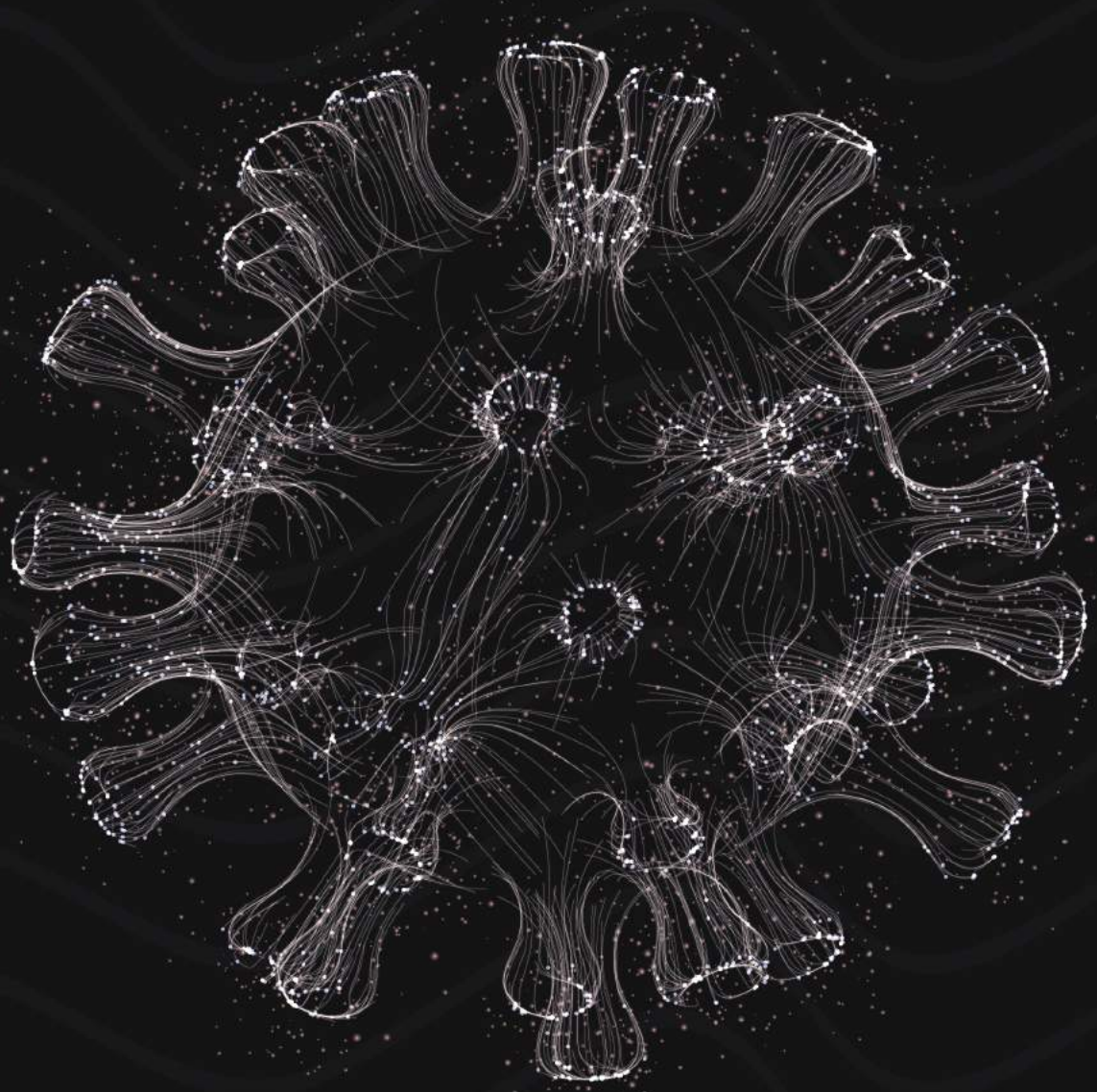
ANVESHAN

Vol 8



The Annual Technical Magazine of MNTC NIT Durgapur

MNTC
MATHS N TECH CLUB

EDITORS' MESSAGE

To all our dear readers,
We, Maths N Tech Club welcome you all to the newest edition of our Annual Technical Magazine- Anveshan.
The past one and a half years have been tough on all of us. But, as they say, every cloud has a silver lining. This pandemic has given birth to a whole new world of innovations and technical milestones that have helped us in several ways. In this edition, it has been our aim to bring forth these wonderful creations of mankind that have been a boon to us in this bane of COVID.
Ranging from inventions by famous companies, to small but magnificent creations by college students like us, this magazine will take you through it all. We extend our heartfelt gratitude to our respected Faculty Advisors- Dr. Anita Pal, Dr. Seema Sarkar (Mondal) and Dr. Sarit Maitra for supporting us in all our endeavours and helping us in publishing this magazine.
We invite you all to turn the pages from anticipation to fascination and hope that you all enjoy reading this magazine. Thank you all!

From,
The Editors' Desk
Maths N Tech Club

EDITORS' MESSAGE

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ABOUT US

Who we are?

Our club was set up in 2004 with the aim of creating a platform that helps in stimulating passion for mathematics and interest in the technology of today's world. At Maths N Tech Club, we understand the importance of analytical reasoning and rational thinking. Hence, we organise a plethora of events throughout the year that aims at reinvigorating the seemingly dormant passion for mathematics and the thirst for knowledge about today's technology.

Why we do it?

"Little drops of water make a mighty ocean." - On a similar note, we try our best to deliver little drops of knowledge about recent technical enhancements through the various workshops that we conduct around the year. We also try to shower fertile minds with little drops of analytical reasoning and logical aptitude through the various events conducted by us from time to time. In this manner, we try to fill the ocean that is the human brain.

ABOUT US

FACULTY ADVISOR'S MESSAGE

FACULTY ADVISOR'S MESSAGE

I have great pleasure in conveying my best wishes to MNTC for releasing the technical magazine "ANVESHAN" which brings the students, teachers of various disciplines and technical people on a common platform to share and display their ideas and creative talents.

I wish all the students who have been involved in bringing out the magazine for their greater success and career ahead. I also wish them to experience victory in all of their future endeavours.

~ Dr. Anita Pal

"Education is about awakening –Awakening to the power and beauty that lies within all of us."

I would like to congratulate the entire team for their hard work and dedication for giving shape to this magazine. The reflection of the students' creativity is the epitome of the magazine. I am sure that the positive attitude, hard work, sustained efforts and innovative ideas exhibited by our students will surely stir the mind of the readers and take them to the fantastic world of unalloyed innovation and novelty.

FACULTY ADVISOR'S MESSAGE

We are committed to the improvement and growth of student community. We would like to see them soar to new heights and taste success in all their endeavours. Our students are intelligent, resilient, creative, imaginative, disciplined, dedicated to life-long learning, respectful and ethical. They are the future leaders and role models of society.

During this unprecedented time, we have earned the support and cooperation from everyone at every step and I look forward to the same collaboration and support so that we embrace all the challenges with confidence, steadfastness and fortitude and keep on coming up with publication of a better magazine every year.

To us, "Success comes to those who work hard and stays with those who don't take rest on the laurels of the past."

~Dr. Seema Sarkar (Mondal)

FACULTY ADVISOR'S MESSAGE

FACULTY ADVISOR'S MESSAGE

With much pleasure and pride I congratulate the students for publishing ANVESHAN. In this time of COVID pandemic it has been onerous to maintain the rhythm of life as it used to be in earlier times. In spite of that, with much enthusiasm they have published this magazine. I hope their effort will be highly appreciated by all the students as well as by other readers, in general.

