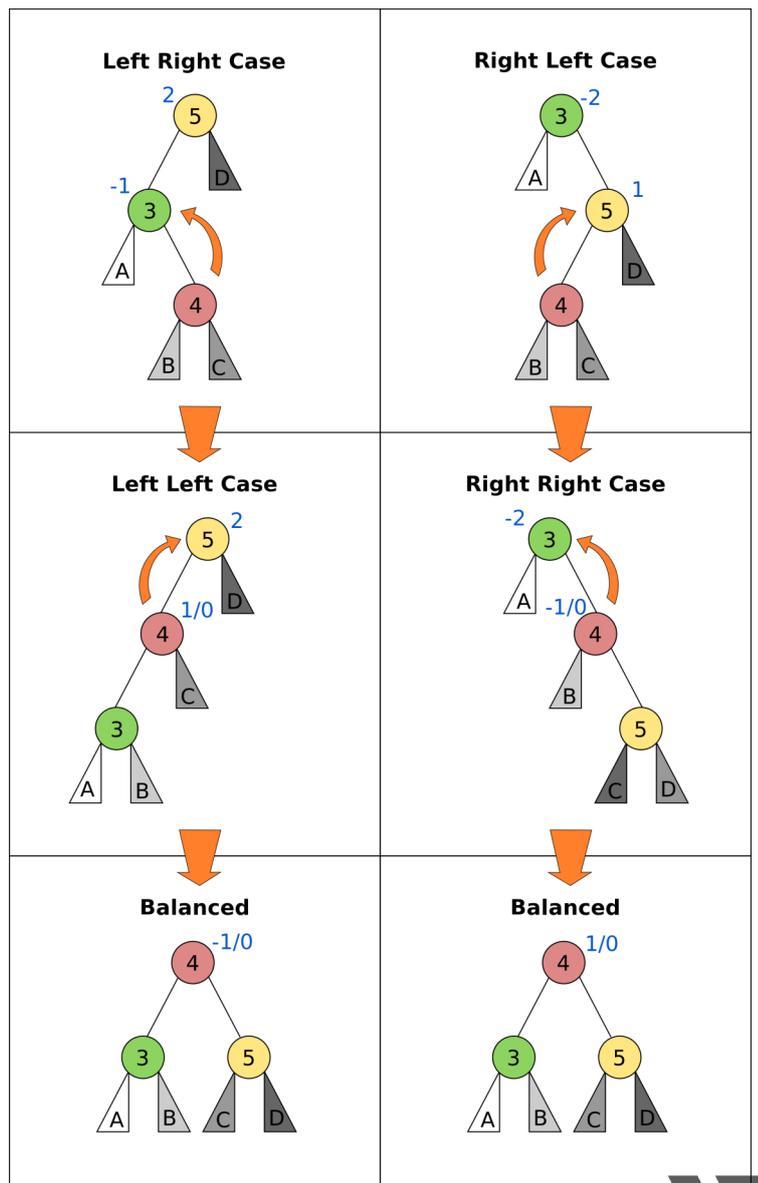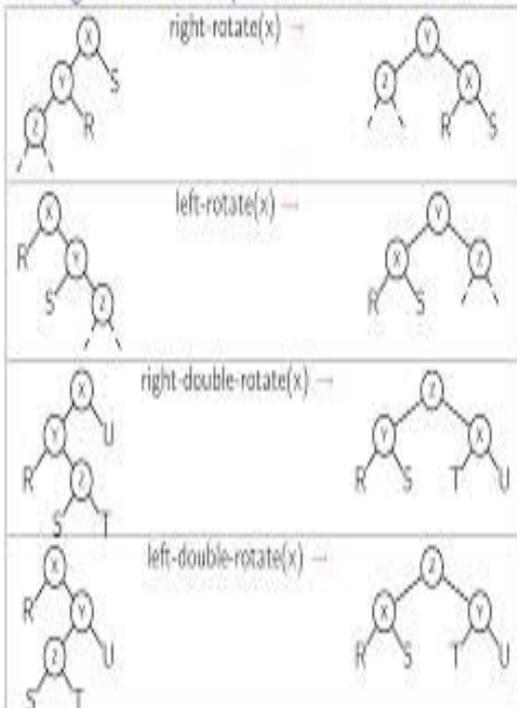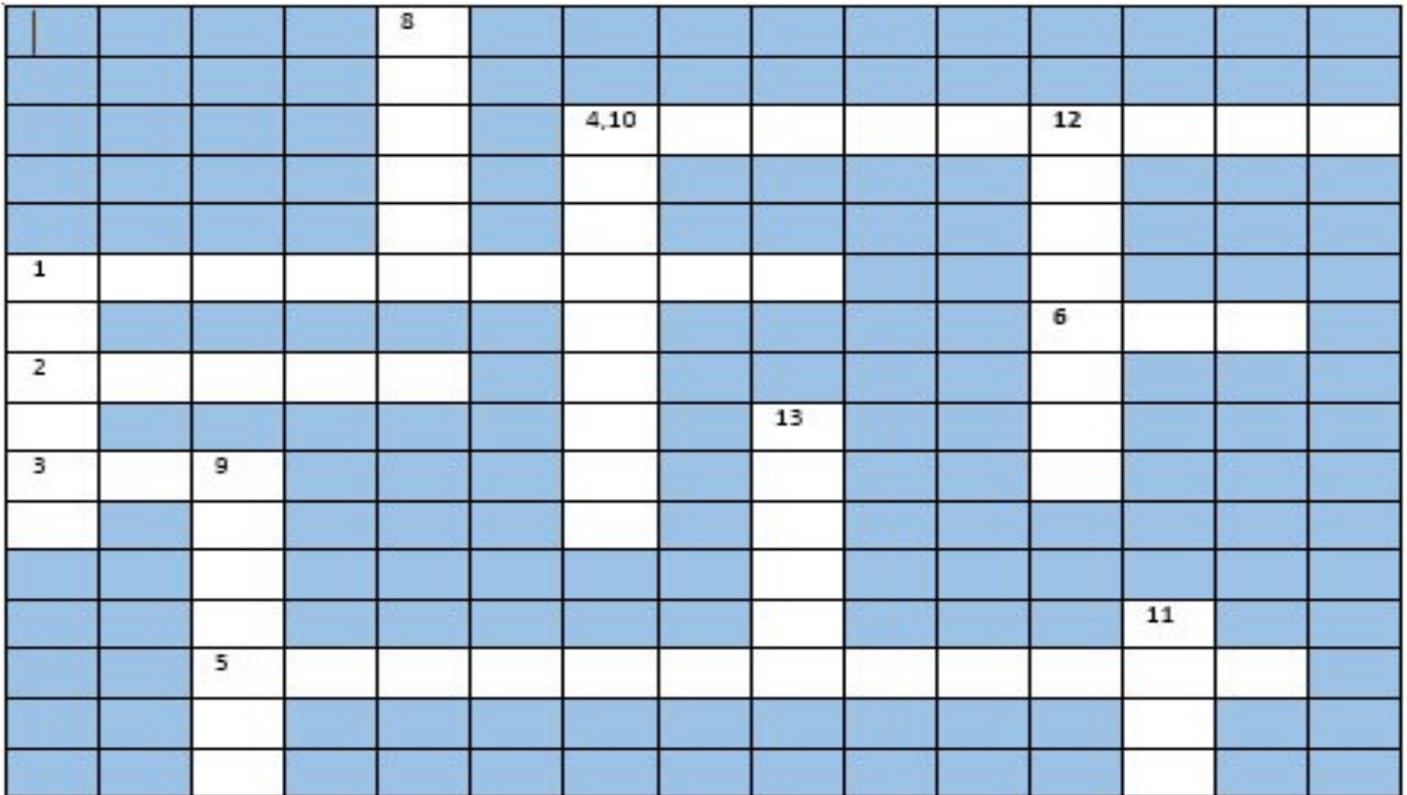
Crossword: Decrypt It

ACROSS

1. A way of communicating widely over short distances between electronic devices
2. A kind of memory used to make a computer work faster
3. A standardized connection for attaching devices to computers etc.
4. A program that finds and removes viruses from a computer
5. The process of partitioning a digital into multiple sets of pixels
6. A part of memory hierarchy

DOWN

7. A copy of files from a computer's hard disk on some external medium
8. A mobile computer consisting of a screen only, and controlled by touching the screen
9. A program like Firefox and internet explorer
10. A procedure that specifies a finite set of steps, that if followed give the solution to a problem
11. The internal memory of a computer
12. An electronic communications network that connects computer networks
13. To end a session at a computer

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