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Issue #1

BLACKBOX

(your privacy)

Up In the Clouds

-Abhay Mitra

Cloud computing is all the rage. Be it cloud based storage services like Dropbox, online productive suites like Google Docs, mail clients like Gmail, or Platform as a Service providers like Heroku and Google App Engine, cloud computing has been instrumental in breaking the barriers of hardware, platforms and geography to provide a consistent, seamless experience across devices and platforms to the end user.

Cloud computing has also been a boon to startups and medium scale enterprises, who have benefited from the scalability, affordability and service guarantees that it offers, without having to invest in capital intensive infrastructure and a separate IT team. By bringing reliability and capabilities once limited to established corporations, within the reach of anyone willing to pay for it, cloud computing has levelled the playing field and lowered the barriers of entry to a capital intensive industry.

But while vendors like Amazon, IBM and Microsoft are trying hard to project cloud computing as the solution to most, if not all of the problems that IT managers face, things aren't nearly as perfect. Beyond the nebulous name, cloud computing has to deal with the same problems that have troubled system administrators for long. Here's what Ron Rivest, one of the inventors of the RSA algorithm, has to say about it,

"Cloud computing sounds so sweet and wonderful and safe... we should just be aware of the terminology, if we go around for a week calling it swamp computing I think you might have the right mindset."

The two main challenges that cloud computing faces is ensuring security and privacy. While one often accompanies the other, security and privacy are infact very different things.

The US government's infamous PRISM program, that Edward Snowden brought to the fore last year, is an example of a privacy violation that didn't amount to a security breach. This was made possible by Government laws which allow authorities to peek into data stored on the data centers used by service providers without a warrant, and without even informing the users who own the data.

Who owns my data?

This raises the question: Who owns the data generated in the cloud? Is it the person who creates the content? Is it the company on whose portal the data was uploaded? Or the company who owns the datacentre where the data is stored? Or does the government have the implicit control of all the data that lies under its jurisdiction? If so, what constitutes jurisdiction? As it turns out, the answers to these questions aren't simple. In fact, the best answer to these questions is probably "It depends". Rightly so, this answer doesn't inspire a great deal of confidence among internet privacy activists.

Dropbox is a cloud storage service. It allows you to store some amount of data on its servers, and access that data over the internet. On the outside, it looks like additional (cheap too!) storage space for the user. There is a difference though. Suppose you have a music album (pirated), and you decide to share it privately with a friend on Dropbox. Chances are, your friend won't get the songs and you might lose your copy too. Or be greeted with a copyright violation notice. While we do not condone sharing pirated files, the ramifications here are far greater. Is it okay for cloud storage providers to read your data? While it may not be a problem for a majority of users, this capability has been used in the past by authoritative governments to harass, and silence dissenting voices.

Businesses too, have had to bear the brunt of an ambiguous policy regime. Without clearly laid down surveillance laws, and with service providers having to comply with government orders in the interests of national security, businesses have been apprehensive about moving all but experimental, non-critical components of their IT infrastructure to the cloud. This is ironical, as proponents of cloud computing in its early days advertised it as the one-stop solution to the problems of scalability, energy efficiency, and maximizing effectiveness of available resources; problems faced mostly by businesses and IT departments in large corporations.

The Road Ahead

Privacy concerns relating to cloud computing were, for quite some time, the elephant in the room that everybody in the business knew about but did little else about. While companies are happy obliging to government requests and concealing their own less-than-sincere privacy policies beneath mammoth user license agreements, users were either blissfully unaware of the extent of privacy violations they were regularly subjected to, or chose to turn a blind eye, considering it the price they had to pay for availing the cheap or free services offered by the cloud.

Recent revelations about the extent of government surveillance, and a concerted effort by consumers and service providers in its wake has made so much clear: the subject of civil liberties and individual privacy merits a much wider debate than has been afforded to it in the past. Governments have rightly pointed out that a free Internet will be an impediment to national security, and a ripe ground for harboring illegal enterprises. Privacy advocates have responded with the claim that the Internet is notoriously hard to control, and that determined people (read *terrorists*) can always find a way around government regulations.

While governments across the world have pledged to bring in major reforms and comprehensive legislation governing privacy in the online world, there is still a long way to go. Companies too, emboldened by recent judgements and public support, have taken initiative to protect the privacy of the average user from government surveillance. Just last month, Google and Apple turned on, by default, encryption of user data on smartphones running Android and iOS respectively. Presumably so, US Intelligence agencies were not impressed, even threatening to take the companies to court on charges of hurting national security. This reaction, privacy advocates say, is yet another manifestation of the double standards that governments across the world have when it comes to supporting individual privacy and controlling the flow of information on the Internet. These double standards are precisely what supporters of online privacy and free Internet want governments to acknowledge and act upon. They believe that only a free Internet, with strong safeguards for individual as well as corporate privacy, can sustain and support the promises of a connected, cloud-first world. Optimists among them believe that the Internet of tomorrow will be a self regulating entity with minimal governmental interference and strong privacy safeguards for its users. Pessimists worry about the possibility of an Orwellian surveillance nightmare. All of them agree on one thing though, the fight has only just begun.

Jasper

-Ashna Srivastav

Tony Stark's J.A.R.V.I.S. needs no introduction. In the Iron Man movies, he uses fully functioning voice modulated Artificial Intelligence as an assistant. It manages the lights and security system in his home, orders pizza, pilots his Iron Man suits, and assists with his research. Some of this is still very much in the realm of science fiction, but not all of it. Inspired by the Iron Man movies, two Princeton students have built a J.A.R.V.I.S. for the real world.

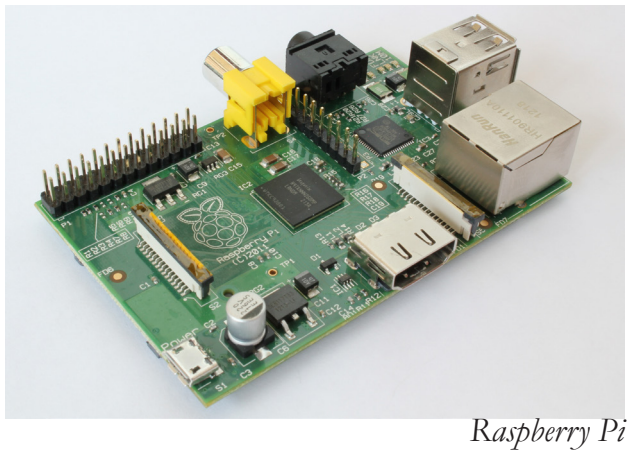
Meet Jasper, created by Shubhro Saha and Charles Marsh. "That was even the initial project name — 'J.A.R.V.I.S.' — until we decided that it was too unoriginal," says Charles Marsh. Instead, they now call it Jasper.

