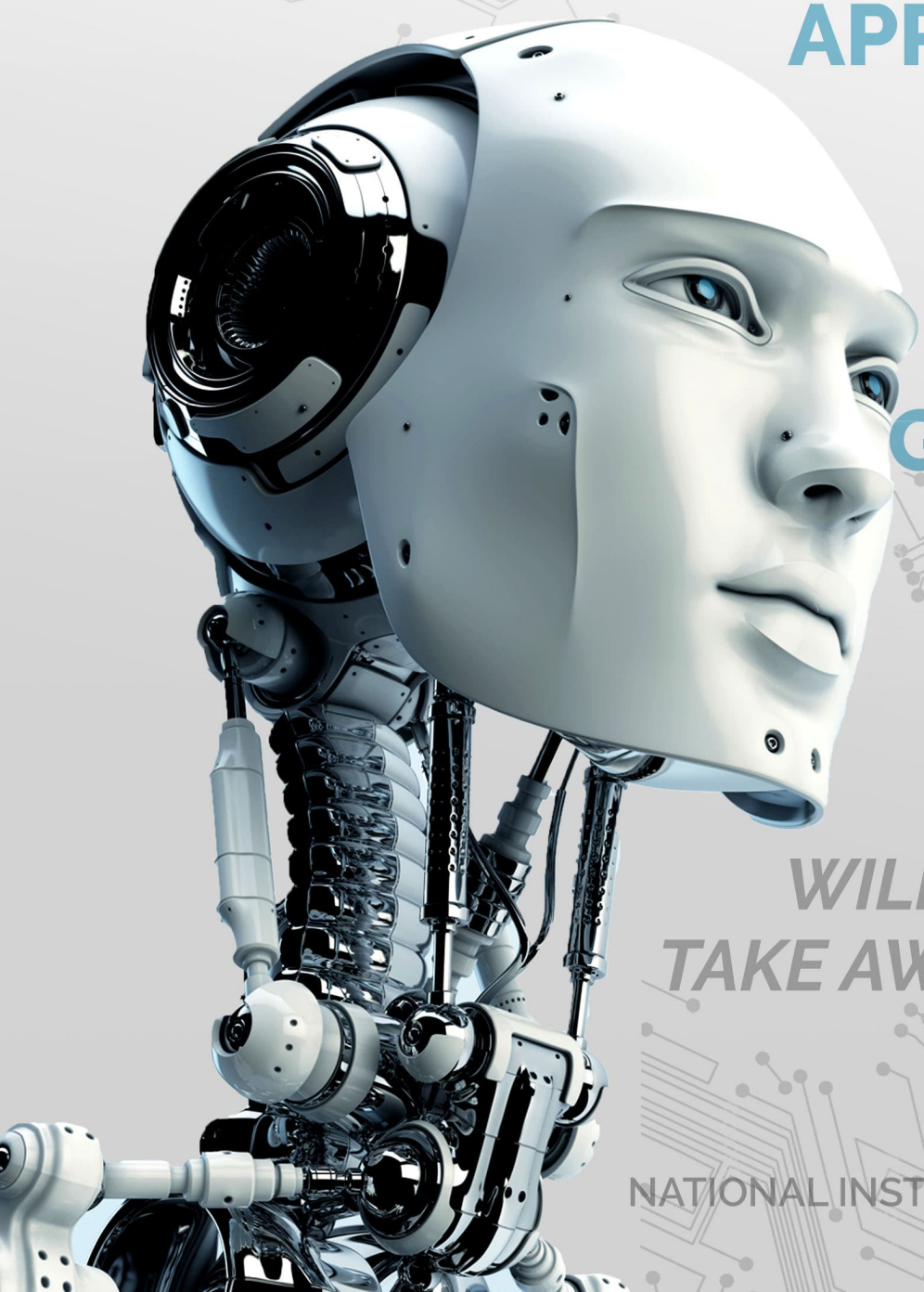
BITS AND BYTES

CSE NEWSLETTER

7th EDITION



INSIDE

APPLICATIONS
THE MACHINE LEARNING WAVE

GIZMO TALK
AMAZON ECHO

EDITORIAL
WILL AUTOMATION TAKE AWAY OUR JOBS?

