COMBIGS

FOREWORD

COMBIGS is delighted to launch the first edition of GEN(E)IUS, the student-run magazine of the Bioinformatics department at SASTRA University. COMBIGS, the Computational Biology Group@SASTRA, a student chapter of Bioinformatics@SASTRA, began its journey on 01.09.2005 with just a handful of people as its members. This year, COMBIGS has about 250 members actively participating and enhancing the qualities of the association. Being a student-run group, we work on new themes for our fellow mates that would inculcate a better taste in both life science and computer applications in their mentation. Our focus over the years has been fully on activities like technical forums, coding events, and quizzes on a weekly basis that keep the students engaged with departmental concepts in a different way.
Additionally, we have introduced the Bioinformatics Library in JVC, which consists of recent journals, magazines, and reference books that help students explore the field of bioinformatics.

In 2012, COMBIGS organized the "International conference on Structural and Functional Genomics," which had a huge number of participants from a motley of departments. We believe in continuing the same and many other activities in the near future. Coming together is a beginning; keeping together is progress; working together is success.

In this edition of GEN(E)IUS, the core content remains unchanged, offering the same insightful narratives. However, we are thrilled to unveil a revamped design, courtesy of the dedicated COMBIGS web team during the 2023-2024 period. The redesigned layout adds a fresh perspective to the familiar content, enhancing the overall reading experience.

Microgravity Research on Drug Development"

Ever dreamt of flying in a spacecraft or drifting in SPACE? And when you open your eyes and realize the reality around you, that your specialization has nothing to do with space or some crazy spacewalking stuff. IT'S NOT SO! There are various disciplines in science wherein research is being conducted on this globe. But Earth has got two villains that reduce the degree of research and do not let the best results come out.

They are none other than the Gravitational Force and its sidekick Thermal Convection. Could these experiments be conducted in a place void of these villains? Welcome to the "NASA SPACE PRODUCT DEVELOPMENT PROGRAM," where a range of experiments, from fluid mechanics to space medicine, is conducted aboard the ISS, i.e., The International Space Station, situated at an altitude of 320 kilometers above the Earth. And yes, indeed, far better understandings of these experiments are obtained from the results produced under microgravity conditions.

With respect to drug development, one should have some knowledge of proteins. That's because both the drug and its target are made of proteins, and to understand their function, a detailed knowledge of their structural organization is necessary, generally obtained through crystallization—the process of forming solid crystals, precipitating from a solution, or sometimes deposited directly from a gas. However, the Gravitational Force retards the formation of crystals by inducing unwanted atomic interactions inside the core of the protein molecules.

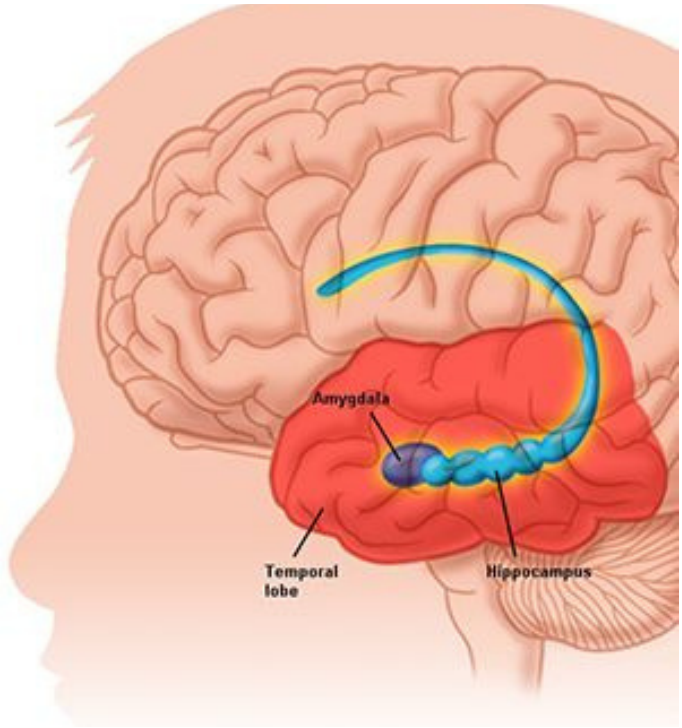
Microgravity Research on Drug Development"

On Earth, a protein is crystallized by keeping it in a capillary tube or a containing vessel, leading to surface interactions, and crystals of perfect unit cell dimensions are not obtained. Thermal Convection, the currents that carry heat energy from one place to another, also creates surface interactions that retard crystal growth. But at microgravity conditions at the ISS, crystals grow bigger and better and are transported back to Earth for further analysis, done by bombarding X-rays on the crystallized protein to get the diffraction pattern, providing the 3-dimensional structural coordinates of the protein molecule.