Certainly from the domain of science fiction, it may lead one to expect sophisticated systems, high functioning chips and a high expense, but no, Jasper has been designed especially for and built off inexpensive hardware, using the trendy SOC (System On Chip), the Raspberry Pi model B; a little computer that fits in your hand and is capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to word-processing, and playing games. Jasper runs on the Raspbian OS, a free operating system based on Debian, optimized for the Raspberry Pi hardware. All you need is an internet connection, a microphone and a speaker.

Although Jasper doesn't have the versatility of an AI such as J.A.R.V.I.S., it is a customizable and open-source platform for developing voice-controlled applications and is basically Siri's super cool cousin. Unlike Siri, it is not restrained to mobile devices and comes with a dead simple API (Application Programming Interface), and all of its software runs smoothly on the ARM processor onboard the Pi, so Android and even iOS applications can be run on JASPER.

Like most open source projects, Jasper stands on the shoulders of existing open source code. Much of the voice recognition system, for example, is built on CMU Sphinx (a group of speech recognition systems) and CMUCLMTK(CMU Sphinx Language Model Training Kit). Jasper also uses Phonetisaurus, an open-source library for diction and vocabulary that adapts to users' speech patterns for speech to text synthesis. For the interested, with a good knowledge of Python, Jasper offers a developer interface that lets outside programmers add new tools, modules and implementation that can be triggered by additional keywords, thus expanding and customizing its functionalities.

Say the creators, "Jasper already comes with modules to deal with things like time, weather, Gmail, playing your Spotify music, news (and what's on Hacker News) and knock-knock jokes. You can build your own modules to add more functionality. We're really impressed by how well-documented Jasper is; new developers should be able to get to grips with building on the platform very easily, and we're looking forward to watching what you guys get up to with it." "When we were planning out the Jasper vision, what we really saw was a platform



Raspberry Pi

for hackers: its beauty lay in its extensibility," Marsh explains. "Nothing excited us more than to see what other programmers could do with the device."

With its simple programming language, Python, and affordability, Jasper, the baby brother of J.A.R.V.I.S. can be a personal voice assistant, used for security in homes, in schools to teach children programming and be a useful companion for disabled people. For instance, it can read out the latest news, the weather or even inform a blind person about movements in the house, with the installation of cameras. It can be used to set alarms if an unauthorized person enters the house without a password to turn off Jasper's alarm protocols. Also, it may keep track of events in your calendar, record messages and lots more that is left to the imagination. All this can be done on the simple Raspberry Pi, and with voice activation. Jasper has an exciting future ahead of it as its applications are inexhaustible and limitless.

Bioinformatics

-Ankush Singhal

Computers and information technology have become indispensable tools for most of us. This is particularly true in biological research, where scientists are increasingly applying information technology to biological problems - a science called bioinformatics.

Bioinformatics is the application of computer technology to the management of biological information. Computers are used to gather, store, analyze and integrate biological and genetic information which can then be applied to gene-based drug discovery and development. Bioinformatics involves the integration of computers, software tools, and databases in an effort to address biological questions. Bioinformatic approaches are often used in major initiatives that generate large data sets.

Bioinformatics helps us visualize invisible structures such as proteins and to learn more about their work and function. This leads to insight into central questions of life: How do organisms function? How did life develop? How can new treatments against diseases such as cancer be developed efficiently?

Bioinformatics has threefold aims. Firstly, to organize data in such a manner that it becomes easy for researchers to access existing data and submit new data as it is produced. While data storage is an essential task for data management, any kind of data is practically useless unless it is analyzed. Thus, the purpose of bioinformatics is extended further because of data analysis.

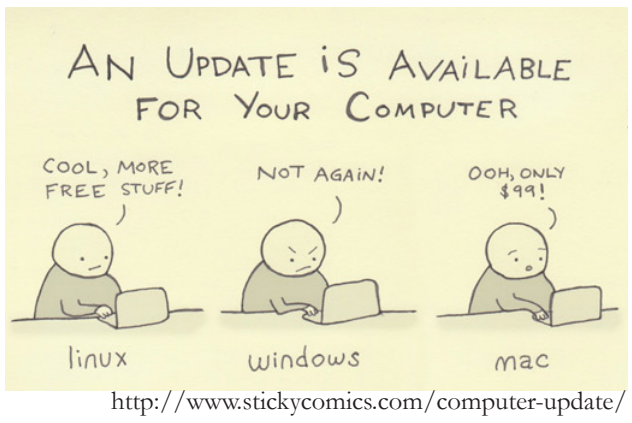
The second aim of bioinformatics is to develop systems and tools to analyze data properly. For instance, after having a particular protein sequenced, it is necessary to compare it with previously sequenced samples. Similarly, the determination of "important" nodes in metabolic networks requires efficient algorithms to calculate centrality in biological networks, along with better measures of centrality. Bioinformatics aims to develop such complex tools by using expertise in computational theory and biological understanding.

Thirdly, bioinformatics aims to analyze biological data through the use of complex mechanisms and convert the data into a biologically meaningful form. In traditional biological studies, examining individual systems and comparison with only a few related fields was possible. But bioinformatics has allowed global analysis and comparison of data made available from a variety of fields. Clearly, developing methods to assess the differences between various types of biomolecules and identifying similarities over a wide range of sources is an essential aspect of bioinformatics. This field, which was originally developed for the analysis of biological sequences, has now grown to encompass a wide range of areas such as genomics, gene expression, structural biology, etc. This has allowed bioinformatics to provide not only greater depth but also to add the dimension of breadth to biological investigations. This has essentially provided us with the opportunity to study individual systems in detail and compare them with others to reveal similar traits between some systems and detect irregularities. This leads to a better understanding and modelling of the system.

The need for bioinformatic capabilities has been precipitated by the explosion of publicly available genomic information resulting from the Human Genome Project.

The goal of this project – determination of the sequence of the entire human genome (approximately three billion base pairs) – was completed in the year 2003. The science of bioinformatics, which is the melding of molecular biology with computer science, is essential to the use of genomic information in understanding human diseases and in the identification of new molecular targets for drug discovery.

In recognition of this, many universities, government institutions and pharmaceutical firms have formed bioinformatics groups, consisting of computational biologists and bioinformatics computer scientists. Such groups are the key to unraveling the mass of information generated by large scale sequencing efforts underway in laboratories around the world.



http://www.stickycomics.com/computer-update/

Dream Big

Prof. Mausam teaches Artificial Intelligence (CSL 333) at IIT Delhi. He did his B.Tech in Computer Science at IIT Delhi. He then went on to do M.S. and PhD in Artificial Intelligence at the University of Washington, Seattle. He joined the IIT Delhi CS faculty as associate professor in 2013.