DEPARTMENT OF CSE
NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI

TABLE OF CONTENTS

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EDITOR'S NOTE

The Department of Computer Science & Engineering, NIT Tiruchirappalli, is ranked among the top 12 departments for Computer Science in India. It is also regarded as a safe haven for VLSI students. Being the most in-demand programme, a lot of expectations rest on the faculty, infrastructure and courses offered. As a result, the programmes offered have matured into some of the most highly recommended in the nation.

The pedagogical pattern for teaching computer programming in NIT Trichy is designed in such a way that students are at the core focus whilst teachers are provided a realistic chance to inculcate a vast amount of knowledge in the students. The department intends to strive for excellence in the coming years via a balanced process, where innovation and tradition grapple for dominance.

Bits & Bytes, the newsletter of the department, hopes to project the same modus operandi, by presenting the latest news, research avenues, programming hacks and heart-warming stories of people in love with computer science.

In this issue, we hope to entertain and enlighten you with pieces ranging from a feature on Linus Torvalds to a comparison report on startups, a simplified slice on hashing and the elephant in the room, Virtual Currency.

With hopes that our efforts reach out and leave a mark

Striving for excellence
01100011 01101000 01100101 01100101 01110010 01110011!

Sachin Ashok
Content

WILL AUTOMATION TAKE ALL OUR JOBS AND KILL HUMAN THOUGHT?

-A SACHIN

So if robots take our jobs, what do we humans do?
This isn't the first time it's happening though. We've seen this before. Way back in the 18th and 19th centuries, came the Industrial Revolution and with it, manual labour automation. Farm workers were replaced by more efficient and cheaper machines, which not only did farm work in much lesser amount of time but also without basic human rights, minimum wage and sanitized living conditions.
Oh well, not that farmers had all that anyway.

As it turns out, we now stand at the cusp of a second major industrial automation. This time, the robots have come for all of our jobs. It's only a matter of time before even this article gets written by an AI and we'd have to go back to farming. Oh wait, they already got that, didn't they?

In fact, Narrative Science, a data storytelling software company does this on a regular, everyday-job-killing basis.
Read this excerpt,

'Friona fell 10-8 to Boys Ranch in five innings on Monday at Friona despite racking up seven hits and eight runs. Friona was led by a flawless day at the dish by Hunter Sundre, who went 2-2 against Boys Ranch pitching. Sundre singled in the third inning and tripled in the fourth inning ... Friona piled up the steals, swiping eight bags in all ...'

Well it's not exactly Pulitzer worthy, but it'll do for a news article. If an algorithm wrote your news article, how would you even know?
Quite disturbing, isn't it?

Well at least they can't pull any of that funny business with their vocal cords like singing, right?

Ugh…You might want to rethink that.
Ever heard of Vocaloids? No?
Then meet Hatsune Miku, Vocaloid 2 software.

Shipped and sold as 'a singer in a box', it's a singing voice synthesizer that comes in various languages and forms. You can just plug in the melody and type in the lyrics and tada!
Now robots can sing.
Quite well too since it uses synthesizing technology with specially recorded vocals of voice actors and singers.
Okay we get it already.

They've come for all of our jobs.

With autonomous vehicles now being tested by Google, resulting in only 11 accidents in 2 million miles of which none of them was due to automated vehicles but rather other vehicles driven by humans, the question of increased safety with machines has been well addressed.
So, safety- Check.

Humans have trouble making a single brass screw unassisted, but machines can churn out thousand identical ones every hour. We can't even make a single silicon chip that requires several degrees of precision and control that our meaty animal arms do not possess. Pretty simple job for a machine though.
Efficiency- Check.