The determination of protein structure represents a huge opportunity for pharmaceutical companies to develop new drugs to fight diseases. In the US alone, biotechnology product sales exceed $15.6 billion annually due to their collaboration with NASA's Sponsored Research Program on microgravity conditions. Remember the character "Ryan Stone" played by Sandra Bullock, in the movie "GRAVITY"! P.S: She was a biomedical engineer who came to install one of her scanning systems in the Hubble Space Telescope. Not just Ryan, but all the scientists currently involved in microgravity research at ISS were once just enthusiastic amateurs like you and me who also dreamt of flying to space. Opportunities are spread everywhere around. It's just the way you gain access to it.

Anirudh Chellappa S
(Class of '16)

Bizarre Cases in Neurology"



An average brain weighs a little more than one kilogram but houses a complex and intricate network of interconnected neurons. It is obvious that there might be some people whose brains have a few connections gone awry, leading to weird consequences. One of the first and most well-known cases was that of H.M, a patient who had been suffering from epilepsy for eleven years preceding his surgery. He experienced seizures almost every day. In a quest to cure him of his sickness, the doctors removed both his hippocampi from the brain. The result was that H.M was no longer able to retain new memories, a condition called anterograde amnesia, and he remained permanently frozen in time.

Another case is that of Dr.P, a music teacher, who was confounded by the seemingly simple task of identifying faces. A degenerative process in the visual parts of the brain led to strange, almost hilarious, consequences. He failed to recognize his students unless they had some distinguishing feature but was able to guess the identity of a person through his voice. He saw faces where there were none, spoke to parking meters thinking them to be children, and also mistook his wife's head for a hat. While he retained his sense of sight, he could only visualize abstract forms and not real objects.

A particularly peculiar phenomenon is the phantom limb – supposed "ghosts" of amputated limbs. A phantom limb is like a normal limb, though in actuality, it does not exist. Patients with phantoms may suddenly experience intense pain—the phantom fingers may dig into the phantom palms. Such cases prove to be extremely baffling as the limbs do not exist for them to be treated. Another creepy case is of a woman who claimed that her left hand would occasionally try to strangle her. The lady was closely examined, but it was established that she was neither psychotic nor mentally disturbed. It was finally concluded that the reason for her strange condition was neurological.

Bizarre Cases in Neurology"

Every brain has two hemispheres—the right (which controls the left part of the body) and the left (which controls the right part of the body). They are connected by a "corpus callosum" to allow communication between the two sides. It was found that the woman's right hemisphere had latent suicidal tendencies, and the lack of connection between the two hemispheres failed to allow the left hemisphere to keep these tendencies in check.

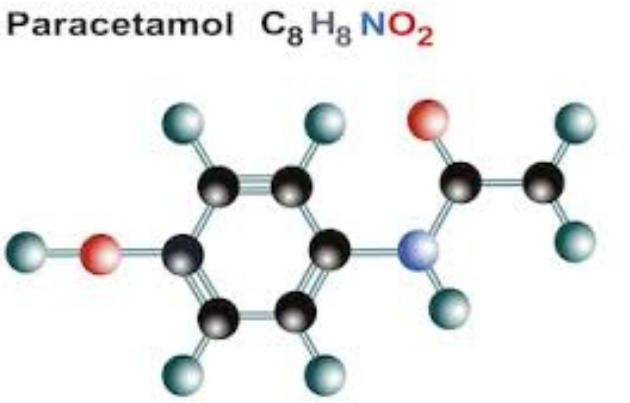
Another fascinating case was that of the twins, John and Michael, who were diagnosed as autistic and severely retarded. They became popular as great mental calculators: given a date within the range of forty thousand years within their time, they could tell the day on which it would fall within a matter of seconds.

Astonishingly, they communicated with one another in numbers—prime numbers to be exact—and could mentally find the primes up to even twenty digits long! Ironically, when asked to perform simple mathematical calculations such as addition or subtraction, they inevitably failed every time. In a complete paradox, the twins are mental calculators who cannot calculate.

Such absurdities make you marvel at how nature works. Just when you decide you have understood everything you need to know, something else arises. There are millions of such chilling tales that put even the best horror movies to shame. If you know of any, do contribute! Send in your articles to bioinfo.mag@gmail.com.