Indian scientists and engineers, like many COVID warriors, have made us proud with their inventions in combating COVID. COVID vaccine have been invented within a very short span of time. Aarogya setu app has been invented and it has been very useful to prevent the spread of this highly infectious disease through contact tracing method. Also, in recent times our country has witnessed tremendous growth in space research and other scientific inventions.
I wish our students would also go long way in serving our nation as well as humankind.

~ Dr.Sarit Maitra

Aarogya Setu

मैं सुरक्षित | हम सुरक्षित | भारत सुरक्षित

AAROGYA SETU

by Vamsi Dath.M (Department of Computer Science and Engineering)

“Arogya Setu “ the word means 'bridge to liberation from disease' in Sanskrit. This app was developed in a record time of about 21 days, by some of the best Indian minds from Industry, Academia, and Government, working round the clock to build a robust, scalable and secure App. The App was released on 2nd April 2020, which was a week after the Lockdown announcement on 25 Mar. It was a quick response and a great initiative for identifying the clusters of a country affected due to the Pandemic of 2020 – Covid -19.

Amidst the worldwide Pandemic Chaos, and particularly in India, where the population is larger than any continent of the world itself, brave engineers made their contributions in the backend by helping the Government and its organization

AAROGYA SETU

in tracking and tracing the issue of the origin and spread of the infection in localities. The app reached more than 100 million installs in 40 days. This was praised by several countries worldwide and not only brought up the health scenario of the people but also helped in making the process much more organized. The tracking facility was not only limited to the app, and the best part is that the open-source code for it has been released in order to facilitate changes for the source code. On 26 May 2020, amid growing privacy and security concerns, the source code of the app was made public. This, in turn, brought a huge response from the programmers' community. This helped many other world countries to come up with some better versions of themselves. The World Health Organisation lauded the Aarogya Setu mobile application for helping health departments to identify COVID-19 clusters.

It was a government initiative, built on a public-private partnership. It is an Indian COVID–19 "contact tracing, syndromic mapping, and self-assessment" digital service, primarily a mobile app, developed by the National Informatics Centre under the Ministry of Electronics and Information Technology (MeitY).

The basic idea of this app depends on Bluetooth-based tracking and mapping of devices. When the app is installed by

someone, it acquires their details like location, mobile info, places travelled in recent times, and previous health records, etc. These details are however stored in the background in an encrypted format, for the security of the citizens. After that, the app also features a self-assessment process, where a person, by providing his most recent conditions would be able to access the risk factor of getting affected by the Virus. And then the App asks for an all-time Bluetooth wake-up permission, which is the key element of the App. The working is such that if at any time there takes place an encounter of 2 or more users of the App at a place for a period of say (5-15min), then they are grouped virtually with their positions information in backend. And if any of the users are found to be affected by the virus, then others are immediately informed with an alert message along with the instructions to be followed. Also, the details are stored in the Govt. database to isolate the cluster spot. This tracking information is also used even when a user is found affected later in some near time, so as to access the locations where the user was active in the affected period.

This is one of the best examples that show the beauty of how the work of some brilliant Engineers helped people amidst these tough situations.

AAROGYA SETU

This was a quick response which helped millions of people with the ease of technology. The pandemic not only made the life of people distorted, but also brought the best out of themselves.

IMMUTOUCH

The year 2020 has been witness to the terrors of the pandemic COVID-19. A pandemic of this major scale has crippled a lot of countries, their industries, and economies. It could have damaged more if not for some of the brilliant inventions that brought light to our lives. Science and technology never stay stagnant. Amidst this pandemic situation, the innovative minds of our human race have brought forth various new devices and technologies which have made our life easier. One such invention worth mentioning is the Immutouch wristband.

Immutouch, a wristband developed by Slightly Robot, a Seattle-based company owned by two brothers and a friend, had been initially designed to prevent people from harmful touching- trichotillomania- a disorder that compels people to pull out their hand.

IMMUTOUCH

On the onset of COVID-19 in December 2019, they redesigned the initial hygiene smart band to make a new invention called the Immutouch, a wristband that vibrates when one touches their face.

It has an accelerometer that senses the hand movement 10 times per second. The Immutouch buzzes when one touches or comes close to touching their mouth, nose, or eyes. A companion app even helps us by tracking our progress. In this way, it helps us by making us aware whenever we try to touch our face thus keeping the germs from coming into contact with our face.

The Immutouch develops a Pavlovian response, whereas whenever we have the urge to touch our face, we don't in order to avoid the buzzing sensation. Our brain internalises the negative feedback of the vibration, conditioning and training us to prevent ourselves from scratching.

The coronavirus could be spread anywhere, from the doorknobs to the hand railings, to the money we exchange. By preventing us from touching our face the Immutouch prevents the virus from entering our system. This small act of not touching the face could save countless lives and the Immutouch has made our work easy for us.

These small but important inventions help us and keep us from succumbing to the disease. As the year draws to an end, millions of people hope for a better tomorrow, a better future- a future wherein they could lead normal lives and live freely without having to worry about the disease. The human race has won against many distressing situations and thus will surely win this one and all the coming fights in the future. Here's to keeping up the positive spirit and staying safe. Let 2021 be a COVID-free year!

IMMUTOUCH

ROBOTS TO THE RESCUE DURING PANDEMIC

-Article by Saswata Sarkar (1st year, Mechanical Engineering, NIT Durgapur)

The COVID-19 pandemic has changed our lives in many ways. Robots have long helped humans and protected them from several hazards. The pandemic brought several challenges to us, and robots acted as armour to combat these hard times to a great extent. In this article, I want to cite some such examples where robots have helped humans during the pandemic.

Delivery and logistics robots by Starship Technologies

The need for contactless delivery has increased all over the world. To facilitate stores to remain open, delivery robots have been deployed. This allows customers to shop without having to roam inside or without exposing a delivery person.

These six-wheeled icebox-shaped robots move in the streets autonomously to deliver food and other essentials. These robots are equipped with sensors, cameras, and motors. They can judge the obstacles, avoid them and carry out their job. After it reaches the destination, one can unlock it via an app to receive the order.

Colossus

Colossus by Shark Robotics, a French company, applies hydro alcoholic gel to disinfect roads and public places.
These robots operate in hostile environments and high-risk situations. Colossus helped the firefighters to extinguish the Notre Dame fire.

Assistance and companion robots

At the Circolo hospital in Italy, a wheeled robot goes to the bedsides of COVID-19 patients to collect information about their health. In India, CSIR-CMERI Durgapur also developed "Hospital Care Assistive Robotic Device".

ROBOTS

In India, CSIR-CMERI Durgapur also developed "Hospital Care Assistive Robotic Device". It has got several features like video conferencing facilities, collecting samples from the patients and delivering medicines and food to the patients.

HCARD by CSIR-CMERI

It has got UV-C disinfection feature in all its drawers, and its navigation is through either autonomous track follow mode or an IR blaster operated remote mechanism.

It breaks direct contact between the health workers and patients in case of highly contagious diseases.

The pandemic has accelerated the adoption of the existing robots and their adoption in new areas. This would surely encourage the development of new robots and be helpful to humans in many ways.

PRANAYAM 1.0

-Prof SS Roy, Dept of Mechanical Engineering, NIT Durgapur

Oxygen concentrators are the most reliable, efficient, and convenient source of supplemental oxygen available in this pandemic situation. The unit adsorbs Nitrogen from room air by Pressure Swing Adsorption (PSA) method which allows oxygen enriched air to be delivered to the patient through the oxygen outlet, although the concentrator filters the oxygen in a room. Pranayam1.0 is indigenously designed and developed by the Department of Mechanical Engineering of the National Institute of Technology Durgapur.

