

bits & bytes

NEWSLETTER

5th
EDITION

DEPARTMENT OF CSE



NIT
TRICHY





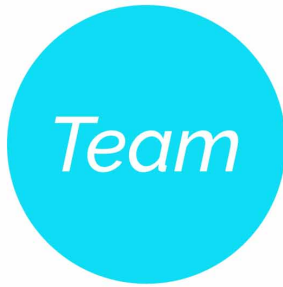
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EDITORIAL

The Department of Computer Science and Engineering, NITT is highly acclaimed in India and is justifiably known as one of the best in the country. Efficient teaching practices and methodology employed by the highly qualified faculty along with the ever enthusiastic and motivated students has resulted in successfully producing batches of students year after year who are capable of taking charge of enterprises of world renown.

The department has undergone several changes in the past to keep in par with changing methodologies and the requirements of time. The curriculum is regularly updated by taking in inputs of student requirement. Thus the Department strives to follow a curriculum on par with the ever changing technologies of the outside world. To cater to the needs of the students is its primary priority. Professors sincerely try to adapt to the changing requirement of the curriculum along with the needs of the variance of intellectual standards of the students. Presently steps have been taken for the First Year students to improve student – teacher ratio significantly, thus promoting the interaction of the students and the faculty and thereby helping the students in the various aspects of the college environment.

The department is proud of the standards and achievements of the students and the faculty. Thus through this newsletter, we aim to spread the news of the achievements of the department, the various activities and opportunities that is up for grabs for the students. The newsletter team is dedicatedly working towards reducing the gap between the faculty and the students. Revamping the newsletter this Issue, we intend to discuss the various research opportunities available for the students within the department along with those available in the outside world. It is in this attempt that we hope to motivate students to take an active interest in this chosen field. This edition is also released as a token of recognition to all the faculty in our distinguished department.

Striving for excellence.

Cheers!

Akhila Yerukola

Chief Editor

To those who feel "I don't think I'm cut out for coding"

Meet Milena Marchan, a 9th grader from Chicago, Illinois. An inspiration to people all around the world, to those who wonder how hard it is to code.

To them she says "If you are not into it because you think it's hard, that's not true. Before I tried it, I thought there would be a whole lot more to learn than there actually was. It can be really, really simple."

Milena's teacher says, "Milena raised the bar in the classroom. She's inspired many students to try to do better."

From the speed at which she ploughs through puzzles and problems, hardly anyone would notice the fact that she was born without an arm, from the elbow down.



Milena Marchan
9th grade
Chicago, IL

**That doesn't stop her from coding.
So what stops you?**

Little Snippets of Inspiration



Lindani Pani (top right)
Mentor at codeX
Khayelitsha, Western Cape

**He's breaking the shackles in
South Africa.
He's learning to code.**

To those who worry "I don't have enough resources to take up coding on a regular basis"

1%.

That's the amount of kids in developed countries that leave school with actual coding skills.

In Africa, divide that number several times over. You'd still not be able to do justice to the lost talent.

This story is of Lindani Pani, a coder in codeX and a full-time apprenticeship for growing African developers. He is currently mentoring a group of young aspiring coders through a JavaScript course on Codecademy. And also unravelling its mysteries through their native tongue, Xhosa.

Every day Lindani takes a minibus from his home in Khayelitsha, a township in South Africa, to come and teach. Three months ago, he was working as a salesman in a big box store (a supermarket) earning a measly salary of \$300, which was barely enough to feed his twin sons. In a year from now, he's looking at almost a 300% salary increase.

Back then he didn't know a line of code. But after joining codeX, in the first 12 weeks, Lindani has built a personal website, a blog, an app to manage money in group saving collectives known locally as stokvels, and an app to increase transparency and efficiency in minibus taxis--since he uses one every day.



Anudeep Nekkanti
Google employee
Samalkot, Andhra Pradesh

**To those who say “I don’t come from a top institute.
How will top companies find me?”**

When Anudeep Nekkanti, a 21 year old coder, hailing from Samalkot (a small town near Vishakhapatnam) landed an offer from Google, Zurich with an impressive package (1.44 Cr) and additional perks including relocation and travel, everyone wondered, “But how? He’s not an IITian, NITTian or BITSian!” or “Where was the coding culture in Anil Neerukonda Institute of Technological Science to facilitate his progress?”

