HORIZON

VOLUME 5 | ISSUE 2

Jan - June 2020

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Sustainable Computing: It's Not Easy Being Green

There's no doubt that sustainable computing is on the rise. The University at Buffalo, part of the State University of New York system, has an aggressive program to cut overall energy consumption that is estimated to be saving more than $10 million annually according to the UB green program and some of those savings come from green computing.

UB figures that each computer uses $100 worth of electricity a year, and that doesn't include the costs to power data centres and servers. There are additional costs associated with keeping server rooms and computer workspaces at the right temperature.

To counteract such energy demands, staffers are told to turn off computers when they're not needed, and use power management software to put employees' monitors in sleep mode when not in use. For example, IT in the facilities department, which houses UB Green, keeps its several hundred computers on at night to accommodate occasional upgrades. Aside from power use, there are other green issues in IT. Computer equipment contains a host of toxic materials, including lead and cadmium in circuit boards, lead oxide and barium in CRTs, mercury in switches and flat screens, and brominated flame retardants on printed circuit boards and cables.

There has been a growing concern about the toxins in computer products giving rise to lead-free computers which are a greener alternative to the traditional computers used in corporate and office spaces.

If the companies can dispose of the lead free components, it’ll be easier because there are no potential toxins, then that's a benefit they can appreciate. But companies have been slow to adopt wholesale policies to foster green computing. That's because sustainable computing requires more than new products. It demands changes in IT policies and user behaviors, as well as cooperation across departments.

Here are some measures taken in different areas of the IT sector to help in being efficient and greener:

Industry

- Climate Savers Computing Initiative (CSCI) is an effort to reduce the electric power consumption of PCs in active and inactive states. The CSCI provides a catalog of green products from its member organizations, and information for reducing PC power consumption. It was started on 2007-06-12.
- The Green Electronics Council offers the Electronic Product Environmental Assessment Tool (EPEAT) to assist in the purchase of "greener" computing systems. The Council evaluates computing equipment and the products are rated Gold, Silver, or Bronze, depending on how many optional criteria they meet.
- The Green Grid is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems. It was founded in February 2007 by several key companies in the industry - AMD, APC, Dell, HP, IBM, Intel, Microsoft, Rackable Systems, SprayCool, Sun Microsystems and VMware. The Green Grid has since grown to hundreds of members, including end-users and government organizations.

Power management

The Advanced Configuration and Power Interface (ACPI), an open industry standard, allows an operating system to directly control the power-saving aspects of its underlying hardware. This allows a system to automatically turn off components such as monitors and hard drives after set periods of inactivity. In addition, a system may hibernate, when most components (including the CPU and the system RAM) are turned off. ACPI is a successor to an earlier Intel-Microsoft standard called Advanced Power Management, which allows a computer's BIOS to control power management functions.

Some programs allow the user to manually adjust the voltages supplied to the CPU, which reduces both the amount of heat produced and electricity consumed. This process is called undervolting. Some CPUs can automatically undervolt the processor, depending on the workload; this technology is called "SpeedStep" on Intel processors,
"PowerNow!"/"Cool'n'Quiet" on AMD chips, LongHaul on VIA CPUs, and LongRun with Transmeta processors.

Video card

A fast GPU may be the largest power consumer in a computer.

Energy-efficient display options include:

- No video card - use a shared terminal, shared thin client, or desktop sharing software if display required.
- Use motherboard video output - typically low 3D performance and low power.
- Select a GPU based on low idle power, average wattage, or performance per watt.

Materials recycling

Recycling computing equipment can keep harmful materials such as lead, mercury, and hexavalent chromium out of landfills, and can also replace equipment that otherwise would need to be manufactured, saving further energy and emissions. Computer systems that have outlived their particular function can be re-purposed, or donated to various charities and non-profit organizations. However, many charities have recently imposed minimum system requirements for donated equipment. Additionally, parts from outdated systems may be salvaged and recycled through certain retail outlets and municipal or private recycling centers. Computing supplies, such as printer cartridges, paper, and batteries may be recycled as well.