With portable oxygen therapy options, our products are intended to give users the freedom and flexibility they want. This also offers you a continuous flow oxygen setting. It can operate non-stop for 6 to 7-hours because of the big displacement compressor that it is adorned with.

The reliable flow regulator also helps in monitoring the flow of oxygen. The working of this product is also very easy to understand. This portable oxygen concentrator comes with a capacity of 5 LPM with oxygen purity of 91-96%. It has a humidifier bottle, a flow-meter knob, and a flow-meter. It is studded with built-in sensors that pick up any deviation in the functioning of the concentrator. The concentrator shell itself weighs just 17-18 kg and comes with an elegant look. It reliably manages the therapy and lifestyle needs of the patients with just one POC and simplifies patient management.

DEEP LEARNING

-- Soumyodeep Dey (4th Year, Computer Science and Engineering, NIT Durgapur)

"By far the greatest danger of Artificial Intelligence is that people conclude too early that they understand it."

This was very rightly said by an American AI/DL researcher who goes by the name Eliezer Yudkowsky. So instead of connecting AI with Terminator-like movies, let us actually try to understand what it is and how it has developed over the years. We will be mainly discussing about Deep learning in this article.

I would like to clear one thing. Deep Learning is not restricted to any specific branch and all engineers can find its application in their respective domains. It would be a very wrong notion if anyone thinks that it is only for the circuit branches.

So what is Deep Learning? It is a branch of Machine Learning where it tries to process huge amounts of data by employing different algorithms and then tries to predict a certain output. It does this mainly by imitating our thinking process (that's where we get the name Artificial Neural Networks) or by developing abstractions.
Still it seems like a black box, right. Let me simplify it further. Think of a Deep Learning Model as a big box comprising of a certain number of vertical layers. Now each layer comprises of some box-like units (also called hidden units of a neural network layer). The first layer is called the input layer whereas the last layer is called the output layer. The hidden units of one layer are connected to the hidden units of another layer, and these are basically called weights. Now each layer is basically a function (also called an activation function). These functions can be any uniform mathematical function that you can think of, but mostly it is either the hyperbolic tangent function(tanh), the sigmoid function(sigma) or the relu function(rectified linear unit).
So by now, many of you might have question in your mind about the fundamental difference between Machine Learning and Deep learning. So, Machine Learning mainly uses algorithms to read and learn from the data and make a guess based on what it has learned.

On the other hand, Deep learning structures its algorithms by creating Artificial Neural Networks that can learn and make its own predictions. Another major difference is that, Deep Learning models are more effective in comparison to its Machine learning counterparts when predicting on huge datasets. As the amount of data grows, the accuracy of Machine Learning models flatten whereas the Deep learning models keep on giving better results.

To process these huge amounts of data, what the Deep Learning community required was high computation speed. Since 1940's even though people made considerable advancements in Deep Learning, it was only restricted to the research phase and could not mark its dominance in the commercial sector. Some big datasets required almost 10 days to one month to get processed and then implemented properly. This was not at all feasible for the real world where you needed to take split second decisions. The turnaround came along with the new millennia. GPUs(Graphic Processing Units) were developed and that increased computational speed by several times. Many more advancements were made, like Parallel Computing , which mainly enabled an engineer to train the same dataset on two different models simultaneously. But this is a whole new topic to be explored and we won't be getting into the depth of it.

If you will ever explore the depths of Deep learning, you will know that there are several kinds of Neural Networks available. Some of them are: normal Feedforward Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks, Generative Adversarial Networks, etc. Out of these ,CNNs and RNNs are very popular and both of these find their applications at various places.

CNNs are mostly used for image processing, classification, segmentation, recognition, etc. It mainly comprises of a few Convolution layers (and a few other layers like pooling layer, a softmax layer). For those of you who do not know, what Convolution is, just understand that it is a mathematical operation on two functions producing a third function mainly altering the shape (or dimensions) of one of them. So when we give an image as an input to a CNN model, it interprets the image's pixel values as data and performs convolution on them to finally produce an output. Over the years various classical networks have been developed like Le Net, Alex Net, VGG Net, Res Net (comprises of almost 150+ hidden layers). Let us not get into the details about each of these networks as that can be tiresome and unnecessary.

If you are interested to work and gain knowledge in this field, do not have second thoughts. Jump right on to it.