Niveda S
(Class of '15)

PARACETAMOL



Drugs serve as our frontline defense against diseases and infections, having been a crucial aspect of medicine for over 200 years. Their popularity soared with the advent of modern medicine, especially following the recognition of the germ theory and the importance of hygiene. Currently, more than 10,000 types of drugs have gained approval, with a significant portion being pain relievers and symptom alleviators produced by various pharmaceutical companies under different brand names.

One of the most common drugs in this category is Paracetamol or Acetaminophen, listed in the World Health Organization's List of Essential Medicines.

Paracetamol, a derivative of the discontinued drugs phenacetin and acetanilide due to their carcinogenic properties, is widely recognized by names such as Crocin or Dolo in India. While it is generally associated with mild to nonexistent side effects, there are several adverse reactions that may not be commonly known or listed on the drug label. This is why self-medication, regardless of the perceived severity of the illness, should be avoided.

PARACETAMOL

Here are some lesser-known adverse reactions associated with Paracetamol:

1. **Hepatotoxicity:**
   - Higher than prescribed doses or prolonged exposure may cause permanent liver damage.
   - Individuals with liver disease or alcohol-related issues should consult a doctor before taking Paracetamol.
   - Consumption of alcohol should be avoided during the medication.

2. **Asthma:**
   - Some evidence suggests a correlation between asthma and Paracetamol.
   - Children with asthma or predisposed to it should only take this medication under a doctor's discretion.

3. **Skin Rashes:**
   - Since August 2013, all Paracetamol/acetaminophen labels should carry a warning about potential fatal skin rash reactions.
   - Immediate reporting of any such rare occurrences is advised.

4. **Pregnancy Caution:**
   - Pregnant women should avoid Paracetamol during pregnancy, as it may cause malformations and predisposition to asthma.

Symptoms of Paracetamol overdose include diarrhea, increased sweating, loss of appetite, nausea or vomiting, stomach cramps or pain, swelling, pain, or tenderness in the upper abdomen or stomach area. Rare allergic reactions may manifest in symptoms such as bloody or black, tarry stools, fever with or without chills, pain in the lower back and/or side, skin rash, hives, or itching, among others.

It is crucial to emphasize that this information is not meant to induce fear of medication but rather to increase awareness that every medical intervention comes with potential risks. Good judgment in the usage of drugs, understanding the associated risks, and taking necessary precautions are paramount.

Arvind J S
(Class of '16)

The college years are laden with emotional challenges. It has been said that people evolve and learn the most during two phases of their lives: up until the age of five and during college. Therefore, it is crucial to remember to be good to yourself and nourish your experiences. College life is packed with adrenaline, laughter, an easy-go-lucky attitude, midnight birthday parties, sulking about the mess food, umpteen treats for the lamest reasons, running after the morning bus, overcoming dysania, and skipping breakfast. At least that's what we were told before our actual experience.

Some three years ago, it felt like liberation to start living on our own, miles away from home. I was looking forward to an enthralling and adventurous life ahead. It was a bit tough initially to be with people we never knew. We weren't aware of how we were supposed to conduct ourselves just to fit in. Surviving homesickness was the biggest challenge of our lives. In due course, monotony set in. We were led into an edifice with the trickiest maze for our classes. It was named Vishwa Karma Joth; we called it VKJ. Sanskrit names! Cool, no? (Okay, it seemed cool to me.) Seventy-five percent attendance – yeah, only 75% was officially compulsory in our times, and 'two out of three mid-semesters' relaxation were the best of schemes.

No ragging in the college. WHAT? Did I perceive it right? There were three terms, in the same phrase, that are not supposed to coexist! 'Ragging,' 'college,' and.. 'no'! It seemed okay then but, "wouldn't it bore me when I become a senior?" was all the feeling I couldn't overcome.

Academics! Having opted for Bioinformatics, I was made to draw beams and trusses and roam around with drafters and chart holders. Basic. Mechanical. Engineering. Seriously? Never in my life had I imagined myself welding random pieces of iron bars in an ugly brown coat in the name of a lab uniform. We managed to get through the first year.

I could not contain the exhilaration on the first day of my second year. It was as exciting as the first day itself. That 'I'm no more a junior' feeling is unbeatable. Eventually, with nowhere to hang out and nothing to do, we chose to attend the humdrum classes.