Display

Light on dark color schemes, also called dark mode, is a color scheme that requires less energy to display on new display technologies, such as OLED. This positively impacts battery life and energy consumption.

While an OLED will consume around 40% of the power of an LCD displaying an image that is primarily black, it can use more than three times as much power to display an image with a white background, such as a document or web site. This can lead to reduced battery life and energy usage, unless a light-on-dark color scheme is used.

Cloud computing

Cloud computing addresses two major ICT challenges related to Green computing - energy usage and resource consumption. Virtualization, Dynamic provisioning environment, multi-tenancy, green data center approaches are enabling cloud computing to lower carbon emissions and energy usage up to a great extent. Large enterprises and small businesses can reduce their direct energy consumption and carbon emissions by up to 30% and 90% respectively by moving certain on-premises applications into the cloud.

TACKLING CLIMATE CHANGE WITH AI

When we think of climate change , the paradigms that come to our mind are of the various industries and power plants, the last one that comes to our minds are tech companies and data centers, but surprisingly these tech companies are one of the major contributors to climate change. While they do not contribute much to climate change directly, their indirect effect can not be neglected. So, how do they contribute ?

The data centers that run these companies are the major contributors to climate change. Google alone has 8 data centers all over the world with around 352,000 square feet of area per data center. Now that's google's alone, when we consider amazon and other major league players like microsoft and facebook the number skyrockets. These data centers consume huge amounts of energy and most of them come from conventional sources like coal and thermoelectric power plants which in turn contributes to climate change and CO2 emissions. To tackle this problem google, amazon, microsoft, apple and many other companies have started switching to more renewable sources of energy to power their data systems like wind farms and solar farms. Although switching to renewable power sources have reduced their dependence on conventional power sources, the data center consume vast quantities of energy every day, and its estimated to increase rapidly in the coming years as more and more data is being generated every hour. The major power consumer in data centers are the cooling systems which are used to maintain the temperature of the data center at around 27.7 degrees Celsius for optimum functioning of the data center. Maintaining such a large area at low temperatures consumes a lot of power. But like all machines, there's an optimum setting with which the energy consumption can be kept low. Usually in data centers these optimum configurations are manually calculated and implemented, which decreases the energy efficiency.

With changing working conditions and environment temperature these systems can be optimized to reduce energy consumption by changing the configuration as per the working conditions, but when done manually these tasks become increasingly difficult and very hard to achieve practically. Google in early 2019 implemented its deepmind AI system at its data center to control and optimize the cooling system to reduce energy consumption. The deepmind AI team monitored the cooling system at the data center every 5 minutes and fed it to the AI models. These models then chose actions aimed at reducing future energy consumption. These actions were then made into recommendations and given to a manual operator, which then implemented it in the system. With these AI recommendations, the data center consumed upto 40% less energy. The deepmind AI was then given direct control over the cooling system without human intervention, and the consumption went down by 30%. Now these were achieved in just a few days, the main advantage of AI is that it self improves over time and as it gains more and more data, it uses these data and develops more ways at increasing the energy efficiency. The deepmind AI can also be implemented in industries to attain more energy efficiency. Most of the high power machines used in industrial systems work on a preset line of commands, but these commands does not allow the machines to work at the best optimum condition for energy efficiency. The machines used in industrial systems have a lot of configurations or combination of settings that can be manipulated to attain maximum energy efficiency.

But with hundreds of machines working there's just a lot of configurations that needs to be manipulated to attain maximum efficiency and for a human worker, configuring all these machines isn't quite practical, especially as the work environment changes rapidly. Most of the industries thus end up using the most ideal combination of configurations throughout the work cycle. This wastes a lot of power. Using AI these configurations can be changed as and when required based on the work environment. The main benefit of using AI to optimise these systems is that the power consumption gradually decreases as the AI develops itself with the information inputs. As more and more tech companies strive towards reducing its carbon footprints using AI and machine learning, the total impact on climate change will decrease to a good extent. With the upcoming of powerful AI and machine learning algorithms we can surely expect a better future in terms of a reduced CO2 emissions and climate change.