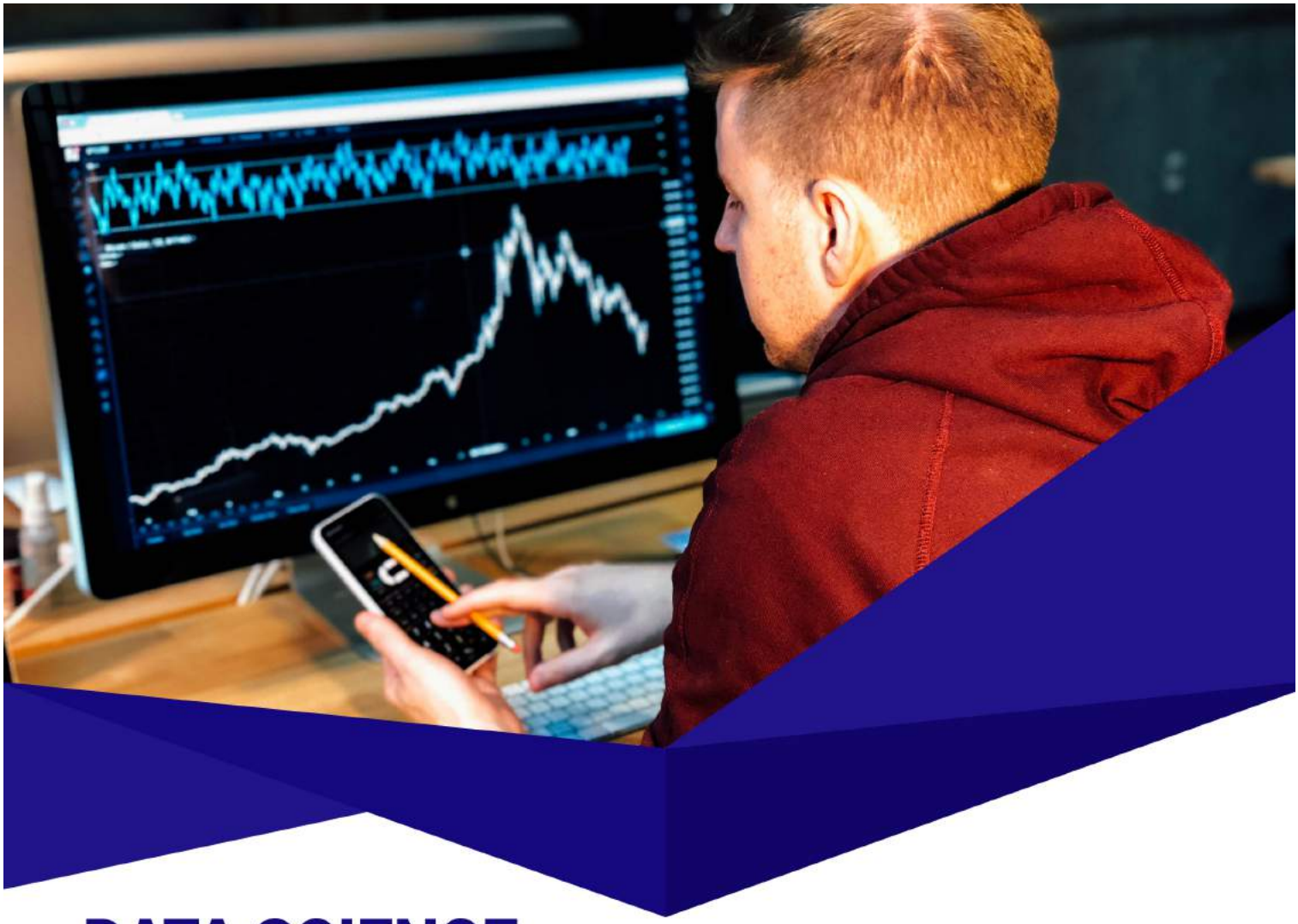
DEEP LEARNING

Stop writing AI/ML enthusiast in your Linkedin profile and become an AI/ML engineer. For absolute beginners, I can't stress this enough, GET YOUR BASICS RIGHT!! Don't directly start reading the ML, DL and AI theory. Also don't think that you would get to write – "import tensorflow as tf" on your very first day. Before starting any of these, try to ensure that you have your bases covered. One of them is mathematics. This is probably the most important, especially if you are research oriented and intend to read popular research papers later on. You should be good at Linear Algebra, Differential Calculus, Probability and Statistics. Once you think that you are quite proficient in these, try your hands at Python. You should be able to implement functions, lambda functions, index slicing and other basic stuff without having second doubts. Also learn about Numpy as it helps in performing mathematical operations on arrays. Before entering the world of Deep Learning, you should also have a basic understanding of the Machine Learning models like Linear and Logistic regression, Support Vector Machines, Naïve Bayes, etc.
Now that you have the pre-requisites, let us get into the crux of this topic. To begin with, I would suggest you to either do the Deep Learning specialization (comprising of 5 courses) of Andrew Ng available on Coursera, or any NPTEL course on Deep Learning offered by the IITs, or a course offered by MIT which goes by the name:

Introduction to Deep Learning (MIT 6.S191). There is another course offered by Jeremy Howard - fast.ai. While other courses have introduced us to the concept of Deep learning in a way where we are taught the basics first, in the fast.ai course the programming aspects of Deep Learning have been stressed upon. All in all, any of these courses will provide a solid foundation, which will enable you to explore your interests further. After you have gained enough knowledge, you can start understanding (and writing) a few code snippets of Tensorflow. The best way is to learn from its official documentation, otherwise you can refer to many books like that of O Reilly's: Hands on Machine Learning with Scikit-learn, keras and Tensorflow.

Now coming to one of the most important aspects- projects. Try to build a few projects from scratch, on your own. Don't just follow along with those youtube lecturers, as that is not really helping you in your learning process. The projects can be anything of your choice. It can be Image classification (as simple as cat and dog), Face Detection, subtitle generator, Chatbots, Image caption generator, etc. Take the help of Google as much as possible, as it can aid you in learning a few extra stuff. Even if you are referring to one of those pre-recorded lectures, try to break apart the code and play around with some values here and there.

Otherwise, it totally defeats the purpose of doing projects.
So this was me discussing about a few basic things related to Deep Learning, and how a beginner can set foot into this domain. I am a fellow learner as well. Deep Learning is a vast topic, and I don't think I have even skimmed the surface. There can be no end to learning, mainly due to the reason that Deep Learning is a very hot topic among the researchers right now. Many of the prominent papers that have been published, have come in the last decade. I urge you to delve deep into this domain and I can guarantee you that you won't regret it. I would be very happy to discuss any new ideas or concepts with you.



DATA SCIENCE

by Anamitra Singha (4th Year, Biotechnology, NIT Durgapur)

Before jumping right into how to be a data scientist and throw some jargon at you, let me explain what Data Science is. Data Science is the study of data … yes that's all it is, sounds boring right? Trust me, it's not.

I don't want to keep Data Science as a buzzword in your mind so, let me start with an example where Data Science is applied in real life, most of us are using Netflix, well at least you're using your friend's account. You open up Netflix, it recommends you with movies, have you ever wondered how it does that? What they have in the backend is called a recommender system, I'd love to get into the technicality of how a recommender system works but I wouldn't be able to fit whatever I know into one article itself. On a bird's eye view let me put it this way, a recommender system takes your

personal information/watch history/users you're similar to and some other features in their mind while recommending you with movies/tv series to watch next. Back in the year 2006, Netflix held a competition, called the Netflix Prize wherein they set a prize money of $1 million USD, if you could improve their recommendation system by 10%, it took nearly 3 years to be solved and took the efforts of many collaborators from around the world. If anyone is interested to read about how exactly the winners of the prize solved the problem click on the link: https://datajobs.com/data-science-repo/Recommender-Systems-[Netflix].pdf

Not only Netflix but Facebook/LinkedIn/YouTube/Amazon and every other IT giant you can think of are using Data Science in some way or the other, all the companies I've mentioned above are in fact using Recommender systems internally to recommend you with friends/connections/videos/products respectively.

Right, if you're still reading this, congratulations you've stepped into the first step of becoming a Data Scientist, the ability to patiently read and learn new stuff. You've probably heard the phrase "Data Science is the sexiest job of the 21st century", henceforth let's jump right into how to be part of the "sexiest job" community.

One thing you might be thinking right now, if you can learn Data Science if you come from a non-CS/IT background, well then let me ask you, do you not take part in coding competitions even though you're a ME undergrad? Anyone can learn Data Science if they are okay to learn Mathematics, Statistics, Python/R, SQL, Machine Learning. Before I state the content or the amount of Math and Stat you need as a prerequisite to understand ML, I'd say that this is a constant learning process, try not getting overwhelmed by the sheer volume of theory you might need to know, most probably won't be able to learn all the things I'm about to mention, at one go. Take a few steps at a time. The order in which I have mentioned is not necessarily the order in which you need to follow to get started with Data Science.

Mathematics: You need learn Linear Algebra and Calculus to be able to comprehend the mathematics behind Machine Learning. You could do that from Coursera or YouTube, there is an amazing YouTube channel called 3Blue1Brown, I'd ask anyone to check out his playlist on "The Essence of Linear Algebra" to get a visual understanding of things like basis, dimensions, vector spaces, matrices etc. If you want to build a solid foundation of Linear Algebra then go ahead with Gilbert Strang's lectures on Linear Algebra (MIT-OCW).

Moving on to calculus, you need to be clear with vector calculus, optimization techniques. To be honest most of the linear algebra and calculus required to learn machine learning is covered in Engineering Mathematics.

Statistics: Well, this is something engineering students are not so comfortable in. You'll need to start with Probability theory where you'll learn about random variable, univariate and multivariate distributions, expectations, covariances, Bayesian inference and quite some more. You'll then move on with Statistics where you'll learn about the different statistical tests, some dimensionality reduction techniques like PCA. You could watch Josh Starmer, zedstatistics, Khan Academy's videos on Statistics as a gentle introduction to statistics on YouTube. For theoretically rigorous courses go for MIT's "Foundations of Statistics" on edx but as a word of caution, do complete MIT's "Probability-The Science of Uncertainty and data" on edx itself before starting with "Foundations of Statistics".

Python: You'd need to learn the basic programming like conditions, loops, functions, exceptional handling, some pythonic data structures like lists, dictionaries, sets. There are few things which are used extensively in Data Science that is lambda functions, list comprehensions, map/reduce/filter functions.

You'd have to become proficient with the three libraries which are like Harry, Ron, Hermione in Harry Potter namely numpy, pandas, matplotlib. You may use Jupyter notebook for writing the codes as it's a very interactive web-based environment. There will be loads and loads of new libraries you'd need to learn about but the good thing in Data Science is you don't really need to remember all the functions of libraries, you can quickly google the library and read about it from the documentation available. For Machine learning the most widely used libraries are re, scikit-learn, keras, tensorflow, NLTK. Resources as of now I'd say go with Corey Schafer and sentdex on YouTube and watch all their videos on Python, you won't regret it.