The curriculum for the 3rd semester was disclosed. Basic Bioinformatics, Cell biology, Molecular biology, Biochemistry.. Biocomputing. What kind of a name is that? Is there no subject in the sphere without a 'Bio' in its name? God overheard me, and "Engineering math, Algorithms" came tumbling after. So, I mused, I'd get to be with the same set of faculty members for the rest of the three years. We'd be family. Well, that's what I thought. I forgot I was being in college when I should not have. That meant I failed to live by the bitter fact that there would be no one to stand by me to show the right path.

Your life is your life. You cannot expect the professors to pat your back constantly. Even if they do, they're just going to get criticized for treating the students like school kids. Trust me; I've given vivas in Greek and seminars in Latin. Further, I'm to do a project in Spanish. I wonder how some of my peers manage to do so well in such alien disciplines. I wondered what they did that I had missed. This was all. While they went hunting for knowledge, all I did was sleep with the laptop on.

BON VOYAGE!

It's never too late to step out of your cocoon. A few attempts to learn the funda would do the trick. The entire course (field, rather) will whirl around the same notions. College is a dry run for the rest of our lives. It's a training ground on how to be successful and gain expertise. We learn to live with the biggest tragedies of life – Mess food, only two permissions per semester, having to put up with Greek and Latin, no attendance for being only 59 seconds late, giving rise to a never-exhaustive list.

It's true that we learn the most salient lessons in our college, not just from the curriculum. After the four years, when you pause to look back, you will vividly see how you got molded to what you will be then. Take every step to make the journey memorable and regret-free.

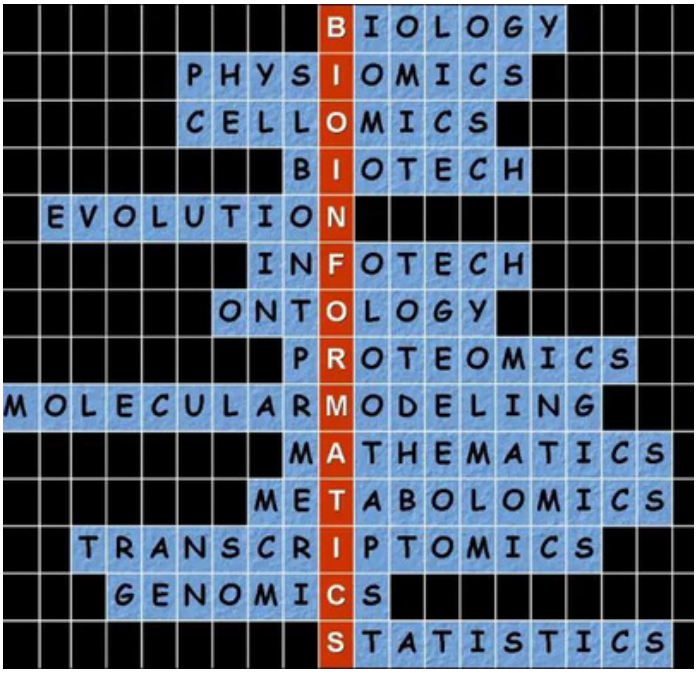
Janani Kripa
(Class of '15)

As far as Bioinformatics is concerned, it's like a continuous learning, unlearning, and relearning journey. It's like the piling up of the proverbial haystack, knowing that the larger the haystack you accumulate, the higher is the likelihood of finding a needle somewhere inside, but more the work in the quest for that needle. As technology builds, we get more and more data. Just like cell phones are measuring our visual world everywhere and can help catch the Boston bombers, advances in DNA sequencing, protein, and metabolite profiling give us more and more information that we must keep up with. It's a thrilling ride! Being a rapidly developing field, the advancements also grow at a faster pace.

This article highlights the features of some interesting advancements in the arena of bioinformatics.

MEDICAL RESEARCH:

The discipline of bioinformatics, which uses computer technology to provide answers for biological questions, has expanded in scope and utility for the past decade. An increasing number of research groups have been investing in bioinformatics infrastructure to aid in the research process. These have led to the establishment of a supercomputing facility within a hospital. Such computational power is being used for the mapping of genes and the study of human disease. We observe here that the growth of computational approaches within various biomedical disciplines is not merely a reflection of a general extended usage of computers and the Internet, but also the production of useful bioinformatics databases and methods for the rest of the biomedical scientific community.



