



TECHNOLOGY

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COVER STORY: Germanium Lasers Bring Optical Computing Closer • Intro to AR • CLUBS &
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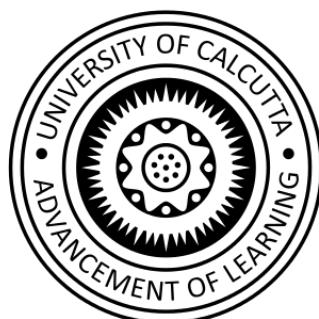


TERAWIRE

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TERA WIRE

THE MONTHLY SCIENCE MAGAZINE OF UNIVERSITY OF CALCUTTA



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TERAWIRE

**GERMANIUM
LASERS BRING
OPTICAL
COMPUTING
CLOSER**

**BY: SOUJATYA
SARKAR**

**COVER
STORY**

Researchers at MIT have demonstrated the first laser that uses the element germanium. The laser, which operates at room temperature, could prove to be an important step toward computer chips that move data using light instead of electricity, say the researchers. "This is a very important breakthrough, one I would say that has the highest possible significance in the field," says Eli Yablonovitch, a professor in the electrical engineering and computer science department of the University of California, Berkeley who was not involved in the research told Wired.com. "It will greatly reduce the cost of communications and make for faster chips." Even as processors become more powerful, they're running into a communications barrier: Just moving data between different parts of the chip takes too long. Also, higher bandwidth connections are needed to send data to memory. Traditional copper connections are becoming impractical because they consume too much power to transport data at the increasingly higher rates needed by next-generation chips. Copper also generates excessive

heat, and that imposes other design limits because engineers need to find ways of dissipating the heat.

Transmitting data with lasers, which can concentrate light into a narrow, powerful beam, could be a cheaper and more power efficient alternative. The idea, known as photonic computing, has become one of the hottest areas of computer research."The laser is just totally new physics," says Lionel Kimerling, an MIT professor whose Electronic Materials Research Group developed the germanium laser. While lasers are attractive, the materials that are used in lasers currently – such as gallium arsenide – can be difficult to integrate into fabs. That's given birth to "external lasers," says Yablonovitch. Lasers have to be constructed separately and grafted on to the chips, instead of directly building them on the same silicon that holds the chips' circuits. This reduces the efficiency and increases the cost. A germanium laser solves that problem, because it could in principle be built alongside the rest of the chip, using similar processes and in the same factory.

"It's going to take a few years to learn how to integrate this type of laser into a standard silicon process," says Yablonovitch. "But once we know that, we can have silicon communication chips that have internal lasers." Eventually, MIT researchers believe germanium lasers could be used not just for communications, but for the logic elements of the chips too – helping to build computers that perform calculations using light instead of electricity. But University of California, Berkeley's Yablonovitch says it is unlikely that light will replace electricity entirely. "I think we will be using light in conjunction with electronic logic circuits," he says. "Light allows internal communications much more efficiently, but the logic elements themselves are likely to remain driven by electricity."

Intro to **AUGMENTED REALITY**



What is AR?

Augmented Reality has been one of the hottest topics since a long time. Almost everyone has used AR knowingly or unknowingly be it in an exciting photo filter in one of our favourite social sites or playing a game or using an app to see how a beautiful furniture would go with the blue wall. But what is AR after all?

Augmented reality is the integration of digital information with the user's environment in real time. Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.

History of AR

The term augmented reality was first coined in 1992 by Thomas Caudell and David Mizell, two Boeing engineers working on a simple see-through headset that aided airplane engineers in complex wiring schematics with the goal to enable cost reductions and efficiency improvements in many of the human involved operations in aircraft manufacturing. We have been dreaming about the

potential of AR for a long time, and the history of the medium stretches back before we even had a term for it. In fact, AR shares a history with its technological cousin, virtual reality. Both virtual reality or VR and AR share a common ancestor The Sword of Damacles. Built-in 1968, the Sword of Damacles was created by a computer scientist and researcher, Ivan Sutherland. His goal was to create the ultimate display. A digital interface capable of transforming the physical world. The prototype was so heavy, it needed to be suspended from the ceiling by a mechanical arm. But it was one of humankind's first experiments into replacing your real world with a digital reality. Since 1992, many people have sought to fulfil the vision that Sutherland wrote about over half a century ago. Today, we have Headsets, exponentially more powerful than the sword of Damacles from 1968, can be worn on our faces like glasses. These hardware are referred to as head-mounted display, HMD for short. However, most people will access AR for the first time with their smartphone.