SQL: If you ever get an opportunity to ask a professional about what is the most important technical skill in Data Science, 9 on 10 times they'll say SQL. Big companies would be storing their user's data in databases, and you'd have to know how to query the data from these databases to even start working on your problem. You need data in the first place to work on, which you can retrieve systematically using SQL. Although, there are multiple instances when you need to scrape data from websites or you might have unstructured data like audio files or images but if you want going to work in big companies then you'd need SQL skills to survive.

You could audit any course on DBMS fundamentals or SQL for data science on Coursera, edx. You'll find YouTube videos on SQL as well. Follow freecodecamp on YouTube.

Machine Learning: Believe it or not, ML is not the only thing that is done in Data Science, according to professionals 90% of the time is spent on cleaning the data first, processing this raw data and making it Machine Learning applicable dataset, next comes building of features for which you will need to study about the business problem as in what your customer wants, you'd also need to develop "domain knowledge" as in the type of domain the problem is in, if it's a biological type problem you'd have to study about the biology related to solving the problem, if it's a graph based problem you'd have to learn the fundamentals of graph theory. In fact, you'd have to read research papers on the topic on which you're working on to build your features. You do the ML modelling after all this is done. Before you just do "from sklearn.linear_models import LinearRegression", you need to understand what Linear Regression does, what are the assumptions it follows. In essence, you need to understand the theory behind all the ML algorithms you are using before just implementing it as your model, because there are things like hyper-parameter tuning which you can't perform properly unless you understand the theory behind the model.

There are few of the general algorithms which you have to study in the course of your learning as follow:

- o Linear Regression
- o Logistic Regression
- o Naïve Bayes
- o K Nearest Neighbours
- o Support Vector Machines
- o Decision Trees
- o Random Forest, Gradient Boosted Decision trees, few other Ensemble techniques
- o Clustering algorithms like K Means, Hierarchical clustering, DBSCAN
- o Dimensionality reduction techniques like PCA, T-SNE(the theory behind this maybe skipped)

I have skipped a whole another part of Machine Learning called Deep Learning, as that in itself is a huge domain. As a general suggestion, I'd ask anyone to get comfortable with classical machine learning techniques before jumping into Convolutional Neural Networks, Recurrent Neural Networks, GANs, Autoencoders, Transformers which come under Deep learning. You can follow Krish Naik's YouTube channel for Machine Learning, Abhishek Thakur's (4 times grandmaster on Kaggle) YouTube channel for learning tricks and tips on solving ML problems. For getting a theoretical understanding you could build your basics with Andrew Ng's course on introduction to ML on Coursera

and then you may dive deeper with CS229 on YouTube which is like a semester long college course on ML taken by Andrew Ng himself at Stanford's classroom.

Alright, that was a lot to digest, I might have scared some people away as well but let's get into facts, all the things I have mentioned above, you need to prove that you know all this. No one would believe your words, so you need to work on projects. A very elegant website from which you may get the datasets to analyse is Kaggle, you could start with easy and introductory problems like the Titanic problem, House Price prediction problem. Start getting into the habit of reading notebooks on Kaggle, you'd find difficulty understanding their codes in the beginning but it would hardly take you a few months to upskill to the level that you'd need to participate in Kaggle competitions and who knows there might be a Kaggle medal winner amongst yourselves.

To summarize, you may follow the steps below to learn and practice Data Science:

1)Learn the basics of Python first including the 3 most used libraries I have mentioned above. Practice writing in the Pythonic way, as C and C++ coders write code a bit differently.

2)Learn the ML algorithms, you'd be fine with the mathematics because we engineering students get the introduction to the math required to learn ML in our first year itself.While learning the ML algorithms read the documentations of the libraries and

try to apply them simultaneously.
3)Follow blogs on medium, towardsdatascience, AnalyticsVidhya, machinelearningmastery.
4)Participate in Kaggle/AnalyticsVidhya/HackerEarth competitions on Machine Learning.
5)Take some courses online like Coursera, edx, DataCamp or you could go with Indian startups providing training online to students, like appliedaicourse, Coding Ninjas etc. Do ask about the reviews from the alumnis of these institutes before taking their training programs
6)Follow Data Scientists on LinkedIn and join Data Science communities.

So, this was my article discussing how you can start into Data Science, I'm a fellow learner as well. I have just mentioned what my mentors have suggested on how to break into Data Science. If you have any doubts or suggestions feel free to contact me on my LinkedIn. Lastly, I'd say learning data science is a process which would take you quite some time but don't bound yourselves to courses rather enjoy the process, learn to love analysing data.

NEURALINK

Described as “the Fitbit in your skull with tiny wires”, Neuralink, a startup by Elon Musk, states that their electronic brain-computer interface will revolutionize the future soon and can perform insane tasks. It enables us to control things with power of thought! Very recently in July 2020, according to Musk, Neuralink obtained a FDA breakthrough device designation which allows limited human testing under the FDA guidelines for medical devices. This has enabled vast human experiments necessary to make it a success. Neuralink has experimented with mice and pigs , which gave positive results. Curing paralysis,restoring memory ,speech, deafness, blindness, and other disabilities, extending the range of human hearing beyond normal frequencies and other exciting stuff like, downloading your brain to a computer, type using your thoughts,listening to your favorite music in your head, summon you tesla telepathically….is just a part of

it is capable of. Now, having seen such things only in movies , it's hard to believe. But this startup makes this possible ! A small easy-to-install device could be used to enhance human capabilities in a multidimensional way.

PROCEDURE

To experience this extraordinary yourself , you need to go through a neuralink procedure. Neuralink ensures this to be painless and quick .So they have designed special(neurosurgical) robots to perform this task very precisely within an hour. The procedure includes removing a tiny portion of your skull and installing a chip to sit with the skull .This will leave only a tiny scar and all the sensors you expect in a smartwatch.Once installed, it will be able to receive and send electrical signals , control machines , computers and other smart devices as well."It actually fits quite nicely in your skull. It could be under your hair and you wouldn't know," Musk said.

ABOUT NEURALINK

It's design has developed such that it is just 8mm in diameter and about 4 to 6 μm thick, containing a high-density electronic system capable of processing information from neurons.The Neuralink implants place wires or what they call 'threads' into the brain. These threads are extremely flexible and are four to six μm in width which is thinner than a human hair.

NEURALINK

ROBOTICS IN NEURALINK

Studies involving the insertion of probes in the brain have shown that, due to their rigidity, the body recognizes them as an unknown material and, consequently, generates tissue to get rid of them, which, in turn, long term, makes them unusable.For this reason, Neuralink has developed a robot capable of inserting flexible probes, allowing the rapid insertion of multiples of these to minimize trauma that can trigger a bounce reaction.This robot has an insertion head with a 40 µm diameter needle made of tungsten-rhenium designed to attach to the insertion loops, made to transport and insert individual probes, and to penetrate the meninges and tissue cerebral. These are capable of inserting up to 6 probes (192 electrodes) per minute.

ELECTRONICS IN NEURALINK

Neuralink aims to convert information obtained from neurons into an understandable binary code in order to achieve greater understanding of brain function and the ability to stimulate these neurons back.Currently, electrodes are still too big to record the firing of individual neurons, so they can record only the firing of a group of neurons; Neuralink representatives believe this issue might get mitigated algorithmically, but it's computationally expensive and does not produce exact results.