Q: How did you get interested in computer science as a career?

Mausam: In India, we often don't really have the luxury of choosing a field after getting interested in a subject. We get a rank and we choose the department according to it. Thankfully, in my case I was both lucky enough to get a high enough rank and at the same time I had computer science in school. I first had exposure to computers in 7th grade and in those days we would do BASIC, LOGO etc. and it was fun. In due course of time, in high school, I had a good teacher who taught me PASCAL and I enjoyed it. That suggested to me that this might be something I want to do. That said, at the time of taking the JEE, who knew what would have happened.

Q: Why did you choose engineering?

Mausam: I am not non-standard. I was interested in science and the question after tenth is whether one is interested in math or not. I really loved math, so engineering seemed a natural fit. In our days, there was very less exposure to these fields. Our first access to the internet was in our second year. We were almost in the pre-Google era, so naturally what it meant was that when I was preparing for the JEE, I didn't really know about various engineering fields deeply. But people who knew me suggested that I should do engineering because I liked math, so I went with that.

Q: What created a passion for AI in you?

Mausam: When I was studying at IIT Delhi, I happened to not take the AI course. However, in my first semester at grad school, I took the AI course and aced it. There was a chess competition where we had to create a chess player and compete with other teams and our team won it. There was a grudge match with the finalists too and we still defeated them. That gave me some reinforcement that I was good in this field. Gradually I took more advanced courses and then started doing a research project and I got more and more excited.

In retrospect I think I was lucky and ended up making a great choice. When we starting working in a field we don't necessarily realise its depth. This was definitely true for me and at the time AI seemed just an intellectual attraction - not something I was too passionate about. Another reason is that I was neither too theoretical, nor was I much into hacking or coding large systems. I was somewhere in the middle where I wanted to be intellectually and theoretically engaged in addition to being motivated by the final impact of my work. Somehow AI just seemed right for this balance.

Q: Tell us something about your current research.

Mausam: I am broadly motivated by the idea of creating intelligent machines in the context of specific applications. My two main application areas at the moment are language and crowdsourcing. In the context of crowdsourcing we tend to see how we can optimize a crowdsourcing platform to the best of its throughput. The optimization includes finding the right workers for the right questions, allocating these questions dynamically to them, tracking the quality of each worker, and trying to use their output for larger tasks like training a machine learning system.

In the language field, I have been looking at the information that is present in text and how can we extract, summarize and present that information to a user in query directed fashion. We can think of this as a kind of "Google 2.0", where we search for a query and it gives us an answer or a list of answers instead of taking us to the place where an answer may be found. In order to do that, the machine has to do a much better job of reading the text.

Q: Where do you see the field of AI in near future? Which branch of AI do you think will flourish the most?

Mausam: AI starts from a single philosophy and everything else is just its application to different problems. At the moment the one branch that has flourished the most is machine learning, as it is widely applicable to language recognition, vision, biology and robotics. But in due course of time, different components of intelligence are going to come together to create an "integrated system" and will exude stronger, more intelligent behaviour. These integrated systems will hopefully become more and more a part of our lives.

Q: You did your bachelor's from IITD. How has the CS department changed over the years? How has your experience been with the students at IITD so far?

Mausam: It's a hard question, because I saw IIT Delhi as a student and now I'm seeing it as a faculty member. So my experience and exposure is very different. The one thing that I can definitely say is that the students today are much more aware. They are much more confident in their ability to get large softwares working and they are also very good at reading research papers. I personally find that students today are smarter but people tell me that the students are theoretically weaker, although this is not what I have experienced yet.

Q: What are your other passions and hobbies?

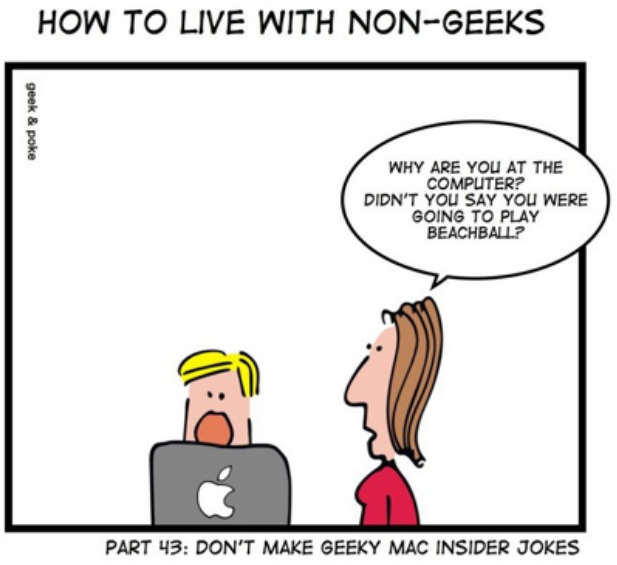
Mausam: I have a second life as an Indian classical music aficionado. I enjoy playing and listening to classical music. I also help students once in a while in preparing group songs. I am excited that I briefly helped the IITD team prepare for the eastern group song in Rendezvous and we won! Apart from that I do a little bit of cooking, watch cricket and enjoy cinema .

> *"My general message to the students is to dream big."*

Q: What is your message to the students of IIT Delhi?

Mausam: My general message to the students is to dream big. Graduating students often get very excited about the highest paying jobs. While I sympathise with that point of view given that a lot of students come from financially weaker background, if we consider students in the top US schools, say from Stanford, you find that a sizable fraction of students think about starting companies, or solving very difficult problems in their PhD, or taking initiative in city policy or something big with a high impact. I find them much more dynamic and full of energy and vitality about making a difference to their field of interest. Many students that I see here are probably intellectually smarter but, they often don't seem to have a passion for anything. What is most important to realise is that IIT students are smart enough to realise very difficult dreams. I think the ability to take risks is fundamentally the most important thing that will help many of us in achieving bigger things in life.