If robots continue to tick all the boxes in the minds of the employer, why would anyone not prefer robots to manual labourers?
What many argue is that, on the flip side, automation has led to dulling of the human senses. While I'm not talking about lasting five minutes in the wild (we wouldn't), it does make a case for how automation is driving out human thought and bringing in machines run on algorithms to satisfy our every need.
How long till dependence on Alexa, Siri and Cortana lead us all to being purposeless zombies?
After all, evolution is a thing. Monkey see, Monkey do.

One example would be pilots growing accustomed to cockpit automation which results in degradation of psychomotor skills required to keep an airplane in the air. As a result, pilots can suffer what one expert calls “skill fade” of their cognitive and motor abilities, leaving them with a reduced ability to react intuitively when an emergency occurs.

Pilots have become computer operators.

I don’t know about you but I really don’t like the thought of a job description of a pilot that reads ‘You push buttons and stuff’.

That being said, the way I look at it is, is either we can fight it or accept that automation, artificial intelligence or just technology, whatever you want to call it, is here to stay and it’s on us to adapt and evolve like we’ve always done.

If robots can do these jobs better and safer, then we should let them.

When the industrial revolution happened almost two centuries ago, hundreds of millions of people didn’t just sit idle. But rather, automation created jobs for humans in entirely new fields.

People on fields and farms turned to factories and industries. Jobs like photographer, web designer, food chemist, sports journalism etc. suddenly saw a lot of influx.

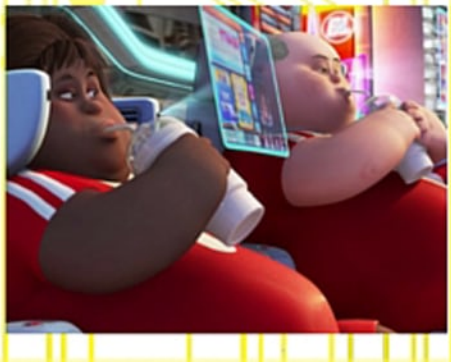
Nobody wanted to do the work of robots anymore. They couldn’t afford to.

This time the challenge is tougher. Artificial cognition, cheap sensors, machine learning, and distributed smarts have brought about smart robots assisting doctors flawlessly and drones shooting at will. Surely a lot of people will lose jobs.

I mean is killing any job for a human?

Jokes aside, it really isn’t a war against machines as much as it’s a war alongside machines for progress. Bright side of the whole thing would be to focus on what it means to be a human now. After all once the brain is figured out and we all go into an existential crisis that we too are based on an algorithm stored deep inside the grey matter, albeit a much more complicated one, we’re all going to be wondering whether we really are any different from AI and what our true purpose really is.

Now we can focus on more important things and find a way to still remain in control of our existence. Now it’s time to find what it is that you really want to do. Stand in queues for tickets, balance check books and run errands for the rest of your lives or get on with things that you really want to do?



2145 A.D.

SOMEWHERE IN CLOUD CITY, I AWAKEN FROM SLUMBER WITH A DEEP SEATED CONCERN. I ASK SEATED ON MY CUSHIONED TRANSPORTER JET PACK, SIPPING ORANGE JUICE

“SHOULDN’T I KNOW WHAT’S 27*19 TOO, CORTANA?”

WOMANLY ELECTRONIC VOICE WORKS CREAKS

“NO SA-CHIN, YOU DO NOT NEED TO KNOW BASIC MULTIPLICATION FOR TODAY’S SCHEDULED ACTIVITIES.”

SATISFIED, I GO BACK TO SLEEP, SIPPY CUP FIRMLY HELD ON TO

Do we need to evolve for a different world?

Yes.

SIRISHA KONATHALA
SHILPA SWETH

Alumni Interview

Year of passing : 2014
Curently: CEO & Founder
Followclass

Shavinder Singh

- Parth Thakkar

1. Please let us know about your professional journey through the years?

I joined Amazon as a software developer in July 2014. I worked for a team called Mozart, and made Amazon websites function in multiple langauges.
Then I joined a start-up Opinio as a software infrastructure architect to get some start-up experience.
In November, along with my friends from Amazon and NIT Trichy, I founded an edu-tech companycalled "Followclass" . It is in beta phase right now.