AR on Mobile

Let's take a look at headset AR and mobile AR in more detail. The rapid development of smartphones has actually contributed to the growth of the VR and AR industries. That's because the same components that make smartphones work, GYROSCOPES, ACCELEROMETERS, MINIATURIZED HIGH-RESOLUTION DISPLAYS, are also required for AR and VR headsets. The high demand for smartphones has driven the mass production of these components throughout the past 10 years resulting in greater hardware innovations and decreases in costs. In the most basic sense, AR is created using the FRONT AND REAR-FACING CAMERAS on your phone. You hold it up and your screen is able to display digital objects and information integrated within your real world. Your phone can now act as a portal to new worlds experiences and information.

Uses of AR

You might already have found a few use cases of AR but here are a few examples where its already being used successfully:

- 1. With major furniture retailers, like IKEA and Houzz, you can see if a \$1,000 couch will be the right one for you, if you aren't sure it'll fit right in your living room or match your curtains. AR makes full use of 3D space, letting you see the furniture at the exact size and dimensions of real life.**
- 2. In 2016, Pokemon Go became the first viral AR game.**
- 3. Expeditions AR is an educational experience designed to help teachers show students information with simple and engaging AR visuals.**
- 4. Its also used in navigation.**

ARCore

Google has also developed a platform for building augmented reality experiences for Android and iOS. Using different APIs, ARCore enables your phone to sense its environment, understand the world and interact with information. ARCore uses your phone's camera for motion tracking, allowing it to understand and track its position relative to the world. Afterwards, it uses environmental understanding to detect the size and location of all type of surfaces: horizontal, vertical and angled surfaces like the ground, a coffee table or walls. Finally, it performs light estimation to estimate the environment's current lighting conditions.

Challenges or Limitations of AR

- 1. AR requires lots of processing power and high-quality hardware.**
- 2. Devices with Android below 7.0 does not support AR.**
- 3. AR needs light to see and will not work in low light.**
- 4. AR still has the problem of occlusion.**

ASHITA GUPTA

**B. Tech on Computer Science Engineering
University of Calcutta**

smart wound DRESSING

Mere external wounds? Injuries? Cuts?

We have band-aids for that.But what about the chronic injuries?How can we understand the condition and status of healing in those cases? We have smart wound dressing techniques to complete this work.....

So what is smart wound dressing? How does it work?

A smart wound dressing will automatically monitor healing and infection ,potentially reducing the 7000 annual lower limb amputations for people with diabetes.The disposable dressing would use fibre optic sensors and a standalone optoelectronic unit with Smartphone connectivity to monitor multiple biomarkers,including temperature,humidity and pH. The proposed sensors will be fabricated in lightweight,flexible,low-cost optical fibres with diameters of roughly 100 microns.The fibres will be incorporated into fabric that will reportedly look and feel the same as conventional wound dressing.The dressing will be connected to a standalone reusable optoelectronic unit to constantly evaluate the wound's status.The unit will transmit and receive light to and from the sensors,relaying information to patients and doctors thanks to wireless transfer to a mobile phone. The medical centers will develop the smart wound dressing for 24 months followed by 10 months of clinical evaluation and patient feedback from people with chronic wounds.