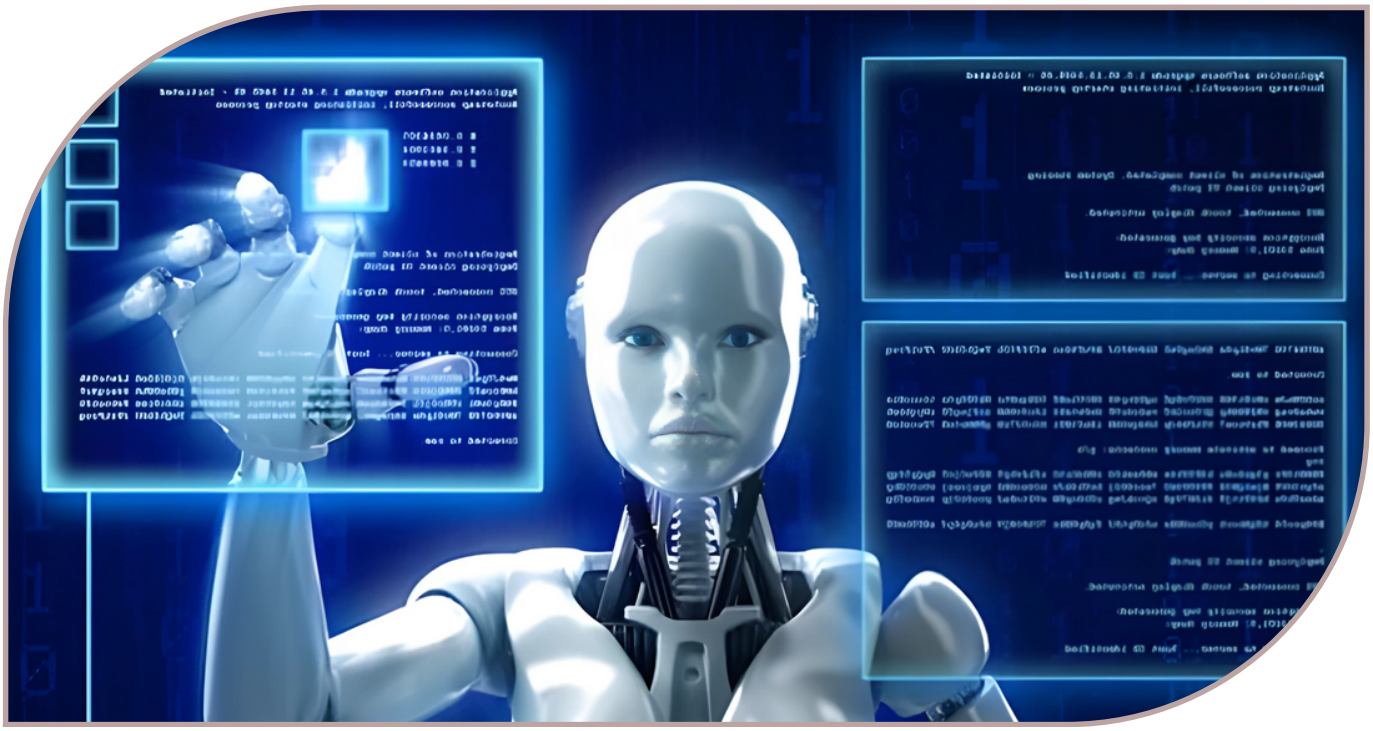
DATA MINING:

Data mining refers to extracting or "mining" knowledge from large amounts of data. Data Mining (DM) is the science of finding new interesting patterns and relationships in a huge amount of data. Data Mining approaches seem ideally suited for Bioinformatics, since it is data-rich but lacks a comprehensive theory of life's organization at the molecular level. Applications of data mining to bioinformatics include gene finding, protein function domain detection, disease diagnosis, disease treatment optimization, and protein sub-cellular location prediction. For example, microarray technologies are used to predict a patient's outcome. On the basis of patients' genotypic microarray data, their survival time and risk of tumor metastasis or recurrence can be estimated.

LIFE SCIENCES:

'Genome-wide analysis' is rapidly becoming a trending topic. Thanks to innovations in high-throughput measurement technologies and information technologies, genome-wide analysis is becoming available in a broad range of research fields from DNA sequences, gene and protein expressions, protein structures, and interactions. The scope and speed of research activities are expanding, and the field of bioinformatics is playing an important role. In parallel with the data-driven research approach that focuses on speedy handling and analyzing the huge amount of data, a new approach is gradually gaining power. This is a 'model-driven research' approach that incorporates biological modeling in its research framework. Computational simulations of biological processes play a pivotal role. By modeling and simulating, this approach aims at predicting and even designing the dynamic behaviors of complex biological systems. "The greatest achievement of the human spirit is to live up to one's opportunities and make the most of one's resources." Science has provided us with lots and lots of resources both in biological and computational form. So, it's in our hands to use them in an appropriate way and emerge out with flying colors. "Advancement only comes with habitually doing more than you are asked."