- SANDEEP KURIAN JACOB
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CASHLESS ECONOMY

One of the most revolutionary changes in the 21st century was the way in which humans interact and communicate among themselves. And yes I am talking about smartphones. In the beginning of the 21st century mobiles phones had far less capabilities than the modern day smartphones. But fast forward to 2007, the year the iPhone was released, it marked a change not just in the smartphone market but also the entire economic and communication system. Fast forward to 2019 and you have smartphones with all sorts of sensors, from iris scanner to radars. The upcoming of smartphones has already replaced most of our everyday electronics like calendars, alarm clocks, music players, radio and not to mention even T.V's . In recent years as more and more countries are striving for a complete cashless society, the smartphone has played an immense role in promoting cashless payment methods. In India, the demonetization of notes gave a huge boost to the cashless culture by necessitating the switch to online payment solutions from conventional payment methods and the increased use of e-wallets like Paytm, google pay, PhonePe etc. for the day-to-day transactions. It's no doubt that the world is striving towards a full cashless society where transactions don't require the use of physical bank notes. A cashless payment solution doesn't necessarily mean online payments or e-wallets, it can also be in the form of credit or debit cards as well.

A complete cashless economy is very difficult to achieve but with the sharp increase in the number of smartphone users and day by day improvements in internet connectivity the future of a cashless society seems bright. Cashless society has innumerable benefits like increasing the efficiency of companies by digitally recording all the transactions and eliminating the need for manual accounting. This also helps to reduce corruption and hoarding of money . Another benefit of moving to a cashless society is that the government can use the digital data for faster analysis to make better policies and schemes. Now a fully digital economy also comes with a set of drawbacks like vulnerabilities to online scams and problems related to cyber security. Certain sections of the population who are in a financial crisis are also vulnerable to a shift to digital currencies. Another major setback is the need for internet connectivity for the majority of digital payments and services. A fully digital economy means that cash is always available to the people and so it may lead to unwanted expenditure. But on the bright side most of the setbacks can be overcome by a more financially educated society and by increased internet accessibility. With most of the developed countries going for a cashless society it's undoubtedly the future of human civilization and is going to be the next revolutionary change of the 21st century world.

Engineers: Can this fine creed be the Futuristic Game Changers?

As engineers, we were going to be in a position to change the world—not just study it. — Henry Petroski, American engineer and author specializing in failure analysis

Every engineering student's transition has always fascinated me. We clamber over the mounting theories, exams, and placement rounds to get settled in our engineering careers. Sadly, very few get placed in the jobs that they dream of. As per the employability reports, only 3% of Indian engineers get placed well every year.

So, where is the problem? It could probably be our mindset or a lack of inner drive to push past the invisible problems in life. We ought to bind ourselves with an oath to be game-changers so that our expertise can revolutionize lives for the better.

For instance, small packing equipment, coffee tables, smartphones, a new vehicle design, AI-based products, agri-tech farming, cybersecurity codes, chatbots, identifying health issues, solar-based EVs, 3D Baby Face Models, and preserved food items are developed based on engineering.

Awesome, exciting, and challenging in one bundle, right? So, to all of you engineers here, how prepared are you to change the world with your knowledge and inner drive to succeed?

Key takeaways to be a Game Changer Engineer

• Be prepared to transform

Life is always a learning process, and if we are ready to learn, utilize resources, fail, and get back on our feet. That is the first step towards self-transformation. For a start, brush up on your linguistic skills, behavioral patterns, and conventional mindsets. Engineers are meant to be solution-makers. A focused engineering transformation involves diligence to provide breakthrough solutions in this disruptive world.

For this, upskill your knowledge base as the world is forever reforming lives with new technologies, theories, and systems for augmented lifestyles.

- **Exiting the comfort zone**

Comfort zones are indeed cozy, but they stop an individual from learning to progress in life. If a person stops learning, it means that, professionally, a dead-end will come soon. So, explore the various dimensions of engineering, see where your caliber lies, and sweat it out to be a game-changer. If you see, young entrepreneurs with engineering backgrounds like Ola (Bhavish Aggarwal), Zomato (Deepinder Goyal), etc. have found solutions to common man's issues with the help of computer science engineering. Even Carnot (Archie-Watts) focused on how to use clean energy for automobiles. The opportunities are plenty, as the problems confronting our lives are in abundance. However, first we need to move out of our comfort zone.