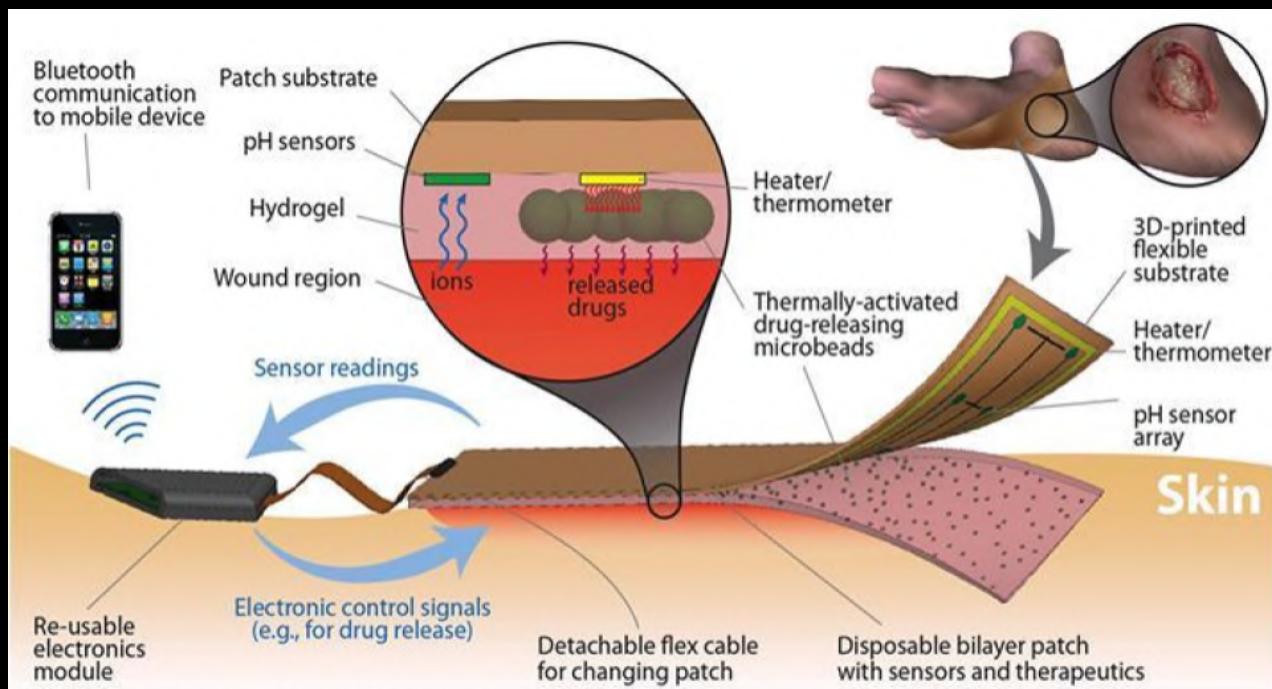
How does the sensors detect wound healing?

The sensors detect wound healing by monitoring microscale changes in the body's tissue.The research group led by DR.MICHAEL CRICHTON

traditionally focussed on the biological properties of wounds but knowledge about the mechanics of how they heal is limited, especially at microscale where changes occur at sub-hair width scales.

Crichton and his team intend for the final form of the sensor to be embeddable within a bandage to measure the changes in the wound's properties without interfering with the process, making small mechanical measurements to see how the tissue is changing and recovering. This could help give a much clearer view of whether the wound needs a different dressing or treatment than pain reports and naked-eye examinations. The new method revolve around how sound moves through the tissue. The sensors are being designed to transmit and receive sound, measuring how quickly the waves travel through the wounded tissue below the bandage. The speed at which the sound is transmitted will give the clinicians an understanding of the tissue strength and how heated the wound is.

Crichton said, "OUR SMART SENSORS WILL ALERT THE PATIENT AND THEIR CARE TEAM WHEN INTERVENTION IS NEEDED TO MAKE SURE THE WOUND HEALS OR WHEN IT IS ALL PROGRESSING NICELY UNDER THE BANDAGE"



Advantages of smart wound dressings

Firstly, it gives us a much prior information about the condition of the injury. So we can decide what to do for the betterment of the wound. **Secondly, the optical fibres are also of high flexibility, low cost and affordable.** **Thirdly, a huge mass of population can be saved because it also helps to know about the nature of the wound through imaging, so those kind of injuries can be detected before they take a wrong turn.** **Fourthly, it can directly connect to the Bluetooth in our respective smartphones as the sensors relay the information. Thus it will have a huge effect on the modern population. It will form a great impact on people of entire world.**



DEBJANI BHAKTA
B.Tech in Chemical Engineering
University of Calcutta



about **MICHAEL CRICHTON**

Dr. Michael Crichton, a biomedical engineer at Heriot-Watt University has been awarded 360000 dollars from the Engineering and Physical Sciences Research Council (EPSRC) to develop a microsensor that will detect wound healing by monitoring the tiny, microscale mechanical changes that happen to the body's tissue. He is working now with Dr.Jenna Cash,a specialist in wound healing immunology from the University of Edinburgh on this two year project.He said “We are working to create a small sensor that can be embedded in a bandage to measure changes in a wound’s properties without interfering with the process.The sensor will make small mechanical measurements-much like how a doctor would prod a lump-and will tell us how the tissue is changing or whether the wound needs a different dressing or treatment. At the moment we judge the progress of wounds on patients’ reports of pain, and how the wounds look to the naked eye of health professionals.**OUR WORK ON THE IMMUNOLOGICAL RESPONSE DURING HEALING IS REFLECTED IN MECHANICAL CHANGES AND ANYTHING THAT COMBINES THESE HAS THE POTENTIAL OF NEW THERAPIES IN THIS AREA.”**