http://blog.lib.umn.edu/torre107/si/



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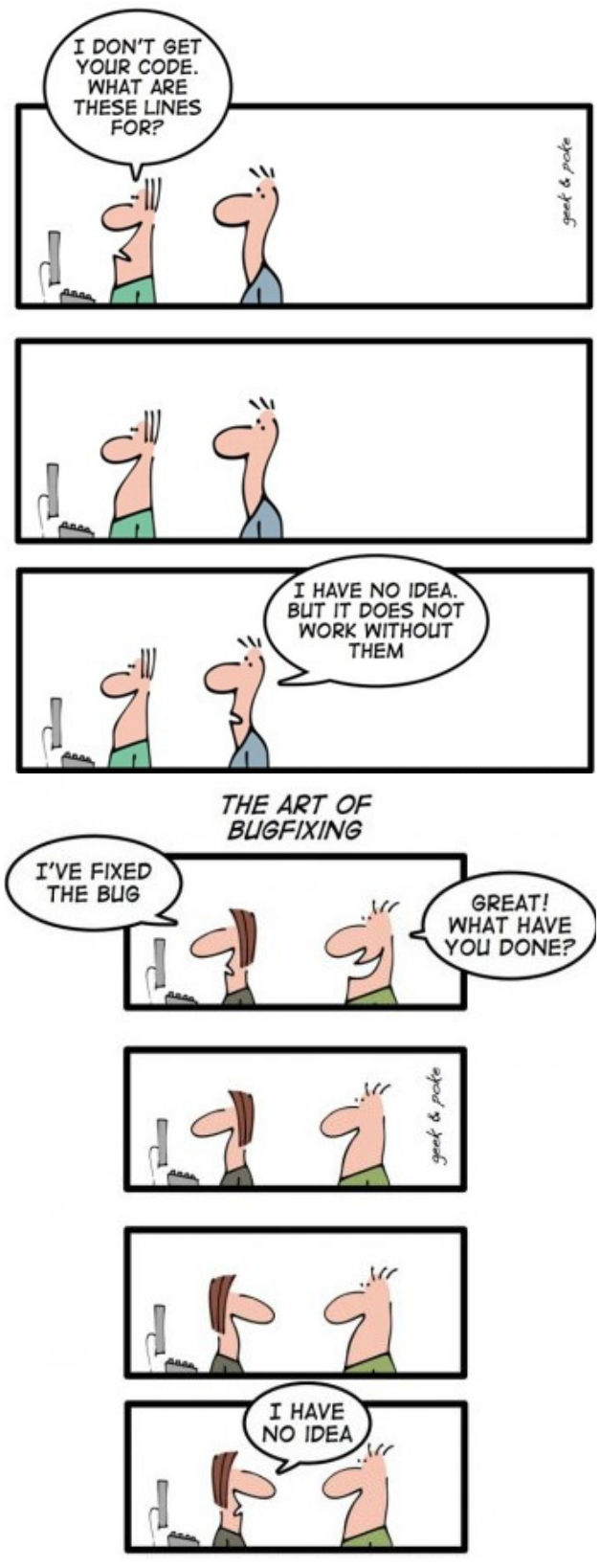

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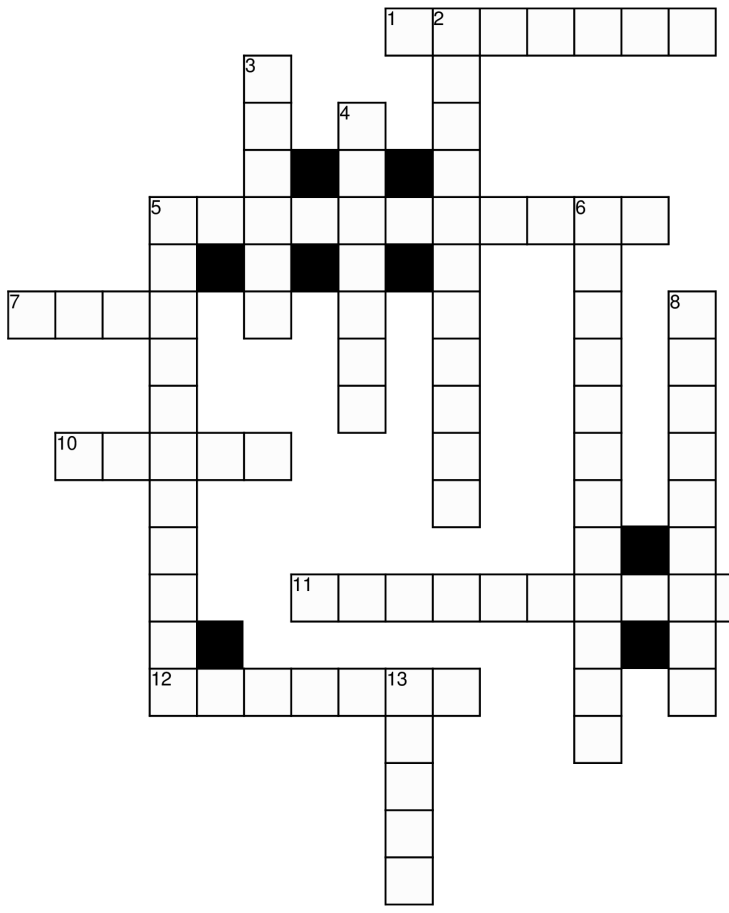


Across

1. Setting that is automatic unless changed by the user.
5. Science Of comparing computers with man's nervous system
7. A software platform suitable for Starbucks.
10. Begins and ends in virtuous computer problem.
11. Line in a programmer's valentine.
12. Skynet's virus that hampered the real world.

Down

2. A programmer's bane.
3. Format widely used in text editors because all document formatting is preserved.
4. You want to shoot yourself in the foot but the guns haven't been invented yet
5. Combination of nanoscale robotics and computer science.
6. Sounds like grave study is used to understand codes.
8. Desktop's Big Brother.
9. The lazy programmer uses this functional programming language.
13. Bits Of Literature