His answer, was quite simple-

“What helped me get this job was competitive programming. That is all I did right from my second year till date. Whatever I could answer in interviews was because of what I learned for competitive programming.”

**If you make all the right noises & work hard for your passion,
Success will find you.**

Little Snippets of Inspiration

**For those who wonder “I’m not from a coding background.
How far can I go, honestly?”**

Kevin Systrom, CEO of Instagram, is a self-taught programmer unlike many others who embrace the coding field from an engineering background.

Kevin Systrom will probably go down in history as one of the greatest success stories of Silicon Valley, but more importantly, he will be seen as a great inspiration to budding coders without formal engineering training, in the years to come.

The success of Instagram, the largely popular photo sharing app, augments this enthusiasm of learning to code.

But how did all this happen?

Systrom explains on Quora:

“...The story starts when I worked at Nextstop. While I was there working in marketing, I started doing more and more engineering at night on simple ideas that helped me learn how to program (I don’t have any formal CS degree or training). One of these ideas was combining elements of foursquare (check-ins) with elements of Mafia Wars (hence the name Burbn). I figured I could build a prototype of the idea in HTML5 and get it to some friends. Those friends ended up using the prototype without any branding elements or design at all. I spent weekends working on improving the prototype for my friends...”



Kevin Systrom
Chief Executive Officer
Instagram

**Learn. Practise. Innovate.
And Repeat.
That’ll take you farther than
you’ve ever dreamed.**



MOMENTS WITH MRS. SRIDEVI

FACULTY INTERVIEW



How did your professional journey start?

When I was doing my masters, I got a placement offer from HCL. I also got an offer for the post of a lecturer in a college. I chose to be a part of the education system, as I wanted to kindle enthusiasm in young minds.



How has this decision affected your life? Have you ever regretted leaving HCL for a teaching career?

Never. This profession gives me satisfaction. I don't need to meet unreasonable deadlines. I find time for my family, and I can keep myself updated and perform research, all at my will.



Were you a part of NITT from the very beginning of your career?

After marriage, I started working at Shastra. Later, I shifted to NITT. I have been working here for around 6-8 years.



What are your subjects of interest and why?

Computer graphics is a fascinating field. It has a lot of scope and its applications are increasing in number.



You have been teaching students for quite a long time now. What differences do you find in the attitude of the students?

I feel that the new batches lack commitment, whereas the final year students are very dedicated towards their work. But I've noticed that the incoming batches are pretty knowledgeable about the advancements in technology. They use a lot of shortcut methods in their work, which in a way is good as it makes life easier.

FACULTY INTERVIEW



What is your level of interaction with the students?

I make time for students, even after class. They can come to my room and clear their doubts in academics. Apart from that, they can always approach me for any suggestions they require for pursuing their interests.



Do you have a role model?

Not really. I follow whatever I feel is apt for me.



What are your hobbies?

I love reading books and playing with my children. I have 2 kids-one of them is 7 years old and the other is 2 years of age. I like spending time with my family.



Is there anything else you would like to share with us?

I cherish the appreciation I get from my students. It gives me the reassurance that I made the right decision years ago in choosing teaching over a corporate sector job.



What do you feel about the students in general?

The students today are very talented and creative. I give a lot of thought-provoking assignments, and I really appreciate the innovative solutions they come up with. I don't just teach them, I also learn from them.



What is your message to the students?

Be committed to everything you take up. At the same time, enjoy the little things of life.

Practical Puzzle

“The Problems of
Puzzles are very
near the problems
of life.”
-Erno Rubik

Okay, we have a problem.
Bess and Jess, friends for 15 years, have always shared everything with each other- from classrooms to books, journals to diaries, lunch money to pocket money, crushes to secrets. Today they are Business associates, who wish to share Top Secret business information with each other helping to close a merger between two major players in the market. But here's the problem -The only way they can get the briefcase of documents to each other is through a channel controlled by a rival, Tess -a crafty minx ready to go to any lengths to foil the plans of these two soul sisters.

