AURORA

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"**Education is what remains after one has forgotten what one has learned in school" -Albert Einstein**

Beyond the walls of LTC and the Faculty Divisions, there exists a limitless field of knowledge waiting to be explored. Beyond the questions of midsems and compres, there exists a relentless curiosity to discover the unanswered. Beyond the label of an "engineer", there exists a person carving out his own path.

BITS Embryo is a platform that tries to stretch the limits of the college curriculum by augmenting it with online talks by renowned personalities from across the world. The topics of the talks, Breakthrough cosmological research at CERN, Building a career as an animation designer at DreamWorks studios, Cracking the Civil Services examination, Social Entrepreneurship, Game Development, to name a few, are chosen so as to guide the BITSians with varied career and study interests.

Vignettes of last year talks

#1 Why can't Time run backwards?
Speaker: Anthony Leggett, Nobel Laureate

The fundamental laws of classical or quantum mechanical physics look exactly the same if the direction of time is reversed. Dr. Leggett asks, "What is the origin of the arrow of time?" He used simple laws of thermodynamics and classical mechanics to find out whether the past "causes" the future. The arrows of time towards the future as perceived by us were

- Psychological: We can remember our past but can only predict the future.
- Biological: Plant/Animals start small and grow bigger.
- Electromagnetic: Light bulbs and stars radiate light but don't emit it.
- Thermodynamic: The disorder in the universe always increases.
- Cosmological: The universe is expanding.

Vignettes of last year talks

#2 Astral Projections
Speaker: Dr. Steve G. Jones, Hypnotherapist

What do the ancient Hindus, medieval civilizations, countless modern-day scientists and spiritual leaders have in common? They've all extensively documented the theory of astral travel, or out-of-body experiences (OBEs) – the theory that it is possible for a person to leave the physical body and experience something beyond the physical realm.

"There are several theories as to why people have OBEs. A common link between them is the idea that in certain circumstances the brain somehow loses touch with sensory information coming in from the body. This triggers a series of psychological mechanisms which can lead to someone having an OBE. It's a little bit like if you sleep on your arm and lose sensation in it. Only with an OBE, the sensation loss is in the whole body and the brain's response creates a feeling of separation from the self.

#3 Internet of Things
Speaker: Carla Diana, University of Pennsylvania

Something exciting has been happening to our everyday objects. Things that were once silent and static can now sing, glow, buzz, and be tracked online. Some are constantly listening for sounds, sights and touches to translate into meaningful inputs. Others have the ability to learn, refining their behaviours over time. They can be connected to one another as well as the Internet.

As people continue to interact with data in all aspects of life, they will expect their digital devices to deliver real-time, visualized, networked feedback. The WSJ envisions a roadmap where 50 billion devices could be connected to the internet by 2020. Collectively, this "Internet of Things" will provide cloud-enabled experiences that can profoundly change many aspects of everyday life both in and out of the home.

In this talk, Carla shared stories from the front lines of designing interactive hardware/software products and ecosystems in her studio and at the award-winning firm Smart Design. She discussed challenges and highlighted opportunities where the combination of physical device and virtual data can provide a more meaningful experience than either alone.

Keep your shirt on, data centres!

The amount of energy consumed by big data centers has always been a headache for tech companies. Keeping the servers cool as they crunch numbers is such a challenge that Facebook even built one of its facilities on the 'edge of the Arctic Circle'. Well, Google has a different solution to this problem: putting its DeepMind artificial intelligence unit in charge and using AI to manage power usage in parts of its data centers. The results of this experiment? A 40 percent reduction in the amount of electricity needed for cooling, which Google describes as a "phenomenal step forward."

After accounting for "electrical losses and other non-cooling inefficiencies," this 40 percent reduction translated into a 15 percent reduction in overall power saving, says Google. Considering that the company used some 4,402,836 MWh of electricity in 2014 (equivalent to the amount of energy consumed by 366,903 US households), this 15 percent will translate into savings of hundreds of millions of dollars over the years. It seems the company's $600 million bet on AI will pay for itself before too long.

The specially designed neural networks control "about 120 variables in the data centers," including "the fans and the cooling systems and other things." The AI worked out the most efficient methods of cooling by analyzing data from sensors among the server racks, including information on things like temperatures and pump speeds. DeepMind's engineers say the next step is identify where new data is needed to calculate further efficiencies, and to deploy sensors in those areas.

And the company won't stop with Google's data centers. "Because the algorithm is a general-purpose framework to understand complex dynamics, we plan to apply this to other challenges in the data centre environment and beyond in the coming months", said DeepMind in a blog post. "Possible applications of this technology include improving power plant conversion efficiency, reducing semiconductor manufacturing energy and water usage, or helping manufacturing facilities increase throughput.

Cancer Treatment

In the great, rising fight against cancer, scientists are constantly looking for solutions that are both effective and less ravaging than current treatments like chemotherapy, and well, hairlessness. One experimental concept, optogenetics, uses light to reduce or eliminate cancer cells. Researchers at UT San Antonio have devised a method using this school of treatment to attack inoperable or hard-to-reach tumors, which could give options to patients who were considered too high of risk to help.

The technique involves injecting the chemical compound nitrobenzaldehyde into the tumor and waiting for it to diffuse through it. Then a beam of ultraviolet light is aimed at the chemical-filled tumor, which becomes so highly acidic that it basically commits suicide, according to a UT San Antonio press release.

Technology Footprints

In two hours, 95 percent of the cancer cells targeted in the test mice, Remy, were dead, estimated the researcher.