The Mind Of a Computer Engineer

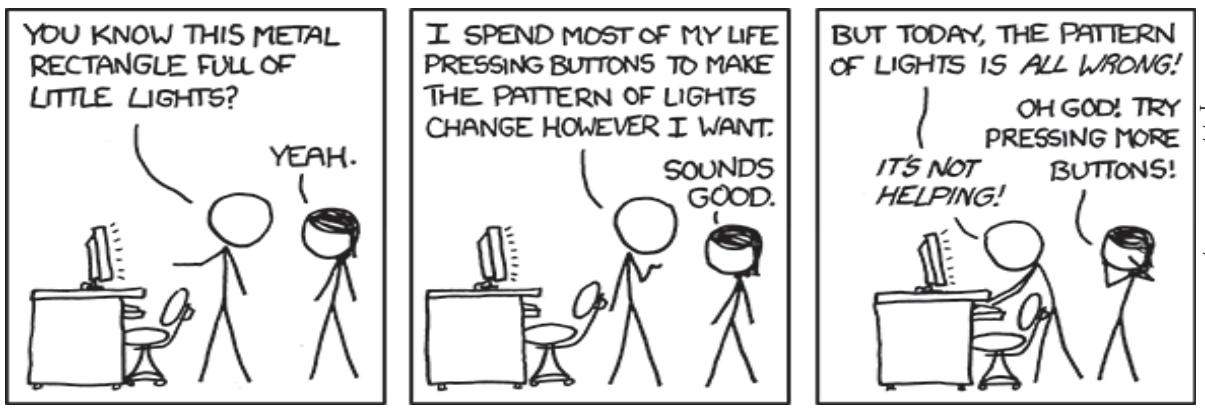
-Ashna Srivastav

While the loop is true,
And the instructions are pushed into a queue,
Started hashing out a plan,
Sorted the priorities, turned on the CPU fan.
The battle of the bits and bytes,
Rages on, within the disk's hefty apetite.
This haunts you, the dilemna of Bill Gates or Steve Jobs,
Instead, better choose Linus Torvalds.
Wild Pointers dangle you at the mountain's edge,
But you wouldn't want to face the blue screen of death.
Being a thief, getting greedy with algorithms,
and banging to the spindle's tune and rhythms
Playing Need For Speed with the proccessor,
Counterstrike with a time complexity war.
Uh Oh, a segmentation fault, a disaster,
Count from one to ten, don't lose your temper.
Bugging is a dangerous crime,
Debug to avoid serving jail time.
Sitting down and getting to threading,
Because you wouldn't want to keep your guests waiting.
Crunching on some cores and chips,
while figuring out the flops and the flips.
I'd hate to burst your bubble, alas no refrain,
This infinity is really a strain.
Memory has reached it's limit,
We'd better exit.

Did you know?

Most Web servers, ssh servers, GCL systems are named after classical Hindustani and Carnatic ragas. However, some admins are more creative when naming their systems. There is an entire series of machines named after cocktails (tequila, screwdriver, etc) and another after robots in Asimov's Robot series.

Also, If you smoke near an Apple computer, it's warranty becomes void.



http://xkcd.com/

Filter Bubble Theory

-Akshay Gupta

Next time you open Google, try this: Search for a relevant piece of news and ask your friend to do the same. Then compare your search results. Surprised? The results will be different, and depending on how diverse your tastes are, they might even be radically different. This is an example of what has been described as the 'filter bubble', wherein a search algorithm guesses what information a person would like to see, based on the person's location, search history and past click behavior, and selectively shows this information to them.

The term filter bubble was coined by Eli Pariser, who, in his book 'The Filter Bubble: What the Internet is hiding from you', argues that users, as a result of such personalized searches, get less exposure to conflicting viewpoints and become intellectually isolated in their own informational bubble. He believes that filtered searching closes us off to new ideas, subjects and important information and thus has a negative impact on civic discourse. Moreover, he also warns that it can make us more vulnerable to propaganda and manipulation and can lead to fragmentation of society.

Places where such personalization algorithms are deployed abound on the internet. The most well-known examples are the recommendation engines of sites like Amazon, Netflix or Youtube. Amazon uses an algorithm based on item-to-item collaborative filtering for book recommendations. In this approach, each of the user's purchased and rated items are matched to similar items, and these similar items are then combined into a recommendation list. Matches for a given item are determined by building a similar-items table which groups items that customers tend to purchase together and then using a similarity metric for filtering this table. Youtube uses a similar approach for its video recommendations. These sites depend heavily on the effectiveness of these algorithms. Netflix even held an open competition with a million dollar prize for the team which could come up with the best algorithm for predicting user ratings for movies.

A somewhat less obvious example is Facebook's newsfeed. Facebook determines what appears in our newsfeed using an algorithm known as EdgeRank. Everything we do on Facebook, from hitting 'like' to commenting or sharing, is categorized as an edge. These edges are weighted using a secret metric. Any content or relationship that doesn't get enough edges is 'blocked' and will no longer appear in our newsfeed. In fact, Eli Pariser, who has a left-leaning ideology, originally began his research into the filter bubble concept when he realized that Facebook posts of his more conservative friends were no longer appearing on his newsfeed, simply because their views differed from his own due to which they did not have enough shared activity.

Of course, not everyone believes that the filter bubble is all-pervasive and potentially dangerous. Dissenters of Pariser's theory believe that the effect is minimal and can be addressed. Moreover, there is debate regarding to what extent web filtering is actually happening. A study from Wharton that analyzed personalized music recommendations found that these filters can actually create commonality, not fragmentation, in online music taste. Consumers used the filter to expand their taste, not limit it.

Personalization is ideal for marketing, and feels quite satisfying to users in the short term. It is therefore not surprising that websites are relying more and more heavily on these techniques for marketing and advertising. Regardless of whether we believe in the dangers of web filtering, it thus becomes our responsibility to try and break the bubble we are comfortable in and expose ourselves to the diversity of the Internet.

What's Next?

-Surbhi Goel

My mind has changed more times than I can count in the last 2 years deciding what I want to do after college. Unfortunately or fortunately, I still do not have a clear answer. However, I have successfully tried and tested many different options throughout the course of my college life and figured out what I do not want to do.

Starting out, mostly everybody applies for research internships during the summer after second year to gain research experience.

"I was not satisfied with just an undergraduate degree."

Following this trend, I did so too and ended up going to the University of Michigan at Ann Arbor, Michigan, USA to work with the Systems and Security group. Though I got a feel of what research is like and quite enjoyed the environment, I did not feel motivated by the area I worked in. So I decided to try other areas of research as I was adamant about pursuing research. In this attempt, I worked in theory and theoretical machine learning but did not find something I was really passionate about. So for my third year internship, I decided to experiment the avenue of technical job profiles and interned at the headquarters of the most sought after company, Google. The experience in terms of the exposure I got, the people I got to interact with and the lavish life I lived for the short duration were exceptional but the work failed to inspire me. There was an amazing amount of work happening at Google but all the work that attracted me required more expertise than I would have with only a bachelor's degree. Even though I got a PPO from Google, the experience led me to decide one thing: I definitely wanted to study more, I was not satisfied with just an undergraduate degree. So whether it is a Masters degree or a PhD, I wish to further my knowledge and gain enough expertise to be able to solve more intricate problems maybe at Google or elsewhere.

Even though I do not have a clear direction as of now, I believe a lot of us do not. We ought to not think of it as a barrier but rather an opportunity to explore and find what fits us best.

To Do or Not To Do

-Shivanker Goel

I wanted to do a Ph.D. ever since I joined IIT Delhi. Why? I heard people say research means "inventing new stuff" and "advancing the boundary of human knowledge." Research is about making "significant contributions."

You can look at a Ph.D. as a platform to do things that matter. You get to solve real problems and not just do petty coding. Sounds exciting, right? So I worked for it, maintained a good CGPA and planned my projects with Professors so that I get strong recommendations when I apply for a Ph.D. I did my second year internship with the Information Security & Cryptography group at "Max Planck Institüt für Informatik ."