2. It's obvious that being an NITTian , academics is a must, but apart from that, what other things must you do in your college life to have an upper hand over your peers?

Do a lot of coding (smiles). Start taking part in various coding competitions on CodeChef, Spoj, Topcoder,etc from your second year or even before that.

3. Could you name a few of your hobbies or interests?

I like reading. Apart from that, I follow football, tennis, and cricket.

4. Who is your role model? And is there any theory, or quotes, you follow in life, or have done so in life-defining moments?

My role models would be Messi, Federer and Muhammad Ali.

I really love this quote from Messi -
"I start early, and I stay late, day after day after day, year after year. It took me 17 years and 114 days to become an overnight success"

5. What are your best college moments?

All of them. It is impossible to choose one. Every moment in the college was special.

6. If you had to do it all over again, what things would you do differently in your college life?

I would read more. Not just academics, but other things like knowing recent trends in Computer Science, new technologies, new start-ups etc. There are a lot of things happening in the world of Computer Science and you need to stay up to date with it.

7. What is the difference you have observed, between students of your batch and the freshers passing college these years?

I think they are more ambitious than us.

8. Keeping in view the contemporary corporate scenario, what else do you suggest a student to learn apart from the current syllabus?

Our current syllabus concentrates more on theory part, but we do not get enough chances to implement it, and in the chances we do get, we end up copying someone else's code (smiles).

So what I would suggest is implement the things which you have learned.
For example – if you are studying networks, try to send a packet from one place to other. When you do this, you will understand all the concepts properly.

Same goes with databases. Try to design a database for a student management system, think about different use cases and create the tables. You will understand everything about keys, joins, etc.

9. What would you look for, when in the position to hire new graduates?

I concentrate on fundamentals and confidence for new hires. They should be strong with all the concepts of computer science. I ask them to compare two data structures (generally linked lists and arrays). If the candidate explains it with the time complexity, then it's good, if he mentions the memory usage, very good. If he can talk about things like caching, it's excellent.

10. What are the goals of your life?

To build a successful software company.

11. Were you a part of any clubs in the college? Did it help in any way?

Yes, I was a part of "Aayaam, Hindi Cell Of NIT Trichy", and later became its President. And it was very helpful. For a job in big companies like Microsoft, Amazon and Oracle, your soft skills are really important. And these clubs do help in that regard.

12. Any words of advice to the students?

"Take your studies seriously."

Sirisha Konathala
Lakshmanaram N

The Machine Learning wave

Soorya Narayan

To get a computer to do something new, earlier, you had to program it. For the uninitiated, programming requires that you lay out in agonizing detail every step that the computer has to do to achieve your goal. This means that it's nigh on impossible to do get the computer to do something that you don't know how to do yourself.

This was the challenge faced by an Arthur Samuel, who in 1956, wanted to have his computer be able to beat him at checkers. But how can one specify instructions on bettering himself? He came up with the idea of having the computer play against itself thousands of times and learn how to play checkers.

Come 1962, this computer had beaten the Connecticut state champion.

The first big commercial success of machine learning is probably Google. They use a machine learning based algorithm on fetch information from all over the web. Amazon and Netflix use machine learning algorithms to suggest products and movies that you might like. It's borderline creepy when Facebook tells you about who your friends might be. These are algorithms that have learned how to do these tasks from large amounts of fed in data rather than being programmed by hand.