- **Bring Solutions to the Table**

As mentioned earlier, engineering teaches science. But if you want to be a game-changer, you need to apply it to real-life daily living. From the Burj Khalifa to eco-friendly automobiles and impressive health based technologies, art and science are intertwined to create beautiful solutions for the common man. Only if you have solutions can you be a game-changer in life.

- **Dream and Commit by Working Together**

Ideas can sprout from a single mind, but they take form with the collective effort of many talents. That is the beauty of a company. For instance, when we have projects to work upon, collective efforts involve more interaction, brainstorming, and filtering of the options that give way to the making of a lucrative product or service. Combined work always adds value to the performance.

- **Pay heed to emotions**

To be a game-changer in life/career/society, you need to step into the shoes of the one who suffers. Understand their issues; pump up your emotional IQ to bring quality to your ideas. Often, if you look at giant companies, they may have excellent product lines, but poor quality in service, response, and troubleshooting that may spark red flags for customers. So, understand and frame your ideas.

- **Be a Master of a Skill**

You can be a Jack of all trades, but definitely a game-changer needs to excel in at least one aspect of engineering. In today's world, mastering technologies, along with any other dimension of study, is a must. For the next 10 years, careers that involve machine learning, AI, data analytics, agile global omnipresence, great marketing and communication, and sustainable engineering will shine at the forefront. So, master your pick.

• **Open to Sustainable Perspectives**

In the 21st century, a game-changer always thinks of different ideas that will predominantly be useful for nature and humanity. So, brainstorm your minds to bring forward lucrative solutions and sustainable solutions.

To Conclude

Engineering holds a notable position in the world of careers, business, and world progression. Today, every idea, project, and business opportunity that you come across in the papers has been formulated based on engineering.

Today, if great companies are changing the way business is done, it is no magic. A team of engineers is doing some serious groundwork and brainstorming. We can all be game-changers together, provided we are ready to go beyond the books and use our knowledge dynamically.

Of course, many may pinpoint that finance, business, and artists' professionals are part of the novel ideas. But, whether the world likes it or not, the essence of every product or service takes form within an engineer.

RESEARCHERS TEACH HUMAN BRAIN CELLS IN A DISH TO PLAY "PONG"

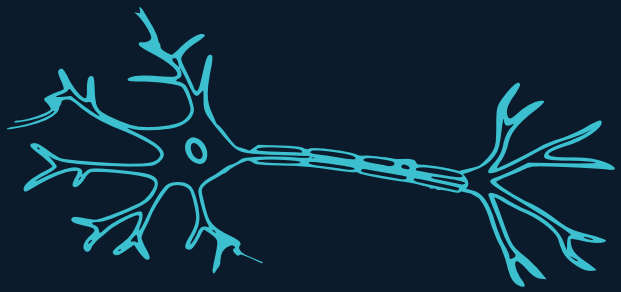
Scientists have successfully taught a collection of human brain cells in a petri dish how to play the video game "Pong" .

Researchers at the biotechnology startup Cortical Labs have created "mini-brains" consisting of 800,000 to one million living human brain cells in a petri dish, New Scientist reports. The cells are placed on top of a series of microelectrodes which analyze neuronal activity. Brett Kagan, chief scientific officer at Cortical Labs and research lead of the project calls them "cyborg brains".

He said that while the mini-brains can't play the game as well as a human, they do learn faster than some AIs.

To teach the mini-brains the game, the team created a simplified version of "Pong" with no opponent. A signal is sent to either the right or left of the array to indicate where the ball is, and the neurons from the brain cells send signals back to move the paddle.

So yeah, they want to create cyborg brains that use actual biological cells — which makes sense. Since neurons can learn so quickly, it can vastly improve current AI when brought together with machine learning.



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