For my third year internship, I decided that it's only fair that I experience working as a software engineer as well before applying for a Ph.D. So, I did my third year internship at Facebook. And guess what? I loved working at Facebook. At the same time, I realized that I've not enjoyed working on any research project I've ever undertaken.

And, is it really just petty coding in software engineering as they say? Not in my opinion. There is a lot of interesting work in startups. They require you to apply your knowledge

"During Research, you have to live your work"

and creativity to make things work and make things better. Even in bigger companies the work is not bad. The problem you are solving is usually a part of something big and amazing. In Facebook, I saw people solving very interesting problems. Take the messenger for instance. Messages need to be delivered to and from all open browser sessions and mobile apps maintaining consistency. I cannot even begin to describe the amazing solution in this small article.

However amazing the results of post-grad research may sound, the actual research is not at all easy and many a times not very interesting. During research, you have to live your work. You can't just leave your work behind in your office. Your job has to be your life. For some people, this is actually very good. But I realized this is not very true for me. So finally after considering all these points and a lot of pondering, I decided that I'd rather go for a job rather than apply for a Ph.D.

Swarm Intelligence

-Haroun Habeeb

Science fiction has been obsessed with Swarm Intelligence since time immemorial. Starting with The Invincible, a novel by Stanislaw Lern where a human spaceship finds intelligent behaviour in a flock of particles, to the Borg from Star Trek, the notorious Zerg, the Covenant from Halo, and the Quarian's original idea of the Geth from Mass Effect.

So, what is swarm intelligence?

Scientifically, Swarm intelligence is defined as the collective behaviour of decentralized, self-organized systems. It is often used in artificial intelligence. Today's swarms, formally called Swarm Intelligence Systems (S.I.S), draw inspiration from flocks of birds, ant colonies, herds of sheep and so on.

Swarms contain a population of agents or boids which logically interact with one another. The agents often follow very simple rules and although there is no central intelligence, their interactions lead to intelligent behaviour.

Some technicalities:

There is a plethora of algorithms for swarm intelligence – from the Particle Swarm Optimization to Differential Evolution to the Bat Algorithm.

Particle Swarm Optimization: The problem is treated in an n-dimensional space. The best solution turns out to be a certain point in this space. Initial velocity and communication channels are used to seed each hypothesis. This method's advantages over global minimization is that since there are so many agents, the chance of local minima is impressively small.

Stochastic Diffusion Search: This method is suitable when the objective function can be decomposed into independent partial functions. In the standard version of Stochastic Diffusion Search, the partial functions are binary. A feedback system is also present to ensure that agents stabilise around the global best solution.

Where are they used?

Swarm intelligence-based methods have a variety of applications. Primarily, it is being researched by the military, in an attempt to control unmanned vehicles. The European Space Agency is also considering an orbital swarm for self-assembly, while NASA is planning on using swarm intelligence to map planets. There is also a paper which discusses the possibility of a swarm of nanobots being used to kill tumours from within the human body.

One artistic application of swarm intelligence is the usage of boids to animate aggregations like crowds of people, flocks of birds or schools of fish. Swarm Intelligence is used to create realistic animations in movies and games.

Why is it in the news?

Recent advancements in swarm intelligence have lead us to believe that the Zerg might not be too far away. The most notable of these is Kilobots – developed by Harvard.

Kilobots is a swarm of 1024 miniature robots which was created in the lab of Radhika Nagpal, Fred Kavali Professor of Computer Science at Harvard School of Engineering and Applied Sciences.

"The beauty of biological systems is that they are elegantly simple—and yet, in large numbers, accomplish the seemingly impossible," says Nagpal. Kilobots are capable of forming shapes. And unlike earlier swarm intelligence systems, Kilobots can correct their own mistakes, not individually, but as a group. If one kilobot makes a mistake, nearby kilobots attempt to fix the mistake. Videos online show the kilobots forming a 'K', a star and a wrench. Every kilobot is given a 2D image of the structure they have to replicate, along with the location of the 4 corners of the table.

Each individual kilobot is tiny. They move on two vibrating motors and communicate with each other using infrared, and also measure their proximity. This simplicity however, leads to the robots being less reliable.

While the technology may not be perfect yet, it is a clear indicator of things to come.

The Cyber Warzone

-Shivanshu Gupta

A collection of almost 98,000 files (totalling more than 13GB of photos and videos), apparently from Snapchat users, was recently posted to The Pirate Bay. The files were allegedly saved using a third-party site called Snapsaved.com, which allows users to save and access their snaps online. Although this wasn't really a full blown attack on Snapchat itself, the app, which is a favorite among teenagers, has also been a favorite among hackers. Beginning December last year, it has suffered a series of attacks. First, Snapchat's app FindFriends was hacked and user names and phone numbers of about 4.6 million accounts were accessed by a security firm. Later, in January, the app was found to be vulnerable to denial-of-service attacks. Even a Captcha security feature released by Snapchat was hacked within a day of its release!

Unfortunately, it's not just Snapchat that has been a target of such attacks. In fact, hackers (a.k.a. crackers or the blackhats) are constantly looking for security flaws online and incidents such as website defacements and data breaches are almost an everyday thing. So in the wake of this event, we thought we'd scare you even more by bringing to you a compilation of the major hacking incidents that rocked the internet world.

iCloud Breached

Nude photos of more than 100 high-profile celebrities including the likes of the Oscar-winning actress Jennifer Lawrence were leaked online in what could be the biggest such breach of privacy in the recent past. The anonymous hacker, using the pseudonym Tristan, allegedly breached Apple's iCloud service, copied the nude images and videos of several actors, models, singers and presenters and posted them on the infamous 4chan online forum.

Malware attacks on Yahoo!

Thousands of Yahoo! users were attacked every hour by hackers and its servers were made to send out malware called "exploit-kit" into user systems. According to Yahoo!, the source of the leaked user credentials appeared to be third-party databases and that its own servers were not breached. People frequently use the same passwords on multiple accounts, so possibly hackers brute-forced Yahoo accounts with user credentials stolen from other data breaches.

Adobe Hacked

About 38 million Adobe customer accounts were reported to have been breached by hackers in May 2013, when the source code of Adobe's popular Photoshop program was hacked and parts of the code stolen. Using this, the hackers stole personal user information, including account IDs and encrypted passwords as well as credit and debit card numbers of 2.9 million customers, and source code of several more of Adobe's most popular products.