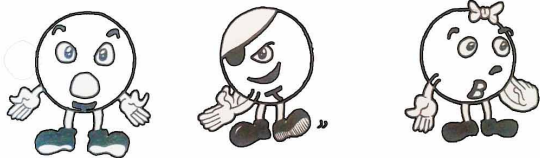


Bess and Jess have no way of communicating with each other, but they DO have a set of lock and key each to put on the briefcase. They can't send the keys over of course, Tess will make a copy and open it! So what should they do?

Bess and Jess, being the smart girls they are, eventually did get the job done, and the solution they found to the problem was quite simple too!

The case was successfully sent by Bess and opened by Jess in a total of three journeys by a dumb-struck and frustrated Tess.

Tess, unable to open it without the key, delivered it intact. Now at Jess' place, much to Tess' surprise, instead of trying to open the briefcase, Jess simply put her lock on the suitcase as well and instructs Tess to take it back to Bess. Confused, Tess makes her second journey back to Bess, delivering the briefcase intact, once again.



Unsure of what they'll do next, Tess hands the suitcase to Bess, who takes off HER lock and instructs Tess to take it back to Jess. Tess, understanding what the friends had managed to pull off, delivers the case to Jess, who opens her lock, and thus the briefcase, retrieving the documents.

This rather clever technique of double locks to prevent tampering is something that is employed in secure transfer of information today, such as the Hypertext Transfer Protocol over SSL, or HTTPS. This protocol is used for secure communication over the internet through HTTP secured with a layer of Transport Layer Security (TLS) or its predecessor, Secure Sockets Layer (SSL). Sounds like a lot of fancy words with fancy acronyms, right?

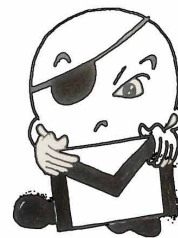
The important takeaway here, however, is that HTTPS provides bidirectional encryption and prevents man-in-the-middle (or Tess-in-the-middle) attacks much in the same way Bess and Jess' method of sending the briefcase did.



Take for example, sending a mail through Gmail.

1. First, your Laptop will try to create a connection with Google's servers. So it promptly sends an HTTP request for this.
2. The Gmail server, however, aware of Tess' lurking, sends back a request to create an HTTPS connection instead.
3. Now your Laptop receives this request, along with a certification that this request has indeed been sent to it by the Gmail server it contacted. Content with a more secure mode of transfer (obviously), your Laptop agrees to create an HTTPS connection.
4. The Laptop encrypts your Username and Password using one of Gmail's Public Keys. For understanding the HTTPS concept alone, picture all PUBLIC Keys as LOCKS and all PRIVATE keys as, well, KEYS. Public keys are available publicly, their corresponding private keys however, are retained by the laptop or the server.
5. Once this encrypted information is received by the Gmail server, it verifies the information using its own Private Key, and confirms the email log on.
6. Gmail sends the Email information to your laptop using your laptop's Public key.
7. Your laptop reads and decrypts the message using its own Private Key and thus, information has been successfully sent!

Better Luck next time, Tess!



COMPUTER APPLICATIONS

WASP

WINNING AND SCORE PREDICTOR

We have all watched cricket on TV at home, (or perhaps the mess during WC2015) with family and friends. Many channels broadcast cricket, but only Sky Sport (New Zealand) can brag about introducing score predictor tools. They used the WASP system for the first time in November 2012.

Introduced during an HRV cup Twenty20 game, WASP is a score predictor tool for a limited overs match, like One Day International (ODI) or T20. On expanding the abbreviation, we get 'Winning and Score Predictor', which is a tool that predicts the score based on factors like the ease of scoring on the day according to the pitch, weather and boundary size. For the team batting first, it estimates the final total. For the team batting second, it gives the probability of the chasing team winning.



The WASP tool is the brainchild of PhD graduate, Dr Scott Brooker and his supervisor, Dr Seamus Hogan from the University Of Canterbury (U C) in Christchurch, New Zealand. The two of them worked on it for four years after being requested by the Economics department to find an alternative for the controversial Duckworth-Lewis method.

Most people don't realise that the WASP system is grounded on the theory of dynamic programming. It compares data of previous matches, and estimates the probability of scoring runs and losing wickets in every possible game situation. It then works backwards to calculate the total runs or probability of winning in any given situation.