SOUJATYA SARKAR

HULT PRIZE 2020 @CalUniv

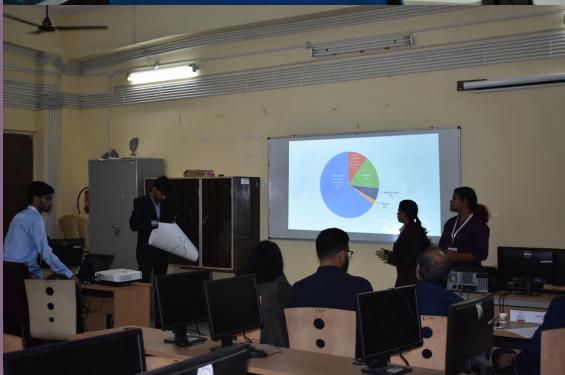
The Hult Prize was established by Bertil Hult, and is an annual, year-long competition that crowdsources ideas from MBA and college students after challenging them to solve a pressing social issue around topics such as food security, water access, energy, and education. The Hult family – founders of EF Education First – donates USD 1 million in seed capital to help the winning team launch a social enterprise. The Prize is a partnership between Hult International Business School and the United Nations Foundation.

Former President Bill Clinton selects the challenge topic and announces the winner each September; he mentioned it in a 2012 TIME Magazine article about "the top 5 ideas that are changing the world for the better". The Hult prize has been referred to as the "Nobel Prize for students" by Nobel laureate Muhammad Yunus.



HULT PRIZE 2020 - ON CAMPUS

UNIVERSITY OF CALCUTTA



This year's Hult Prize 2020 was a grand success. With great companies like *Unish Kuri*, *91.9 Radio FM*, *Cane Crush* and *RedBull* as our event partners, and a strong and able organizing committee, this year's Hult Prize On Campus event was a successful and exemplary phenomenon. With great names as our judges this year, the competition arised to the next level ! Thanks for such a fantastic HP20 OnCampus Round *Shaswata Barua* (Campus Director HP20@CU).



HULT PRIZE 2020 - ON CAMPUS

UNIVERSITY OF CALCUTTA



FIRST ROUND TOP 3:

1. ARAMBH
2. UTKARSH
2. Team CARBON

ARAMBH members
were Aryaman
Sharma, Rupam
Kumar Roy, Bhaskar
Dutta and Amartya
Bhattacharya.

Top 10 teams qualified
to the second round.



HULT PRIZE 2020 - ON CAMPUS

UNIVERSITY OF CALCUTTA

SECOND ROUND





HULT PRIZE 2020 - ON CAMPUS

UNIVERSITY OF CALCUTTA



Shreemoyee Goswami, Samina Haque,
Shatadru Banerjee, Aritra Ray (From Left)



Neha Sarkar, Nishan Chatterjee,
Debashrita Kundu (From Left)



Shweta Jha, Sayak Sengupta,
Ratul Mondal (From Left)

HULT PRIZE 2020 - ON CAMPUS

UNIVERSITY OF CALCUTTA

JUDGES

Arihant Kothari
Deputy Manager(10000 Start Ups) at NASSCOM
Hult Prize at University of Calcutta 2020 Judge

Abhiroop Sengupta
Founder, President and CEO DeltaSencorp & Co
Hult prize at University of Calcutta 2020 Judge

Rajyeshwari Ghosh
Founder at Quantum Holistic,
Certified Blockchain Practitioner,
Former Big Four and Wall Street Professional
Hult Prize at University of Calcutta 2020 Judge

Dr. Pradip K Mazumder
MD and Co-chairman, CSC Capital(USA) India
PM, Entrepreneur Hub, Kalyani University
Hult Prize at University of Calcutta 2020 Judge

Sumit Marda
CEO and Co-Founder of mindhour.com
Hult Prize at University of Calcutta 2020 Judge

Hari Balasubramanian
Angel Investor
Indian Angel Network
Hult Prize at University of Calcutta 2020 Judge

Vishal Kumar
CEO and Founder of Learning While Travelling
Hult Prize at University of Calcutta 2020 Judge

Sabyasachi Mukhopadhyay
Data Scientist, TEDx Speaker, Intel Software Innovator,
Google Developer Expert of ML, Kolkata Lead of Facebook
Developer Circle
Hult Prize at University of Calcutta 2020 Judge