HOW IT WORKS

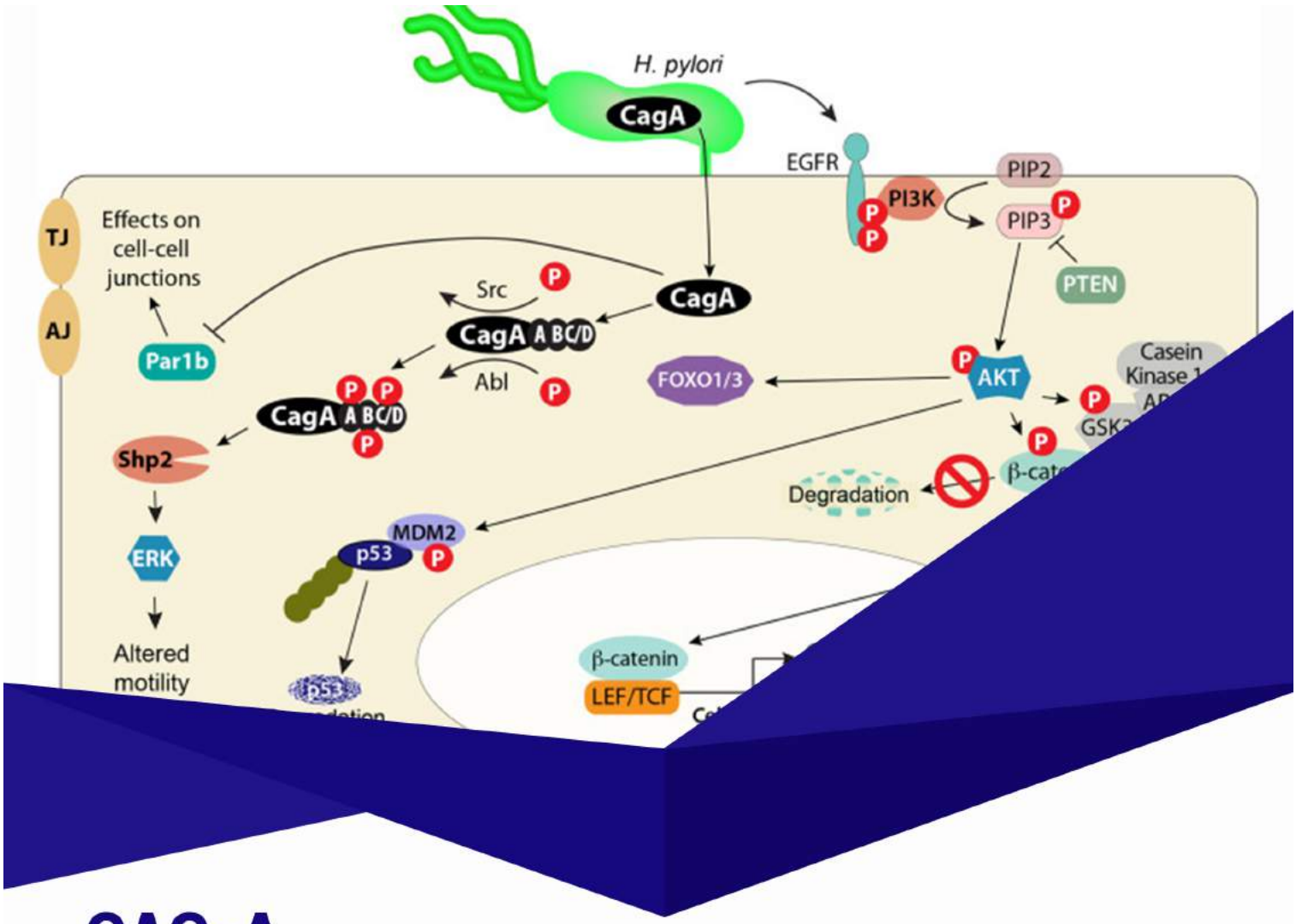
These neurons in your brain connect with each other to form a large network and communicate using chemical signals called neurotransmitters. This reaction generates an electric field and you can record these reactions by placing electrodes nearby. These electrodes can then understand the electrical signal in your brain and translate them into an algorithm that a machine can read. This way Neuralink will be able to read what you are thinking and find a way for you to talk to machines without even opening your mouth. So no more calling out "OK Google" or "Alexa". The goal of the chip is to record and stimulate electrical spikes inside your brain. You'll also be able to learn different skills using a dedicated app.At the moment it is not clear whether Bluetooth or some other form of technology will be used to relay the data but it is certain that the process is going to be wireless.

AN EXAMPLE WORTH SHARING……

Nathan Copeland is one of the few human beings who already has a working interface. He broke his spine in a car accident and is paralyzed from the chest down. Copeland's implant is connected to the outside world wirelessly. They let him control robots and computers, and they have sensations sent back into his brain.

NEURALINK

It's not limited (to act like an arm) like the previous robots he used. "If I think up, it can move up and keep the arm parallel to the ground. It's a lot faster. I like it", he says. "I can pick up a tennis ball for sure. It has a gripper. I pick up and move things across a table as many times as I can in two minutes. I broke my own record. I have pretty awesome control of it.", he said . And when asked why he chose to get such an implant, he shared "To help push the technology so it is commonplace enough to really help people out, so they don't go through the things that I went through. The depression and the feeling that you can't do anything anymore and can't contribute to society—it's just despair." Neuralink aims long-term to restore someone's full-body motion (with the chip). Thank you for reading



CAG-A

By Priyanshu Pandey(4th Year, Dual Degree, Biotechnology,NIT Durgapur)

CagA or (cytotoxin-associated gene A) is a 120–145kDa protein encoded on the 40kb cag pathogenicity island (PAI). It is a Helicobacter pylori virulence factor that has a significant role in cancer. H. pylori infection is generally associated with MALT lymphoma and gastric adenocarcinoma. There is ample scientific proof that cagA is involved in cancer development. H. pylori, in certain conditions, injects CagA in the host system via a type IV secretion system. CagA is known for inducing cellular elongation, also referred to as the hummingbird phenotype. Various studies have also shown that CagA has additional effects on the tight junctions of epithelial cells.

Here in this short article, I will discuss a part of CagA protein that has although been identified but not worked upon much:

the phosphatidylserine-binding sites in the second domain of its N terminal (CagA1–884); wherein a lot of scopes lies ahead, and why it is time to change our approaches.

The N terminal is approximately 70 percent of the protein, and it interacts with intracellular partners, such as ASPP2, RUNX3, TAK1, and TRAF6, and thus plays a vital role in the development of gastric cancer.

Domain I is the extreme N-terminal domain of CagA. Domain II also contains a sizable anti-parallel β-sheet, with which CagA binds to β1-integrin for its delivery into the host cell.

The N-terminal binding sequence located within Domain III forms a four-helix bundle with the C-terminal binding sequence located within the disordered C-terminal tail, creating a C-terminal lariat loop strengthens the interaction of CagA with PAR1 and SHP2. The CagA-SHP2 complex formation is mediated via the interaction between the tyrosine-phosphorylated EPIYA-C or EPIYA-D segment and the SH2 domains of SHP2.

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CagA interacts with and thereby perturbs several host signal-transducing molecules via tyrosine-phosphorylated EPIYA motifs in its disordered C-terminal tail. CagA also binds to polarity regulating molecules via the C-terminal CM motifs, causing junctional and polarity defects. Domain I of the structured N-terminal CagA interacts with tumor suppressors, ASPP2 and RUNX1, resulting in the inactivation of tumor suppressor functions. Domain II and Domain III of CagA are involved in CagA delivery into host cells and subsequent membrane localization. Through the interaction, CagA activates or inactivates

the target proteins. CagA (CagA-M) contains the positively-charged PS-binding region (aa 613–636) and a putative β1 integrin binding site.