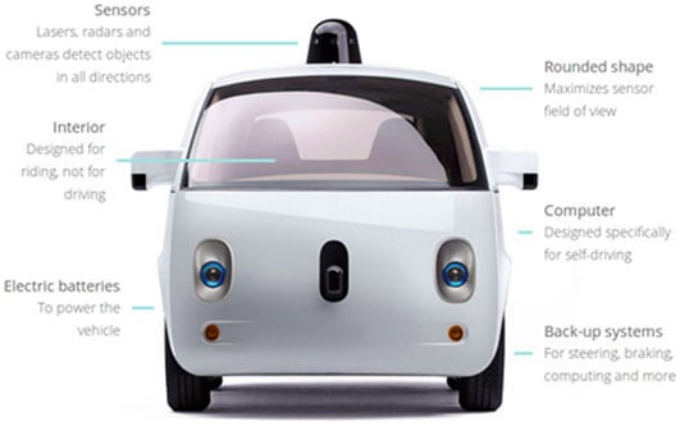
Machine Learning is also responsible for why we are now able to see the first self-driving cars. Problems like telling the difference between, say, a sidewalk and a pedestrian or a tree, which are pretty important as far as driving is concerned could not be solved by programs written by hand. However, machine learning made it possible.

Machine learning is an extraordinary concept. It involves algorithms modelled after the brain, that can seem to do almost anything, and as I have come to discover, it has also learned how to see. In a competition called the German Traffic Sign Recognition Benchmark, deep learning had learned to recognize traffic signs like the ones below. It could not only recognize the traffic signs better than any other algorithm; the leaderboard actually showed that it was about twice as good as people. Computers: 1 People: 0.

One of the most well-known projects in the autonomous driving scene is the Google Self-Driving Car that has had over a million accident-free miles on real roads already. The software powering Google's cars is called Google Chauffeur.

According to its website,

The car processes both map and sensor information to determine where it is in the world. The google car knows what street it's on and which lane it's in.



Sensors help detect objects all around the car. The software classifies objects based on their size, shape and movement pattern. It detects a cyclist and a pedestrian in this case.

The software predicts what all the objects around might do next. It predicts that the cyclist will ride by and the pedestrian will cross the street.

The software then chooses a safe speed and trajectory for the car. Our car nudges away from the cyclist, then slows down to yield to the pedestrian

"Does your car have any idea why my car pulled it over?"

One outrageous success of computer learning I came across was where a team from the University of Toronto won a competition for automatic drug discovery. Why was it outrageous? For starters they beat the algorithms developed the international academic and pharma communities. Secondly, nobody on the team had any chemistry or biology background. And did I mention that it took them just two weeks?

How did they do this? They used quite an extraordinary learning algorithm called deep learning. Deep learning is an algorithm modelled on how the human brain works, and as a result is an algorithm which seems to have no theoretical limitations as far as its potential is concerned. Simply put, the more data and computational time you give it, the better it gets.

Another mind blowing event in the machine learning world was when Google in 2012 announced that they had developed a deep learning algorithm, which on watching YouTube videos and crunching the data on 16,000 computers for a month, independently learned about concepts such as people and cats just by watching the videos. This is almost exactly the way that humans learn, not being told what they see, but by learning for themselves what these things are.

We are in the midst of a revolution.

When discussing the implications of Machine Learning, people can often be dismissive. Well, computers can't really think, they don't emote, they don't understand poetry. So what? Computers right now can do the things that most humans spend most of their lifetimes being paid to do. Now's the time to start thinking about how we're going to adjust our social and economic structures to ride this fast changing reality.

Aditya Balaji
Manjith Dungdung

Algorithms

-Parth Thakkar

Let's say you have to multiply 4 matrices:

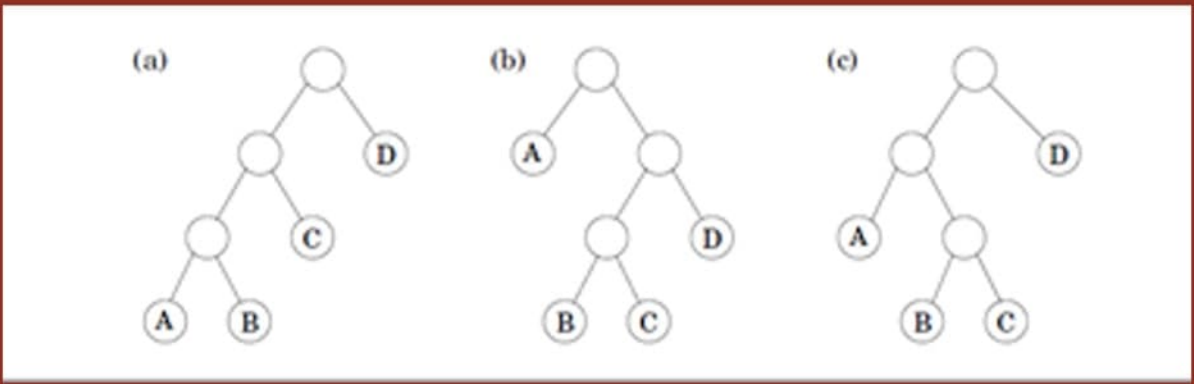
A_(10×20)×B_(20×30)×C_(30×45)×D_(45×10)

The final matrix will be of size . Let's consider different ways of computing the final product using the associativity property of matrix multiplication:

((A×B)×C)×D
(A×(B×C))×D
(A×B)×(C×D)

Clearly, all the above methods result in the same final product. However, let us find if all of them take the same amount of computation!
To multiply two matrices of sizes and , you need to do multiplications. Using this fact, the number of steps required for each of the above multiplications (cost) is computed in the table below:

Multiplication	Cost Computation	Cost
((A×B)×C)×D	$10 \times 20 \times 30 + 10 \times 30 \times 45 + 10 \times 45 \times 10$	24000
(A×(B×C))×D	$20 \times 30 \times 45 + 10 \times 20 \times 45 + 10 \times 45 \times 10$	40500
(A×B)×(C×D)	$10 \times 20 \times 30 + 30 \times 45 \times 10 + 10 \times 30 \times 10$	22500



Clearly, the positioning of the parentheses matters. So, if we can somehow find the optimum way to parenthesize our multiplication chain, we can even reduce the time required to compute the product. This is what we will explore here – how to place the parentheses, the right way.

Let's consider a general matrix multiplication chain:

$M_1 \times M_2 \times M_3 \ldots \times M_n$

The sizes of these matrices are $m_0 \times m_1$, $m_1 \times m_2, \ldots, m_{(n-1)} \times m_n$.

Now, a natural way to represent parenthesizing is to think of the expression as a binary tree. Remember expression trees? Same thing here. One way to find an optimal parenthesizing is to try all possible binary trees, and then choose the one with the lowest cost.

That obviously doesn't work for large n – the number of binary trees with n nodes is exponential in n.

Dynamic programming to the rescue! We can use DP here, since there is a nice recursive condition that must be satisfied – for a tree to be optimal, its subtrees must be optimal too.

What does a subtree correspond to in the actual multiplication expression? It's corresponds to a contiguous product like this:
$M_i \times M_{(i+1)} \times \ldots \times M_j$

Let C(i,j) be the minimum cost of computing this product. This product can be split into two products like this:

$(M_i \times M_{(i+1)} \times \ldots \times M_k)$
$\times (M_{(k+1)} \times M_{(k+2)} \times \ldots \times M_j)$

Thus, we can have a
recursive definition of C(i,j) as the following:

C(i,j)=min{ C(i,k)+C(k+1,j)+ cost of combining the two parts }

$C(i,j)=\min_{(1\le k\le j)} \{C(i,k)+C(k+1,j)+m_{(i-1)}\, m_j\, m_k\}$

Since our aim is to minimize the cost of the product, we essentially have to minimize C(1,n) – and now that can be easily computed recursively. The tree corresponding to that cost will give the required parenthesization. Of course, the base case of the above formula is trivial: C(0,0)=0. At the same time, C(i,i)=0.