Dr Hogan describes the system as follows:

"Let $V(b, w)$ be the expected additional runs for the rest of the innings when b (legitimate) balls have been bowled and w wickets have been lost, and let $r(b, w)$ and $p(b, w)$ be, respectively, the estimated expected runs and the probability of a wicket on the next ball in that situation.

We can then write:

$$V(b, w) = r(b, w) + (p(b, w) * V(b+1, w+1)) + ((1-p(b, w)) * V(b+1, w))"$$

Simply put, the function to calculate the expected runs that will be scored has a simple recursive formula. Since $V(b^*, w) = 0$ where b^* equals the maximum number of legitimate deliveries allowed in the innings (for e.g.: $b^*=300$ in an ODI match), we can solve the model backwards.

The models are based on a database of all non-shortened ODI matches and T20 games played by the top-eight countries since 2006. The batting first model estimates the additional runs likely to be scored as a function of the number of balls and wickets remaining. The batting second model is a little complicated, but uses a similar logic. The batting second model estimates the probability of winning as a function of balls and wickets remaining, runs scored so far, and the target score.

Like the WASP system, there are many applications of various paradigms in computer science and programming that we may not notice right away, but once we do, the way we look at this world will change forever.

Algorithm

Range Minimum Queries

Consider the following problem: You are given an array A of N numbers and you are to carry out two operations on it:

- 1) Update a given range $[i,j]$ in the array – by adding or multiplying each element in the range with a constant factor.
- 2) Find the minimum element in a given range $[i,j]$

These operations are simple enough, and can be carried out easily. This problem wouldn't be interesting if the number of operations to be carried out is not large. Of course, one can solve the problem via brute force, but it won't be feasible.

There are some really neat methods to solve this particular problem. We shall look at one very interesting and wacky method. After that, we shall look at a related problem, and some of its applications.

This method might seem slightly bizarre if you haven't encountered anything like this before. The idea is to divide the array A into blocks of size $\lceil \sqrt{N} \rceil$. For each block, the minimum element in that particular block is computed, and is stored in another array $B[i]$, where $B[i] = \min (A[k] \forall A[k] \in \text{block } i)$.

For example, when $N=17$, we will have 5 blocks of size $\lceil \sqrt{17} \rceil=4$ elements each. Then, $B[0]=\min(A[0],A[1],A[2],A[3])$, $B[1]=\min(A[4],A[5],A[6],A[7])$, and so on. Thus, $B[4]=A[16]$, because in the 5th block, we will be left with just one element - $A[16]$.

Once this is done, operations of type 2 – finding the minimum in a given range – become easy. Let any range $[i,j]$ be given. For example, let's consider the range $[2,14]$. Now, we need to find the minimum in this range.

Algorithm

However, we already know the minima in the ranges [0,3],[4,7],[8,11],[12,15],[16,16] (from precomputation). Using this information, the minimum in the range [2,14] is given by

$$\begin{aligned} &= \min(A[2..14]) \\ &= \min(A[2..3], A[4..7], A[8..11], A[12..14]) \\ &= \min(A[2], A[3], B[1], B[2], A[12], A[13], A[14]) \end{aligned}$$

The time complexity to perform Type 2 operations using this method would be $O(\sqrt{N})$. The other operation – updation, will also have a time complexity of $O(\sqrt{N})$. However, there will be a precomputation overhead involved. This, being a one-time operation, is feasible, as its time complexity is only $O(N)$.

The above method turns out to be feasible in most real world applications. But there are better alternatives to this, for example the Segment Tree method, or the Sparse Table method.

Range Minimum Query is a widely studied problem, and has numerous interesting solutions. A related problem is finding the Lowest Common Ancestor of two nodes in a tree. It has been shown that this can be converted into a Range Minimum Query problem, and can hence be solved by the widely studied methods.

The Lowest Common Ancestor problem has also come up in various other fields – one of them being bioinformatics, where one often needs to find how closely two species are related. It also appears in the implementation of Object Oriented Languages. Such languages provide inheritance of objects, whose structure is analysed in various stages of compilation and execution using the Lowest Common Ancestor problem.

STARTUPS

Coupon-Dunia

"Hey Ravi! Look at this trendy watch. Isn't it cool? Moreover it is flat 50 off in Flipkart. It would be sad if I missed such an opportunity, isn't it?" ,asked Sam.