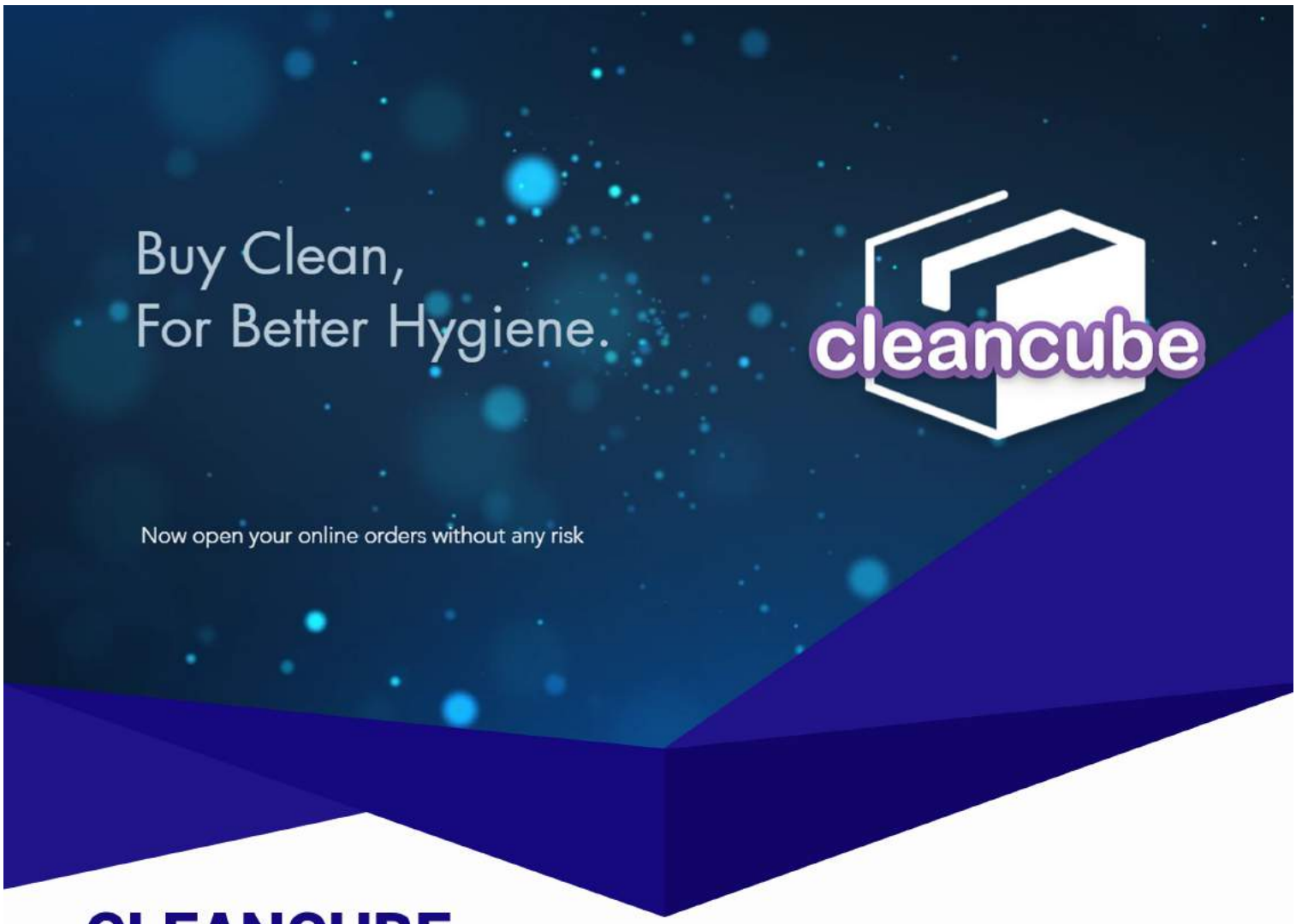
The Middle Fragment of CagA (CagA-M, aa 257–880) Alone Is Sufficient for Altering Host Cell Morphology.

Taken together, this indicates that the N-terminal 10 amino acid residues (257–266) and the PS-binding region (residues 613, 614, 617, and 621) in the middle domain of CagA play crucial roles in stimulating actin rearrangement and morphological changes in AGS (adenocarcinoma gastric cell line) cells.

There could be various approaches of targeting the talked about domains and disrupting the CagA complex either with SHP2 or with β1-integrin (depending upon the choice of the domains). Though they seem very convincing in hand sight, these approaches do not appeal to me very much in the long run.

Associations from small convenience samples, without a postulated biologic mechanism, and without considering other virulence and environmental factors have to date resulted in many false leads and wasting of resources. Yes, one can design a drug delivery system and achieve the same, but we still know only the tip of the iceberg when it comes to an understanding the "why" rather than "what" of the H. pylori infection system.

We need a robust approach that can only be developed after we clearly define and understand the virulence factor/s in H. pylori. A lot of scope lies ahead if we tread on science's quality rather than targeting different domains time and again of the same complex if insufficient knowledge. As Chanakya said, "the problem is to be nullified at the root."



CLEANCUBE

By Sayantan Pal (EE 3rd year). Sumalyo Dutta (ECE 3rd year), Shreyashi Sen (EE 3rd year), Arvil Sen (EE 3rd year) (IEM Kolkata)

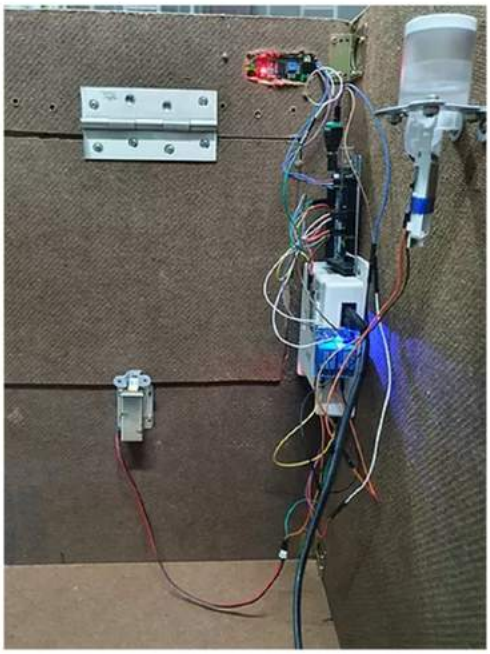
In our project Cleancube, we have attempted to add what we love, to what is currently a worldwide problem with no legitimate solution as such.

Cleancube is a container designed for delivery parcel deposition with added sanitisation and security measures. Here, you can have all your online deliveries sanitised right according to the standards mentioned by the WHO while having zero contact with the delivery man. As an added bonus, the deliveries can happen without you being present in your home too, for it can be controlled through an app which goes by the same name. As a safety measure, no one can open it until you send an OTP set through the app to your delivery boy.

Inside it, an automated small spray bottle containing alcohol based sanitizing fluid will be fixed which will sanitise your product,thus removing any germs present.What's more, you can use any box of your preferred size to function like our box, given your size and space requirement.

Team Cleancube.