Prerona Roy
Founder of Inspire Excellence, Leadership and Business
Coach, JMT USA
Hult Prize at University of Calcutta 2020 Judge

Arijit Bhattacharyya
CEO and Founder, Virtualinfocom
TEDx Speaker
Hult Prize at University of Calcutta 2020 Judge

Ravi Ranjan
Entrepreneurship Evangelist, Startup Expert, TEDx Speaker
Ex NASSCOM/IAN/Ennovent
Hult Prize at University of Calcutta 2020 Judge

Meghdut Roychowdhury
Founder and Curator in Chief, Offbeat CCU
Director of Global Operations, Techno India Group
Hult Prize at University of Calcutta 2020 Judge

Raghav Kanoria
Co-Founder of Calcutta Angels Network,
Partner of Anchor Group,
Founder of Neoleap Accelerator
Hult Prize at University of Calcutta 2020 Judge

Anirban Jyoti Ray
CEO of Greenovera India
Hult Prize at University of Calcutta 2020 Judge

Sandeep Chatterjee
Associate Director, Deloitte India
Hult Prize at University of Calcutta 2020 Judge

The background features a dark stage with a grid of circular logos for Hult Prize, OnCampus, and unikorn.org.

Learning PYTHON

with Chirantan

Okay, so I'm doing this... I am the most lethargic and distracted person in this world, but still have taken up this challenge to produce an article every month for TERAWIRE, to make a full course on Python which you can follow to be amazed by this powerful programming language. Even if you are a completely new to coding, there is no reason to worry...We all were beginners at a time, and well everyone I guess can learn coding with a bit of dedication and practice.

I will try to make this course as interesting as possible... I will try to make this as interactive and fun as possible... I know this is in text format, but I will provide links to source codes and good videos whenever I can for making this interesting.

The only piece of advice I want to give right here at the beginning is like learning any other LANGUAGE, any programming LANGUAGE can be learnt best by reading code snippets or typing code yourself... You may not be perfect at the very first and that's OKAY. But just as any baby learns their mother tongue naturally by listening others speaking it, and babbling words...coding is learnt exactly in that way, by looking at snippets of code written by others, and writing code yourself.

I will try to make this course as simple as possible....which I believe would be helpful for complete beginners, but nevertheless those who have some experience in writing code can get help from this too. As this is a monthly magazine I would also leave some coding challenges and exercises at the end of each edition which you can try. The solution to which would be provided in the next edition. As one month is ample time... I would try to give as many problem exercises I can which you can solve for your own good.

Now I would like to share a basic Course Outline. From here you can find the topics that would be covered in this course. I would make this course simple but thorough so that at the end of it everyone who has gone through this course seriously can code like a pro with practice 😊.

COURSE OUTLINE

1. **How professionals code?**
2. **Getting started**
3. **Variables, expressions and statements**
4. **Functions**
5. **Interface Design**
6. **Conditionals and recursion**
7. **Fruitful Functions**
8. **Iterations**
9. **Strings**
10. **Word play**
11. **Lists**
12. **Dictionaries**
13. **Tuples**
14. **Data Structure Selection**
15. **Files**
16. **Classes and Objects**
17. **Classes and functions**
18. **Classes and methods**
19. **The Goodies**
20. **Debugging**
21. **Analysis of Algorithm**

**So enough of speaking....lets jump right into the jungle of unknown in
the quest mastering the Legendary Snake Python.**

How Professionals Code ?

Ever played jigsaw puzzle as a kid? Ever spent time fidgeting with Rubik's Cube? Ever played Sudoku...or even basic problems? Like jumbled words and all??

What's common in all these?

Basically you are given a problem and you use your critical thinking abilities to solve the given problem or puzzle. Programmers/Coders do the same thing. They are given a problem and they use their critical thinking abilities to give some instructions to the computer to solve the problem, as efficiently as possible. If you have ever tried to solve a Rubik's cube you most probably know that you can either go on trying without any fixed procedure to solve a Rubik's cube, which can basically take forever, or you can follow a predefined algorithm or you yourself can figure one out to solve it faster. Even a coder can do the same thing...they can go on trying to solve the program blindly without any kind of logic development, or they can use their critical thinking and a bit of mathematical knowledge to device an algorithm to solve the problem much more efficiently and accurately. Well that's what differentiates a pro coder from others. They use their skill to use the resources that he has access to, to develop algorithm to solve the problem and thereby use a language(like Python) to convey his instructions to the computer to solve it.