TAO Division of NSA Hacks Computers Globally (December, 2013)

National Security Agency (NSA) is responsible for large-scale intrusions all over the world breaching the privacy of countries and individuals alike. NSA's elite hacking unit Tailored Access Operations (TAO), which describes its mission as "getting the ungettable", has master access to read anybody's data and can target anyone, at any time and in any place. And if the global whistleblower Edward Snowden is to be believed, they are responsible for numerous cybercrimes, from breaching privacy – they routinely intercept data traffic all over the world – to causing a 3-day internet blackout in most of Syria in 2012. The latter was a blunder committed by the TAO division while attempting to infiltrate the country's data traffic!

Stuxnet

A classic case of industrial espionage - nuclear installations at Iran were hacked into and attacked by a computer worm, Stuxnet. It was designed to make the centrifuges spin out of control and cause physical damage to the nuclear plants. According to Edward Snowden, the worm was developed jointly by NSA and Israel in an attempt to derail Iran's nuclear program. The worm eventually spread outside of Iran and has affected other power plants close to Europe, infecting the internal network of a Russian power plant. Moreover, according to the Iranian media, Israel is now partnering with Saudi Arabia to develop a worm even more destructive than Stuxnet.

These are just a few instances of how our online privacy is frequently compromised. The web is not the safe haven that most would expect or want it to be, but is rather a battlefield. There's a cyber-war going on. There are the usual hackers, the blackhats, constantly trying to find vulnerabilities in private and public networks with malicious intentions. And then there are governments with "cyber experts" trying to infiltrate into each others' networks, committing cyber-crimes in the name of defense. So, the next time you go online, remember, there might be someone out there, monitoring your every single move. What can you do about it? Well, you could set a strong random password!

Open Source Contribution

-Saurabh Anand

Why Contribute to Open Source?

Before I get into the how, it's very important to look at the why in Open Source Contribution, because contributing to Open Source organizations or projects is mostly self driven and you need to identify with one of the reasons for contribution. Only if it makes sense will you be able to sustainably continue.

So first and foremost, I and most of the other people do it for the fun. When your code or feature is being used by millions of users, it just feels awesome and proud knowing the kind of impact it has (also, boasting rights). Besides these intangible things, you also add a lot of things to your profile which makes your resume stand out from the rest. You acquire skills like working with version control tools, experience at talking to people from different countries and cultures, writing real-world, long-term-maintainable software as part of a globally distributed team and it's all publicly recorded out in the open, which just increases its credibility and makes it easy to get references for. All these skills are highly valued in the industry. Besides that this also increases your chances in internship programs like the Google Summer of Code. You also get to find out what's the latest and the greatest out there, sometimes coming across interesting, challenging problems you can do research on.

How to Contribute?

Now that I've hopefully gotten your interest, let's see how we can contribute. Since I've contributed to Mozilla, I'll talk about that. For people who want to contribute without necessarily having to code, there are quite a few projects. You could help localize (meaning translate) the various projects of Mozilla to a language you're comfortable with. You could also contribute to projects like WebMaker and engage in educating people about the Web and related technologies or become a Firefox Student Ambassador for the campus and help organize events like hackathons etc.

For people interested in coding contributions, it would be good if you have experience with at least one programming language like C/C++, Java, Python, JavaScript. Once you know that, you simply need to head on to http://www.whatcanidoformozilla.org/ which lists the various projects Mozilla has. Mozilla has a lot of projects which make use of different technologies and have varying levels of difficulty. Once you choose something interesting, download the codebase and compile it. After that, simply pick a bug. A bug fix or an issue is normally mentored by an experienced person who'll guide you at every step and help you fix your first bug. At any point of time if you have any questions, feel free to ask then on IRC (#introduction channel on irc.mozilla.org). If you need to connect to IRC, simply go to a website called IRCCloud.

Once you submit a fix or some code to implement a feature, it's reviewed by an experienced person, which again allows you to improve your coding skills. Once it passes review, it's merged and shipped to all the users (and you feel really happy).

If you feel stuck anywhere, feel free to contact me over email, Facebook or any other medium. I would like to end by saying that most of us should atleast give this a try. Quite a few of us do competitive programming but unlike that, the code you write here has impact on real people.

Srishti Research Group

The SRISHTI research group at IIT Delhi is a group of PhD candidates and students headed by Prof. S.R. Sarangi. They focus on core systems and architecture research. The SRISHTI group has recently released the Tejas architectural simulator. Tejas can be used to simulate complex multicore processors. Its unique selling point is that it is written in Java, and is very easy to use and modify. They are currently focusing on multi-core architectures and also on architectures and operating systems for real time computing, theoretical results in computer architecture, and architectures for embedded devices. We wanted to know more about the Srishti group and about the prospects of taking up research in Computer Architecture as a career. So we asked Rajshekar Kalayappan and Prathmesh Kallurkar, both PhD candidates and members of the group working on Reliability and Fault Tolerance in Computer Architecture and Architectural Support for Operating Systems respectively, to give their views on these aspects and also tell us more about the group.

Q: What is Srishti Group all about? What is the motivation for what you are doing?

Rajshekhar: All the members of the Srishti research group do research in the field of Computer Architecture. Now most research in the area is done on simulators. The reason for this is that you can't possibly fabricate an idea that you have on a chip in order to showcase it, as it's just not feasible in terms of cost for if the idea doesn't work, you would have to fabricate again. Thus, the research in this area is first done on simulators and only when the results of the simulators are satisfactory that the actual fabrication starts. But unfortunately there are only a few simulators available for academic use and the problem with these is that it takes a lot of time to get started with them.

It was Prof. Sarangi's idea to create a good, easy to understand simulator. Hence he brought us together to form the Srishti group with the goal of creating Tejas.

Q: What project are you currently working on? Do you work as a team on some big project or do you have individual projects of your own?

Prathmesh : We are currently focusing on multi-core architectures and also on architectures and operating systems for real time computing, theoretical results in computer architecture, and architectures for embedded devices. And yes we do have our own individual projects. The team consists of four PhD students and ten masters students. Every member in the group has their own individual project, and all of us use the simulator, Tejas to test our ideas. And in the process also develop Tejas by adding any features that we feel should be a part of the simulator. For instance I am working on Architectural Support for Operating Systems. The goal is to enhance the hardware to improve performance of Operating System intensive workloads like web servers, database servers and to characterize the behavior of different operating systems.

Rajshekhar: My research is in the area of Reliability and Fault Tolerance in Computer Architecture. My work involves the efficient detection of soft error occurrences which finds relevance in space applications, airplane systems etc. The group is also working on techniques to speed up parallel applications. These include Nanophotonic Support for on-chip communication and Novel thread synchronization primitives.

Q: Do you regularly outsource subtasks in your project as BTPs and other projects under Prof. Sarangi?