Website: https://www.cleancube.tech/



SKYRAGE

By Soumik Adhikary, Kalyani Government Engineering College

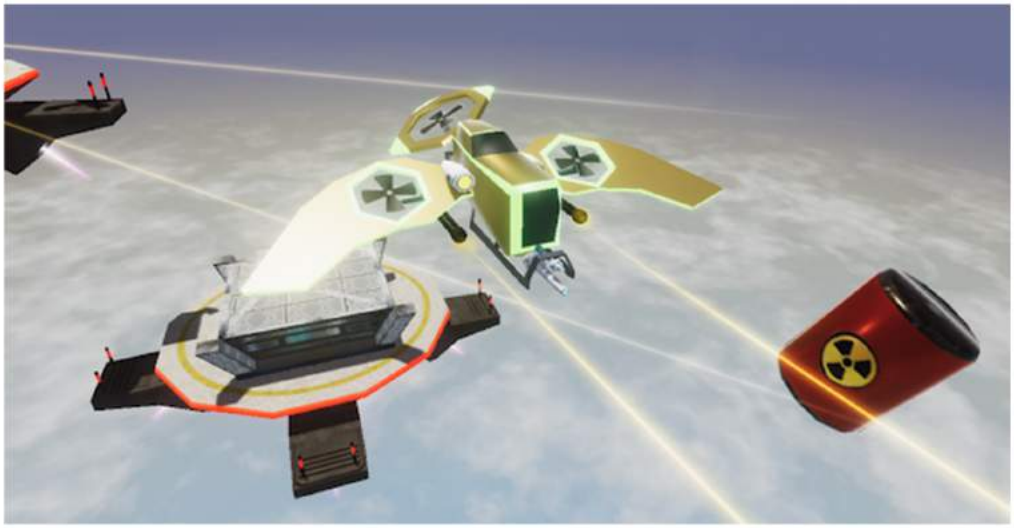
My name is Soumik Adhikary and I am B.Tech student in Kalyani Government Engineering College. I am an indie game developer and the co-founder of Experience Infinity Studio aka Xπ Studio along with Atharva, and our first android game SkyRage is published on Google Play Store.

The making of SkyRage was an amazing experience for us. We learned a lot during the making of the game. The hobby games we used to make now had the taste of professionalism in them. From 3D-modelling to texturing to audio production to game-coding to bring the objects to life, we learned a lot. Creating something out of nothing defines the magic of game dev. After nearly 4 months of hard work, designing, video calls, bug fixing , and polishing, the game is now out and ready for you to enjoy.

SKYRAGE

SkyRage is an action and sci-fi genre android game. It includes drones of exquisite and futuristic designs and is also equipped with various types of weaponry to gain victory over enemy robots. Enjoy unique campaign missions for each drone and never-ending RageMode. Fight with the enemies in three different environment ambiences and destroy their bases.
Enjoy!

Download SkyRage:
https://play.google.com/store/apps/details?id=com.ExperienceInfinity.SkyRage



MTC presents :

PUZZLES

1. There are 25 horses. What is the minimum number of races needed so you can identify the fastest 3 horses? You can race up to 5 horses at a time, but you do not have a watch.

2. My twin lives at the reverse of my house number. The difference between our house numbers ends in two. What are the lowest possible numbers of our house numbers?

3. Given two hourglass of 4 minutes and 7 minutes, the task is to measure 9 minutes.

4.

9898 = 6
6666 = 4
1213 = 0
7898 = 5
5683 = ?

5. A 42-year-old man has 3 children. If you multiply the 3 children's ages, you get 36. If you add up the children's ages it's 13. And his oldest child plays football for 3 years. How old are the kids?

6. Three sons, two fathers, a grandfather and two brothers from a family went to a football game together and bought one ticket each.How many tickets did they buy in total?

7.
AOD:11530 then
132627:?

8.
For how many real values of x, is $x^2 = \text{mod } x$

9.How to send a secret message to your friend Marrie using your mail? But Sophie, who you don't trust, has access to all of your mail. So you password protected your message. But you can't send a key, because Sophie could open by using it. How will you send message securely to Marrie?

10.What is the smallest number that increases by 12 when it is flipped and turned upside down?

11.While house hunting in London, I came across a very good leasehold property. Discussing the lease the landlady told me:

'The property was originally on a 99 years lease and two-thirds of the time passed is equal to four-fifths of the time to come. Now work it out for yourself and see how many years are there to go!'

12. There is a pile of 12 coins, all of equal size, but only 11 are of equal weight. Can you find the unequal coin and determine if it is heavier or lighter, in 3 weighings?

13. Tarun noticed that the amount of money he spent on a drink is a rearrangement of the amount of money he had in his pocket. He also notices that the amount of money he had left over is also a rearrangement of the money he had before buying the drink. What is the amount of money he spent on the drink if he has more money left over than he had spent?

14. 11 letter Indian city is I am

First 4 letters is a water body
Last 6 letters is a fruit Name
9,5,3 is a soap Name
1,8,3 is used by a Student
7,8,3 letters is a Bird Name
6,7,5,3 is an organ in the Face

From given hints Find Indian City Name ?

15.How many times can you subtract the number 5 from 25?

16.Add the number to the number itself and then multiply by 4. Again divide the number by 8 and you will get the same number once more. Which is that number?

17.X is an odd number. Take an alphabet away from X and it becomes even. Which is that number?

18.Tom was asked to paint the number of plates on 100 apartments which means he will have to paint numbers 1 through 100. Can you figure out the number of times he will have to paint the number 8?

19.At the time of shipping, Tom can place 10 small boxes or 8 large boxes into a carton. A total of 96 boxes were sent in one shipment. The number of small boxes was less than large boxes. What is the total number of cartons he shipped?

20.If you buy a rooster for the purpose of laying eggs and you expect to get three eggs each day for breakfast, how many eggs will you have after three weeks?

21.If it took 6 people 9 hours to build a barn, how long would it take 12 people to build the same barn?

22.I am a three-digit number. My second digit is 4 times bigger than the third digit. My first digit is 3 less than my second digit. Who am I?

23.Raj has 2 books. One of the books is faced upside-down and the second book is rotated which makes the top of the book facing Raj. Then what will be the total sum of the 1st pages in each of these books?

24.I have a pound of feathers and a pound of iron? Can you please tell me which one weighs more?

25. A mobile phone and its case cost Rs. 110 in total. The price of the mobile phone is Rs.100 more than its case. What is the price of the mobile phone?

26.Eggs are $0.12 a dozen. How many eggs can you get for a dollar?

27.If you multiply this number by any other number, the answer will always be the same. What number is this?

28.Where do fish keep their money?

29.I add five to nine, and get two. The answer is correct, but how?

30. Using only addition, how can you add eight 8's to get the number 1,000?

SOLUTIONS :

(15 ONLY ONCE BECAUSE AFTER YOU SUBTRACT IT IS NOT GOING TO BE 25 ANYMORE.

(14 PONDICHERRY

(13 ₹ 459

(11 45 YEARS.

(10 86

(9 YOU SEND THE MAIL TO MARRY.

MARRY CAN NOT OPEN IT.SO ,HE CAN PUT ANOTHER PROTECTION ON THE MAIL.

MARRY SEND THIS MAIL WITH THE 2 PROTECTIONS BACK TO YOU. YOU UNLOCK YOUR

PROTECTION AND SEND IT BACK TO MARRY AGAIN.

(8 THREE (1, -1 , 0)

(7 MZA

(6 4 TICKETS

(5 (2, 2, 9)

(4 4.3

(2 THESE MATH RIDDLES AREN'T EASY TO SOLVE! THE LOWEST POSSIBLE NUMBERS FOR THE

HOUSES ARE 19 AND 91. THE DIFFERENCE IS 72

(1 7

SOLUTIONS :

888 + 88 + 8 + 8 +8 = 1.000 (30

When it is 9 AM. add 5 hours to it and you will get 2PM. (29

In the river bank. (28

Zero (27

100 eggs. At one penny each (26

₹ 105 (25

Both of them remain the same weight as pound is pound irrespective of the object. (24

Irrespective of how the books are oriented the first page of everybook is page number 1 thus 1+1 = 2. (23

14 (22

None. The barn is already built! (21

Zero. Roosters do not lay eggs (20

11 cartons (19

20 times. (18

Seven (seven-s=even) (17

Any number (16

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