To actually do the calculation, we need to maintain a 2D array of size (n×n). Each entry in it will store the cost corresponding to the corresponding i,j values. The algorithm is described in the following pseudocode:

Set C(i,i)=0 ∀ 1≤i≤n.
For size=1 to n-1:
  For i=1 to n-size:
    Set j=i+size
    Set $C(i,j)=\min_{(1\le k\le j)}\{C(i,k)+C(k+1,j)+m_{(i-1)}\, m_j\, m_k\}$
Return C(1,n)

The complexity of the above algorithm is O(n^3). This only tells you the minimum number of multiplications you need to do to multiply n matrices. With necessary modifications, you can also find out the corresponding positioning of parentheses. This does not, however, tell the result of the multiplication – although, it surely does make finding the result more efficient.

Sirisha Konathala
Ritul Jain

Amazon Echo

By-Rahul Kar

"Hey Dad! Why did you bring another bluetooth speaker?The Sony speaker is working just fine!" Harrison laughed."Cause it's no ordinary bluetooth speaker, son. It's much more than that." Wondering what it is?...
Its the new Amazon Echo guys.Heard of it?Yes ? No? Lets have a look at its features and get back to the father-son conversation.Oh by the way, it's John's birthday today and the Echo is his birthday gift.....
"So what exactly does this do?"
"Lets have a demo!
Alexa,what time is it?"
A sweet female voice replied,"The time is 8:23 p.m."
"Woah! Cool",exclaimed John."I want to see more"
"Alexa, who is the president of The United States?"
The female voice said "The weather in the Pacifica is 30 degrees celsius, mostly a sunny weather ....."
"Alexa,stop!"
"Now John, you have a try", said Harrison to his 20 year old son.
"Okay! Alexa, who was the Man of the Series in the 2015 World Cup?"
"The Man of the Series in the 2015 World Cup was Mitchell Aaron Starc"
"Wow! I didn't know his full name. This is awesome, Dad. What else can it do? Tell me everything."
"Okay! It's basically a wireless speaker and voice command device. It consists of speaker and voice command device. It consists of a 9.25-inch tall cylinder speaker with a seven-piece microphone array, weighing 1045 grams. As you have seen, the device responds to the name "Alexa". This "wake word" can be customized." "I think I'll stick to Alexa. It suits her voice",said John sheepishly.
Harrison burst out in laughter."Son it's a thing. Alright, coming back..
The device is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic and other real time information.
Like ...'Alexa, add pasta to my shopping list'"
"Adding pasta to your shopping list".
"The list is maintained in your smartphone. In a similar way, you can set alarms and loads of other stuff"
"Okay, now tell me where it gets all the information from?"
"Well, it's the cloud technology. Amazon Echo runs on Amazon Web Services(AWS) and requires a Wi-Fi internet connection in order to work. Anything else?"
"Of course, I have loads to ask. Can I experiment with it?"
"Go ahead and see for yourself," Harrison told his son.
"Alexa, will The Arrow defeat Damien Dark?" John is a big fan of the Arrow.

"I do not have any answer to that question." "Wow, it surely knows how to say no in the nicest way. How did it get that killer voice?"

"I do not have any answer to that question." "Wow, it surely knows how to say no in the nicest way. How did it get that killer voice?"

"Echo's natural lifelike voices result from speech-unit selection technology. High speech accuracy is achieved through sophisticated natural language processing (NLP) algorithms built into the Echo's text-to-speech (TTS) engine".

"And how does it catch our voices?"

"In the default mode the device continuously listens to all speech, monitoring for the wake word to be spoken. The device also comes with a manually and voice-activated remote control which can be used in lieu of the 'wake word'. Echo's microphones can be manually disabled by pressing a mute button to turn off the audio processing circuit."

"So it can be placed anywhere in the house and it will respond?"

"Yeah, but you need to raise your voice according to your distance from it. Or else you can speak into the remote. Well John, why don't you play a song now?"

"Alexa, play a Linkin Park song."