"Maybe not" replied Ravi,shocking Sam.

"Why don't you check with different sites before purchasing dude?",questioned Ravi.

"It's not possible for me to search each and every online shopping site for the best price",replied Sam.

"It sounds reasonable,then Why don't you try CouponDunia?",suggested Ravi.

"It sounds like a coupon selling site to me", replied Sam in a tone of mockery.

"You are partially right.It is India's leading budgeting website, that helps users find the best deals on various e-commerce websites, including the likes of amazon.in, Flipkart, Myntra, Zovi and Infibeam, including many others. For virtually every e-commerce store in India, they list free coupons and free offers that can be availed to save on a purchase.This start-up can truly be said as the most popular coupon website in India due to their focus on helping people save money",briefed Ravi.

"Wow!,so cool.",exclaimed Sam.

"Do you know about its origin dude?Your briefing about CouponDunia just kindled my interest to know more about it",asked Sam.

"Oh!great dude and let me tell you its history",told Ravi and started the history lesson.

"It was founded by Mr. Sameer Parwani,the current CEO of CouponDunia in the month of december in the year 2010 when he was living in Boston.The journey for Sameer was not easy at the beginning.Running a site for Indian consumers while in US came with a whole set of challenges. It was virtually impossible to hire people and impossible to meet clients. Even calls were tough due to the time difference. Moreover Sameer never lived in India, neither he visited India since 2004 nor he speaks Hindi.So he had to overcome the cultural issues too.Although he made a couple of websites until then, but no venture was as big and adventurous as this."told Ravi and made a pause to gain his breath.

"So how did he overcome these hurdles?",asked an impressed Sam who was becoming more and more impatient.

Seeing the level of interest shown by his friend, Ravi decided to proceed further with his elucidation. "But despite these issues he did really well. On the people front he hired contractors in the Philippines to add coupons. Sameer became virtually nocturnal to have as much time as possible to deal with clients.It then got to a point where it became clear that he needed to shift to India to allow CouponDunia to reach its full potential. So he finally moved to Mumbai in August 2012.Initially he had 4-5 employees which turned to become around 40 at present.He expanded his operations in 4 new countries.Going forward he planned to continue expanding it internationally. His domestic plans were to have a transition from distributing coupons that can be used only for online shopping to that of distributing coupons that can be used offline.CouponDunia almost have 10 lakh newsletter subscribers and over 1.7 million monthly visitors at present",briefed Ravi.

"Wow! Amazing! But how did Sameer get such a crazy idea dude? I mean it is nothing more than selling coupons",questioned Sam.

"Let me tell you how Sameer replied to a similar question:

"My colleagues and friends laughed at my idea. But I didn't lose hope,because good startups come from good planning ,but great startups are born of crazy ideas....""

Dude now devise a plan suitably and buy your TRENDY watch",told Ravi in a tone of authority.

GIZMO

TALK

ROOTING YOUR ANDROID

What is ROOTING?

The conventional definition of rooting is “attaining privileged access (root access) over various Android OS’s subsystems.”

What REALLY is ROOTING?

Rooting is the process of removing the limitations that the phone manufacturers set. Rooting gives the ability to tweak system settings, run specialized apps and perform actions that a normal Android user cannot.

Why ROOT your phone?

Boost Your Phone's Speed and Battery Life

With apps like setCPU (or any other CPU control app for that matter), you can overclock i.e. increase your CPU clock speed to more than your phone's capacity, increasing it's performance. You can also underclock, meaning decrease your phone's CPU frequency for better battery life. Rooting also enables apps like Greenify which can automatically hibernate apps you aren't using—perfect for those apps that always want to run in the background when you're not looking, drastically increasing the battery life.

Block Ads in any app

Ads consuming all your data? Ads wasting your time? Ads annoying you? Your solution, install apps like adblock, minminguard, etc. Of course, it won't work in your typical android. You need root access.

Remove Pre-installed bloatware

All the stock ROMs which are programmed by mobile manufacturers come with an awfully large number of stock apps. Example, Samsung comes with Samsung Hub, Samsung games, SHealth, SBrowser etc. They cannot be uninstalled like other apps (obviously). If you want to get rid of them, rooting is the only solution.