You might solve a problem by just using simple logic if you are able to figure it out sneakily. Sometimes some problems are set by the problem setters whose solution is pretty easy if you know the trick behind it. If you don't, then you would keep on trying all day, and come up with complicated less efficient solutions. The only way you will be able to judge these hidden tricks in the problems is by solving problems itself and sometimes even going wrong would help you get better.

Apart from that having a strong understanding of mathematical methods also help a lot in getting better at developing logic. I would highly recommend every reader of this article to participate in coding competitions because that's an excellent way to judge your current standing in respect to others, and also by participating in competitions you can learn a lot of new things and face new problems to solve and challenges to overcome. Though this course which is going to come up would be in Python I would not recommend it as a language to use in coding competitions simply because its high compile time in respect to other languages. You might be very much allured to use Python simply because of the simplicity of code, but if you genuinely want to win competitions I would not recommend it. But Python is the language of the future because of its large scale usage in Machine Learning, Artificial Intelligence and Data Science. Even Google recommends Python as the language to be used for Scientific research and Artificial intelligence.

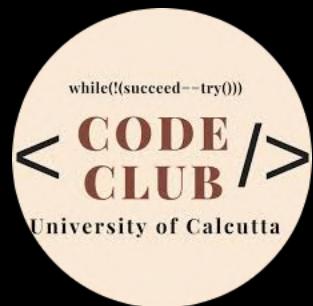
So that's about it, I think that is much to get you all those who are interested to be all pumped up and ready to learn the language by bits and master it completely as it comes with each publication of the magazine.

CHIRANTAN GANGULY

B.Tech in Electronics and Communication Engineering
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Developer Student Clubs
University of Calcutta



CLUBS & EVENTS

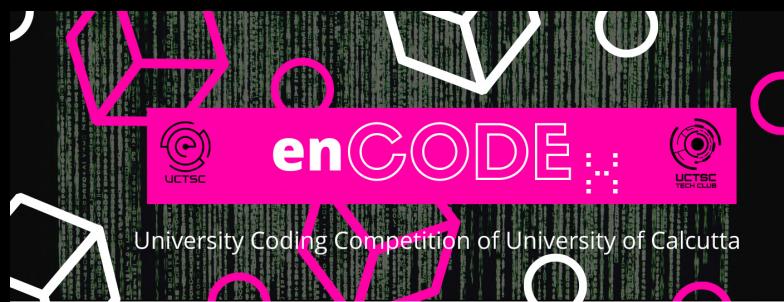
Learn with
Google AI | Explore ML

Google ExploreML Workshop

Intermediate Track will end on December and is open for all students of University of Calcutta.

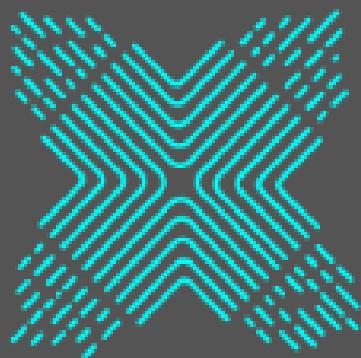
For more information, contact Facilitator ASAP- **Subham Das - +91 8583057474**

TECXOTiC 2020
presents
enCODEx
Round A - 2019



For participating visit **link:**
<https://www.hackerrank.com/encodexcaluniv>

BULLETIN



TECXOTiC 2020

TECXOTiC 2020

TECXOTiC 2020 Organizing Team Form Links are still on -

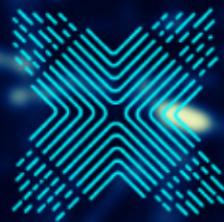
Apply soon to be a part of the Organizing Committee of TECXOTiC 2020.

Last Date for form Submission increased to 20th December 2019.

Next Issue will announce the organizing team in detailed list.



THE TECXOTIC 2020 HYPE HAS BEGUN
Tentative Website: <http://www.tecxotic.cf>



TECXOTIC 2020

THE D-DAY IS COMING!!

ROBOZO



enCODEx



MAKER-a-thon



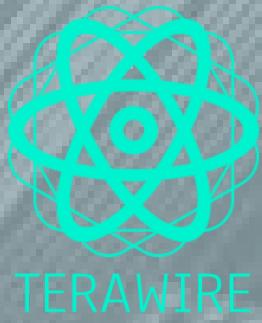
MATRIX



M.I.B.



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