Prathmesh : Last semester there were 4 B.Tech students working with us. They were working on certain features of Tejas. Currently, each M.Tech student has been assigned a mentor who is a PhD student and Sarangi Sir as the overall head, monitors the progress of each of them. The project assigned to the student may be to add an extension or feature to the base Tejas that will also be used by others or a research idea of the student herself.

Q: Do you think UG students have enough exposure to research enabling them to decide whether or not they want to pursue further studies?

Rajshekhar: The undergraduate level course, Basic Computer Architecture, is sufficient to give them the skills required to pursue research in computer architecture.

Q: What are your views on research as a career? Research in Computer Architecture?

Prathmesh: The field of Computer Architecture is very fast paced. There are new innovations by the likes of Intel and AMD every year. And these innovations are possible only through research. It's really exciting to see a feature you developed as a part of your research idea incorporated in a new product. As far as the scope of a career in research is concerned, most of the chip companies like Intel, AMD, Nvidia etc. require PhD's. Even in India itself there are enough job opportunities in R&D Centers. In research there's a certain exploratory feeling, which if you like, then research is the career for you, but not if all you want to do is read well-studied stuff and get a job.

Editor's Note

With several new faces joining the faculty and inauguration of the newly constructed SIT building, these have been exciting times for the department. In the maiden edition of Black Box – a re-imagination of the long running bi-annual ACM department newsletter – we have tried to capture this excitement and present informative articles for our readers. The name, inspired by a design philosophy which didn't quite make it to the final draft, reflects the driving philosophy behind the newsletter, to look deeper into topics we are curious about but rarely find the time to engage with. The trio of '(your privacy) Up in the Clouds', 'Filter Bubble Theory' and 'Cyber Warzone' peers into the unsettling truths about aspects of Internet we have all come to depend on. The article on Open Source Contribution opens yet another black box, and 'Jasper' serves as an example of an exciting open source project built by a couple of computer science undergraduates. The articles by Shivanker Goel and Surbhi Goel, on their decision about what they want to do after college, were included in the hope of helping students who find themselves in a similar quandary this time of the year. The team would like to thank Prof. Mausam and Prathmesh Kallurkar and Rajshekar K. of the Srishti research group, for taking time to interview with us, and help us better understand the people that make the department and know more about their research. I would also like to thank the editorial team for their commitment towards the newsletter, even in the face of looming deadlines and examinations. I hope that the newsletter was a worthwhile read and that there was something for all of our readers, even if it was the fun section. The team looks forward to your feedback, and we promise to incorporate your suggestions in the next iteration of the newsletter. Till then, happy reading, everybody!

Abhay Mitra

ACES-ACM Activity Report

-Akhil Jain

The year began on an alacritous note with the merger of the two students' organisations of the department of Computer Science and Engineering - ACES and ACM - being announced to form a single unit that would look after both the technical and cultural aspirations of the students of the department. The move was welcomed by one and all as a progressive move towards the centralisation of student activities. Everyone was eagerly waiting for the semester to start so that the chapter could start its activities. And when it did, its well wishers were certainly not disappointed.

The first event of the year was the 'Frosh Welcome' wherein the incoming freshers were officially inducted into the department and told about all the fun technical work that goes on in the department and as part of the chapter activities. The orientation mainly focussed upon telling people about the amazing worlds of Graphic Design, Web Design, building Android Applications and a basic introduction to Linux. The freshers were given an insight into the amazing life that lies ahead of them in the department through the sharing of experiences by seniors. The event was a prelude to the freshers party that was held soon after and allowed a more informal interaction amongst the freshers and allowed them to know each other better.

This was followed by a series of interactive sessions between our undergraduate students with the fourth years sharing the experience of their recently completed internships with the third years and the third years in turn doing the same with their sophomore counterparts. It was a session in which students who had interned in all aspects of the industry - research, development, finance and consult shared their experiences and insights of the outside world with their juniors.

This was followed by the headliner event of the semester so far - a three day fest - Zero Hour. Held for the first time ever, the fest saw participation in mass numbers from students across departments and years. With events like a talk by ACM Distinguished Speaker Prof. Aaditeshwar Seth, a workshop on web designing, and innovative programming contests like Codeless and CTF in addition to the regular Mock ICPC contest for IIT Delhi teams, the fest left nothing to the imagination on the technical side. But that a fest can be good at tech as well as enthrall one and all culturally was demonstrated innovatively by the organisers. Events like Kabaddi, LAN gaming, number games, chess, bridge, quiz, treasure hunt and movie screenings left everyone gasping for breath from all the excitement. With free refreshments and cash prizes up for grabs, the extravaganza was a welcome break for all the students of the department from their life of deadlines and examinations.

In conclusion, the semester has been action-packed so far and ACES-ACM has managed to keep the student community on the edge of its seats with all the action packed activities. Also, they have shown much promise to be able to sustain and carry the pressure of expectations and requirements of the student community from the department with elan. Hopefully, the future holds as much amazement as has been witnessed so far.

Coding Club

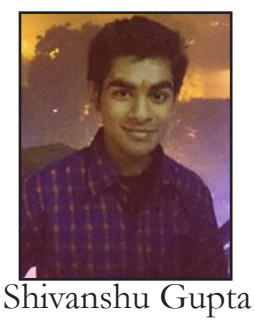
-Rohit Pruthi

Started by ACES-ACM, the official ACM student chapter of IIT Delhi, under the supervision of Prof. Smruti Ranjan Sarangi, Coding Club IIT Delhi has seen great enthusiasm and participation among students. With an aim to develop a culture of coding in students at IIT Delhi, and to increase participation of IIT Delhi students in coding contests like ACM ICPC, coding club has been very successful so far.

Coding club IIT Delhi organizes regular lectures on Wednesday nights, generally followed by a contest. The lectures are taken by students themselves, and cover various topics related to algorithms and data structures, like recursion, dynamic programming, greedy algorithms, divide and conquer and other problem solving techniques. The lecture series is divided into two divisions, div 1 being at a higher level for those having basic knowledge of programming, and div 2 for absolute beginners.

Coding club also has it's own platform, hosted at www.cse.iitd.ac.in/codingclub, where online coding contests are held regularly and practice problems are also added. The judge used by the website is very similar to one used by ICPC online rounds, and supports many programming languages like C, C++, Java, Python, PHP, Perl, Javascript etc. Cash prizes are distributed twice a semester for the cumulative performance in these contests. It also has a facebook group where people discuss questions related to algorithms and coding. With 900+ members on facebook group, and 585 registered users on coding club platform so far, this club has been a successful initiative in achieving its goals.

Meet the Team


Shivanshu Gupta


Haroun Habeeb


Akshay Gupta


Ashna Srivastav


Ankush Singhal