Vishnu Priya R
(Class of '16)



Is it real? Can it exist? Can you really teach computers and machines to think? As of yet, the answer is no. Charles Babbage's definition for a computer is by and large what computers are even today, despite advances in computing and programming; you still have to "teach" the computer everything. Even then, it does not exist in a state of knowing or consciousness, meaning it does not know what it knows and cannot execute on its own unless under your explicit directions or instructions. (Seems pretty stupid, doesn't it?).

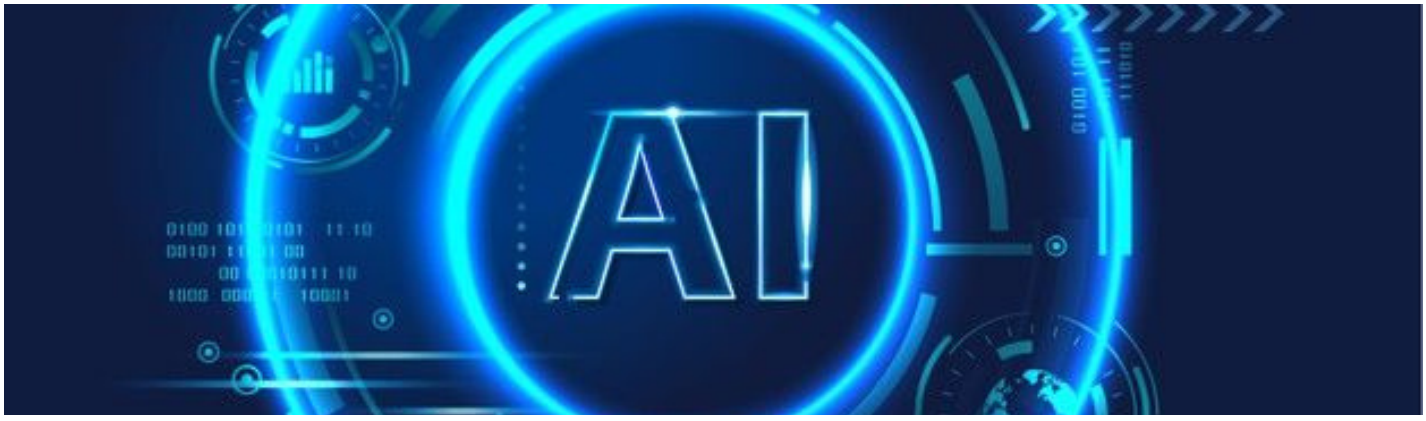
So, what is intelligence?

Different people have come up with different answers, so you can come up with your own after you collect data, analyze them, perform controlled experiments—basically, intensive and time-consuming research. But most of the definitions have these in common: Logic, abstract thought, understanding, self-awareness, communication, learning, emotional knowledge, memory, planning, creativity, and problem-solving. Now each of these words in themselves can have multiple interpretations, but just by looking at it, you know what machines lack.

ARTIFICIAL INTELLIGENCE?

IArtificial intelligence is intelligence that can be simulated by a machine once it has been described in such detail as to encompass the entirety of human intelligence. Even though General intelligence or strong AI (the concept of artificial beings) is many years in the future, it has become an interdisciplinary field of study and application. Some quasi-intelligent approaches include probabilistic learning and statistical learning, which are intensively used to sift through huge amounts of data.

In order to understand machine learning, consider the analogy of a newborn baby; when it is born, it knows nothing, then it gradually learns over the years to think, correlate, etc. Similarly, if we can make machines commit things to memory and learn through past “experiences” and draw inferences for our problems, we can say that the machines are intelligent enough to perform a particular task. It can become “beings” if it attains self-consciousness and is self-sustainable and is capable of ensuring its survival. But since our goals and objectives are mainly to use the computational power of computers to solve problems and obtain information from large amounts of data that are too huge for us to handle, people generally prefer to have machines that are subject to command and hence quasi-intelligent.



Creation and research on machine “beings” have various ethical issues. Many condemn this kind of research and say it is unnatural and akin to playing God. And also, there are others who think machines would replace human beings in the natural order of things, as we have done too much to the planet already. Many avid contemporary (and a few not so contemporary by Arthur C. Clarke) science fiction themes discuss the effect of artificial intelligence: The Matrix, Cortana in Halo, R2-D2 in Star Wars, to name a few. Of course, as there are two sides to every coin. There are those who believe that intelligent machines are the next step in the process of evolution and will help answer questions beyond the capability of human understanding.