While still very experimental, this method limits the treatment to a specific area, unlike chemotherapy that affects all cells in the body. Since it only requires an injection it's also non-invasive, making it appealing for complicated areas like the brain stem or spine. There are others tinkering with optogenetic methods: Tufts University researchers injected frog embryos with genes that produced light-sensitive ion channels in tumor cells that shrunk when exposed to blue light. While both are still far from ready for human trials, they're promising options for future patients who wouldn't be treatable today.

Why SDN is the key to 5G?

5G isn't just about bandwidth or low latency. It's also about flexibility, agility, manageability and being able to create new services. 5G operators will want their infrastructure to provide services they had not even thought of when it was installed. Software Defined Networking (SDN) is the foundation for these capabilities. SDN also means the end of single-purpose infrastructures.

SDN's separation of the control and data planes, open switch model, and network resource abstractions are key. They give operators dynamic control over a variety of functions, including the packet data network connection, variable QoS, downlink buffering, online charging, packet transcoding, legal intercept and selective chaining. Some of the SDN abstractions needed for 5G are currently being explored in ONF's Mobile Networks working group.

Already, numerous SDN-based architectures have been proposed for 5G. For example, NGMN envisions an architecture that leverages the separation of hardware and software, as well as the programmability offered by SDN and NFV. This native SDN/NFV architecture will cover 5G aspects ranging from devices, mobile/fixed infrastructure, network functions, value-enabling capabilities and all the management functions to orchestrate the 5G system.

An SDN-based architecture will enable operators to offer networks as-a-service and manage resources efficiently while running services continuously. Within the central office/data center, SDN will also help operators control resources for highly scalable packet processing and forwarding in the fast path (in the order of end-user session time). Providing flexibility and optimization in an operator's network, SDN will lower capex and opex, freeing funds to create innovative new services needed to remain competitive in a 5G world.

BITSians' say: PS-1 memoirs

Harsh Sharma, 2014A4PS405P :

Each year a number of the sophomores at BITS, go for their PS-I during their summer breaks, and just like all the others I was apprehensive about the same. All the seniors yielded pretty much the same response when enquired about their PS-I experience-"It was Lite". While the professors maintained that it was a practical exposure to research and industrial environment. I opted for IISc, Bangalore as my first preference owing to its reputation as the finest research institute in India. A couple of weeks later, I was delighted to know that I had been allotted my first choice for the practice school.

My first visit to IISc left me spellbound. Blossoming flowers, lush green campus and roads lined by canopies of gulmohars and mahagonies, punctuated with shafts of light. The place was a paradise for researchers. One could find professors and students exchanging their views on the latest scientific developments over lunch or tea in the cafeteria. Each of the research interns was mentored by a PhD scholar under whose supervision one could work on their respective projects using state of the art facilities. The first meeting with my professor at the Materials Research Center, was a thought provoking one. After the introduction, he bombarded me with questions from various courses I had done in my second year. He also followed that up with a number of logical questions to test my knowledge beyond books. After this he explained to me how one can design a bulletproof jacket using Magnetorheolgical fluids. Quite intrigued by his explanation, I showed my willingness to work in the area of Magnetorheology. Magnetorheological(MR) fluids are those which change their viscosity under the application of an external magnetic field. By watching a couple of videos and reading research papers I got to know the depth of the topic. Its use to design earthquake resistant buildings was the one which fascinated me the most. My work primarily involved working on the graph plotting software, 'Origin', through which I simulated curves of various MR fluids, corresponding to various existing theories. The work also involved a fair amount of lab exposure to synthesize these MR fluids and then test them using a rheometer. My professor, PhD scholar and I also engaged in a number of brainstorming sessions to explain the observations we obtained.

The work I did at IISc, would be utilized in the publishing of research papers in various journals. The taxing research work was interspaced with group discussions and quizzes, for the grading of PS. I also explored a number of places. Be it the sparkling waves in Pondicherry or the mouthwatering biryanis of Hyderabad. Swimming in lakes at Coorg or roaming the streets of Bangalore late into the night. PS-I was simply incredible. The exposure to an amiable research environment, the opportunity to learn from extremely accomplished professors and bonding with newly made friends over sleepless nights are just some of the things I would take back from my PS journey.

BITSians' say: PS-1 memoirs

Devansh Patel, 2014A7PS069P :

When we were allotted the PS station I was happy about being in my home town (Ahmedabad) but was slightly disappointed too because of not getting Infibeam, a major IT company. I also expected that in Adani Power it would be something related to power plants in which we had zero knowledge and wouldn't be useful in the future. My expectations were proven wrong. An app was present in Adani for the employees but it didn't have features for various important tags like BLDS (Boiler Tube Leakage Decibel System). Our job was to add this. The knowledge needed for our project was basic knowledge of Machine Learning algorithms, R programming language, Android app development and also basic knowledge about servers. Skills needed would be basic coding in Java and C. We used Rstudio, Android App studio and Xampp.As APTRI allows interns from various colleges, it felt nice to have other college students with us. Also, the head of APTRI, Mr.Sandeep Dixit was the most motivating and knowledgeable person we could ever get. Being an ex-BITSian, he helped us a lot and also expected us to do well. We were happy to have stood to his expectations. The most important thing that I realized was that there is a wide gap between college studies and real life studies.

UPCOMING TALKS…
1. **A search for Extraterrestrial life in Earth's atmosphere, by <u>Padma-Vibhushan Dr. Jayant Naralikar</u>**

2. **Quantum Entanglements: Spooky actions at a distance, by Sir David I. Kaiser**

We are recruiting!
**If you are an enthusiast, a wannabe event-organizer/web-developer/writer/designer, be there at the Orientation!
LTC 5106 12th August| 5:30 pm**

THE TEAM: Vrunda Tol, Nikhil Garg, Udyan Mahajan, Garv Sharma, Pranshu Aggrawal, Shraddha Maslekar

Visit us @ embryo.bits-pilani.ac.in