Harrison burst out in laughter.

....

'Playing a Linkin Park song from your playlist'...The Numb starts playing.

"Oh Dad, thank you so much for this awesome gift. I love Alexa...I mean Amazon Echo."

"Oh Dad, thank you so much for this awesome gift. I love Alexa...I mean Amazon Echo."

Harrison burst out in laughter.

After a week of using the Echo , Harrison asked "So son,you have used Apple's Siri and OK Google and The Echo.Do you feel any difference?"

"Oh I find loads of them! First and foremost, the voice. Alexa's voice is heavenly. It is not as robotic as Siri's. Secondly,it listens to whatever we say and returns the answer politely. Basically we all just want to be listened to and Echo does just that. And finally, Apple's Siri may be the poster child for this wide delta between voice assistant expectation and delivery, even as Google ramps up its own "OK Google" functionality on its ubiquitous search engine. Microsoft, meanwhile, has two takes on the voice assistant -- though Windows' Cortana has a low bar to overcome compared to the experience of yelling at your Xbox One. Moreover, I found that Echo offers weather and news from a variety of sources, including local radio stations, NPR, and ESPN .

In short, I just love her Dad! Err..it.",said John gleefully.

"I'm glad you do, son".....

Sirisha Konathala
Ritul Jain

Recent Events

Arvindmani

The field of Computer Science and Engineering is always abuzz with news, especially so with the exponential growth attributed to it. At the forefront of research and development in this field, lie exhibitions and expositions, taking place in an increasing number of places with increasing frequency.

The most recent of the significant ones was India Electronics Week, which started on the 11th of January and was held in Bangalore. It hosted co-located expos viz. The ElectronicsforYou Expo, LEDAsia, electronicsRocks, iostshow.in, Test & Measurement India and Raksha India. Being an international event, it aimed to promote the Electronics Industry in India, and was touted as an event "where the global electronics industry would come together – in India". In addition to the expos, many events throughout Bangalore were held with the same goal. These included conferences, panel discussions and workshops covering many branches, including the Internet of Things and LED lighting along with the technology driving and driven by it. It included India's first event trying to connect businesses and technical decision makers related to the use of electronics in strategic sectors including defence, aerospace and home-land security. A CEO Summit was also held, attempting to promote investment in these branches.

electronica India, an International Trade Fair for Electronic Components, Systems and Applications, and its sister International Trade Fair, productronica, which focuses on Electronics Development and Production took place on September 9th in 2015, with positive assessments from the exhibitors. The expo was particularly praised for its improvement in the visitor turnout and in the number of conferences and seminars. It is expected to be held again this year, on the 21st of September, in Bangalore.

The world's largest electronics expo, CES, ran its course in the first week of January and is still exciting the world. As with most editions, it acted as the unveiling stage for exhilarating innovations, including the Segway Advanced Personal Robot, presented by Segway, Intel and Xiaomi. The APR acted as both a hover board and an assistant, hiding while you ride and reappearing to serve you in a manner similar to a butler. Another notable product was the Cerevo Tipron, a cyclops projector robot seeking to find a place for projectors in the current mobile world. While the average projector stays rooted while we move out and about, the Tipron can be told to go around with an app, firing streaming video. Phaz (pronounced phase) rolled out its next product in the line of headphones without audio jacks. Staying true to its style, it uses the data port to play music, delivering far greater quality of audio. The latest improvement is the addition of the ability to charge your smartphone with the headphone's battery pack while playing music.

With Computer science and engineering not limiting itself to the world of hardware or electronics, several remarkable coding events were held over the course of the recent past. The most noteworthy include the CodeChef January Challenge, Hackerrank's 30 days of code(still in progress at the time of publishing) and the Real Data Contest for 2015. The college's technical fest, Pragyan, also held a hackathon in December with a theme of Digital India.

Aditya Balaji Lakshmanaram

Bits & Bytes now welcomes freelancers to send in their work to be included in the subsequent editions.

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