Just because people are debating over this controversial area of research doesn't mean that mankind is extremely close to creating artificial beings of intelligence. We have many good and effective machine learning and decision-making techniques that computers use (support vector machines, decision trees, artificial neural networks, to name a few), but still none of it comes close to the efficient way that the human brain is capable of reasoning and thought, maybe because we cannot characterize and break down our thought process efficiently enough to teach it to machines (another unquantifiable measure).

All said, AI is an interdisciplinary field of research that has immense potential, as seen by the very broad and intensive use in many thousands of applications from the automation of small repetitive, weather forecasting tasks to smartphones and primitive robots capable of basic social interactions. So, maybe someday in the future, we will interact with sentient beings other than us humans after all, and if the sapience in Homo Sapiens is what separates us from the rest of the organisms on Earth, are we ready to create a more intelligent kind? And if we do succeed, will they be our salvation or damnation?

Arvind J S
(Class of '16)

A BEVERAGE AND A NEURODEGENERATIVE DISORDER

How good could their chemistry be?

"Drug-induced Parkinson" said the doctor. As an early teen, 'Parkinson' was an unheard diagnosis among the "common cold and viral fever" list that I was familiar with. But the serious discussion my family members had made it obvious that something was serious about my relative's health. This was the first time the word 'Parkinson' encountered my neurons.

Into the department, there came the elective regarding 'Data Mining and Warehousing' and the course 'seminar', which is the best ever exposure any student can have- 1 credit though! It was my 'seminar time'! After a couple of days of vigorous search, my eyes witnessed the title of the paper- "A meta-analysis of tea drinking and the risk of Parkinson's disease."

For some reason, I got glued to the paper. Perhaps those "memory-rich neurons" played their part. Wondering how somebody could decide to research the impact of a common beverage with a neurodegenerative disorder, my mind processed the paper to its best. Marks have never taken a higher degree of need (to me at least), and I was ready to take the challenge of talking about something I was yet to develop basic knowledge on.

A region of mid-brain, substantia nigra has dopamine-generating cells. When these cells die for some unknown reason, the complication starts. And the result is that of decipherable changes-difficulty with walking, thinking, behavioral problems, dementia, depression, sleep, and emotional problems- what we call as symptoms of Parkinson's Disease (PD). The exact reason for PD is unknown and is claimed to be due to genetic variations and environmental triggers.

This paper provided a comprehensive conclusion on the association between tea drinking and a reduction in PD risk, which has important implications for the prevention and treatment of the same.

A BEVERAGE AND A NEURODEGENERATIVE DISORDER

How good could their chemistry be?

"Now, the obvious question is why tea? Tea components- flavonoids, caffeine & theanine, have been proven to be neuro-protective in animal models of PD. Tea has already been proved as a beverage that helps with cancer, heart disease, diabetes, and weight loss, thus proved to be a promising choice. To travel less-trodden paths, we will obviously be curious about the previous results, however few. And so, all related publications from 1996 till December 2010 were searched (8 articles+1418 cases+4250 controls). The analysis was performed with Review Manager 5.0.

(TEA) AND (PARKINSON OR PD) AND (CASE-CONTROL OR CASE-REFERENT OR RETROSPECTIVE OR COHORT OR FOLLOW-UP OR INCIDENCE OR PROSPECTIVE OR EPIDEMIOLOG) were the headings used to search in the PubMed database. Apart from this, conference proceedings were also retrieved. There were selection standards, apparently. They were: Data should include the number of cases and the OR or Relative Risk(RR). Its corresponding 95% confidence interval (CI) is for the highest versus the non-lowest level of tea intake. Studies must define the outcome based on clearly stated diagnostic criteria or identified through diagnostic codes with additional confirmation.

FIn total, eight published articles were included in the meta-analysis. The 8 eligible studies were conducted in 5 countries. The extracted information presented the relative risk and the summary OR from Meta-Analysis for each of the studies: There was statistical heterogeneity among the eight results (P = 0.04). The analyses compared exposed with unexposed for tea drinking, and the overall summary OR based on all studies indicated that tea drinking can protect from PD (summary OR = 0.85, 95% CI = 0.85–0.98) with eight cases. The odds ratio=0.85 => protective effect of tea drinking in PD risks. Now, does it mean if I keep drinking tea, I will be more cautious than those drinking less amount of tea would be our obvious question. And perhaps that is the reason that led them to find out about the **"DOSE- EFFECT"** relationship.