Flash a Custom ROM

This is one of the best benefits of rooting. A custom ROM is basically a different version of Android, which has a lot of features commonly not present in Stock ROMs. If your manufacturer doesn't upgrade your Android version, Custom ROMs are the way to get a higher version.

TRULY OWN YOUR PHONE

In the end, all of this boils down to one thing: you own your device, and you should be able to do with it as you please. Certain manufacturers and carriers try to keep that from happening, but with root access, you truly own your device and open yourself up to all the possibilities other parties try to block.

Is it SAFE?

Frankly speaking, NO.

With great power comes great Responsibility:

Is the allure of being a superuser tempting you? Android rooting opens up a world of possibility, but it also has considerable risks as mentioned below. Yes, when it comes to rooting your Android, you'll want to know the benefits as well as the risks.

1. You can turn your smartphone into a brick.
2. Your phone warranty may turn void.
3. Malware can easily breach your mobile security.

But in the end, one can't really put a price on total openness and control, can he?

How do I root my phone?

The answer varies for each phone model.

Rooting generally involves these steps:

1. Backing up ALL DATA.
2. Unlocking the Bootloader:

Bootloader is a program that determines which applications will run in your phone's startup process. Unlocking your bootloader will allow you to customize your device. Each manufacturer has a different way to unlock. Refer your manufacturer's website to know the exact steps.

3. Using Rooting softwares :

Few applications like OneClickRoot, TowelRoot, etc. are used.

NOTE: This method is not applied to all phones.

4. Using a Root Checker app:

This is the final step to check whether your phone is rooted or not.

XDA is a great source of knowing how to root your phone and flashing ROMs.

Can I unroot after Rooting?

YES.

For all the good that is rooting, you may want to go back to the way things were. SuperSU allows users to unroot phones by simply going into the app's settings and select the full unroot option.

-B.Prabakar

GIZMO

TALK

The QUIC Protocol

You may never have heard of it, and if you are a Chrome user, you have not realized that you are (currently) using it already. Google disclosed this weekend that about half of requests from Chrome to Google's servers are now served over QUIC.

So what is QUIC?

QUIC is Google's experimental, low-latency Internet transportation protocol over UDP, a protocol that is often used by gaming, streaming media and VoIP services. The name 'QUIC' stands for Quick UDP Internet Connection. UDP's (and QUIC's) counterpart in the protocol world is basically TCP (which in combination with the Internet Protocol (IP) makes up the core communication language of the Internet). UDP is significantly more lightweight than TCP, but in return, it features far fewer error correction services than TCP. This means that the sending server isn't constantly talking to the receiving server to check if packages arrived and if they arrived in the right order, for example. That's why UDP is great for gaming services. For these services, you want low overhead to reduce latency and if the server didn't receive your latest mouse movement, there's no need to spend a second or two to fix that because the action has already moved on. You wouldn't want to use it to request a website, though, because you couldn't guarantee that all the data would make it.

With QUIC, Google aims to combine some of the best features of UDP and TCP with modern security tools. On a typical secure TCP connection, it typically takes two or three round-trips before the browser can actually start receiving data. Using QUIC, a browser can immediately start talking to a server it has talked to before. QUIC also introduces a couple of new features like congestion control and automatic re-transmission, making it more reliable than pure UDP. It's reasonable to ask why Google doesn't just work on improving TCP instead then. The problem here is that TCP support is often built directly into operating system kernels — and that's not something Google has any control over. Google hopes to migrate QUIC into TCP and TLS if they prove effective. Given how many Windows XP installs are still out there, it's obviously not something that will happen overnight.

If Google designed a whole new protocol, then all of the machines that make up the backbone of the Internet would also have to understand it — but they already understand UDP.

Google says that it has seen about a three percent improvement in mean page load times with QUIC on Google Search. That doesn't sound like a lot, but you have to remember that Google Search is already about as optimized as possible. Other sites — and especially latency-heavy web apps — will likely see better improvements. Users who connect to YouTube over QUIC report about 30 percent fewer rebuffers when watching videos and because of QUIC's improved congestion control and loss recover over UDP, users on some of the slowest connection also see improved page load times with QUIC.

-B.Prabakar

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