For drinkers of ≤1 cup of tea per day versus non-consumers, the summary OR (OR: 0.83, 95% CI = 0.69– 0.99) showed a protective effect against PD. For drinkers of >1 cup of tea per day versus non-consumers, the summary OR (OR: 0.96, 95% CI = 0.73–1.27) also showed a protective effect. According to the present results, it was concluded that there was not an apparent dose-response relationship.

A BEVERAGE AND A NEURODEGENERATIVE DISORDER

How good could their chemistry be?

"(Non-consumers Vs <1 cup)≈(Non-consumers Vs >1 cup)=>no Dose-response relationship The etiology of PD involves many factors. Five major hypotheses regarding the pathogenesis of PD are a) the theory of genetic factors, b) the theory of environmental factors, c) immunity doctrine, d) apoptosis theory, and e) the oxidative stress theory. In the oxidative stress theory, oxidative stress contributes to the dopamine cell degeneration in PD.

It was happy-enough a discovery, that choosing the less trodden path wasn't a waste of time. Tea leaves contain polyphenols, methylxanthine, caffeine, different lipids, amino acids, mineral substances, and volatile compounds. EpiGalloCatechinGallate (EGCG), an antioxidant ingredient of green tea, is responsible for green tea's weight loss effect. It increases metabolism and burns fat. They are neuroprotective. The mechanism involves 3 aspects: antioxidant, anti-inflammatory and iron-chelating activities. Polyphenols inhibit tumour cell proliferation. From in vitro and experimental animal models it was inferred that antioxidant effect of tea components, especially polyphones, should be the predominant mechanism of tea against PD.

Theanine can protect the brain by promoting the secretion of dopamine. Caffeine enhances locomotory activity in animal models of PD and improves motor function in patients with PD. Flavonoids have anti-inflammatory effects on the cardiovascular system and increase circulation to the brain.

The estimated summary OR from the meta analysis process is 0.85, which denotes that tea drinking lowers risk of PD. The mechanisms underlying the protective effects of tea drinking against PD risk should be multiple. In recent years, many natural products have been proposed to be multi-potent agents to reduce neurodegenerative diseases.
There was no dose-response relationship for 2 reasons:

- Black tea and green tea differ markedly in the nature of their polyphenols while there were only few studies reporting stratified results according to the types of tea.
- The contents of the bioactive compounds in tea may fluctuate because of differences in producing areas, materials, and manufacturing.

A BEVERAGE AND A NEURODEGENERATIVE DISORDER

How good could their chemistry be?

Everything on earth has its limits and so did this paper. The population was small and their location was not widespread, which make it unable to perform analysis on race and ethnicity. Other factors with possible influence on disease progression such as anti-Parkinsonian drugs, food supplements, or alcohol consumption were not considered. There were only few studies reporting stratified results according to specific types of tea (black or green) and the gender of the population studied. The findings indicated that tea drinking can protect against PD, which leads human to value the impact of "LIFESTYLE" on health. Despite the mechanisms behind this association being multiple, the antioxidant activity is expected to be an important aspect.

Now, it is your cup of tea to decide to have/not have tea!

I am not a technical person (I know how evident it is from this contribution of words I have made- larger unnecessary stuff than real technical ones) and that has rarely worried me. But then, I don't even own the best of marks, I am not very strong technically too, what is it that I have then?

There answers my mind. People can be close, things can, places can. But I have had the weird experience of having a disease close to my heart. The word 'Parkinson' boosts up my energy from nowhere- the energy to learn more, to know more, to read more amidst my all-time lethargic nature! And the result-'Parkinson Pavai' -friends dubbed me. I am blessed enough to have professors who push me to know more, who encourage my efforts, how much ever low! I am sure this field would interest many of you, though the P-P would be a rare combination!

So, all I would love to tell my department mates and the beloved readers would be to read a lot of random stuff. God knows what may interest you! Expand the radius of the circle- the circle of your knowledge! Pages would fall short if I ought to discuss everything about the 2 research papers amidst all my rambling. "No two persons read the same book", they say. With brobdingnagian hope that the above line is true, I am pretty sure there would be a heavy bunch of better readers of these research papers. Please do send your mail ids to bioinfo.mag@gmail.com and I would be more than glad to send you the cause of this article-the research papers I mean!

T.Manicka Pavai
(Class of '16)