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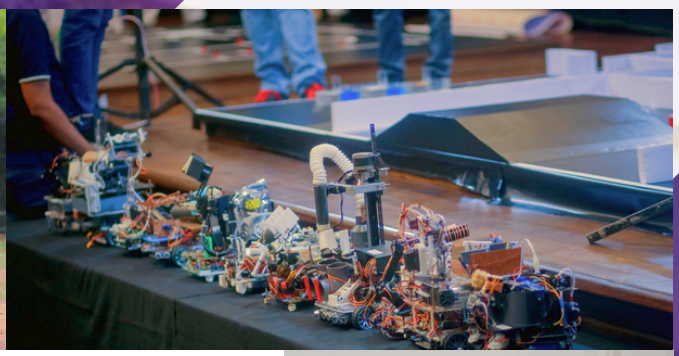

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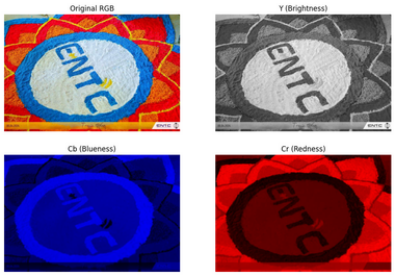

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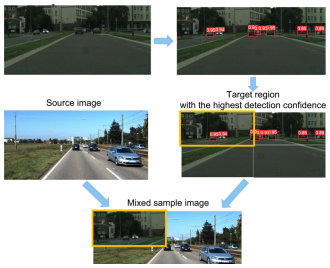

NEWS

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CELEBRATING EXCEPTIONAL TALENT

"Success is rarely a straight line. Some of the most rewarding experiences come from venturing into the unexpected."

Mr. Manoj Bandara

by Maneth Perera

Mr. Manoj Bandara, Chief Architect and Co-founder of Yaala Labs, is a distinguished alumnus of the University of Moratuwa. With extensive experience in designing large-scale systems and leading technology teams, he brings deep insight into architecture, innovation, and the evolving role of engineers in the age of AI. Let's dive in.

1. To begin, could you tell us a bit about yourself and your current role as the Chief Architect at Yaala Labs? What does your day-to-day work typically involve?

I graduated from the University of Moratuwa in 2001 with a degree in Electronics and Telecommunication Engineering, and immediately joined MillenniumIT, which is now part of the London Stock Exchange Group (LSEG). I initially worked on R&D related to a middleware platform that is still in use today. Over the years, I ran multiple projects and eventually became the Product Architect for Millennium Exchange. Under my leadership, we built the world's fastest trading system, which went live at the London Stock Exchange and many other trading venues globally.

I later became Head of Platform Development which built base layers for all Millenium Products. However, at that stage I did a lot of managerial and non-technical work, and realized that I missed being hands-on and close to the technology. I have always believed that architects should code and be "in the trenches" with the development teams.

In 2018, along with a group of colleagues from MillenniumIT, we founded Yaala Labs, where I serve as Chief Architect. My day-to-day work is a balance between technical work - designing or writing code and operational duties - HR, recruitment, operational decisions. On average, I still spend about 60% of my time on core technical work, which helps me stay close to the craft and continue contributing meaningfully at a technical level.

2) You've held several senior leadership positions, from Vice President of Software Development and Product Architect at Millennium Exchange to Architect of the Millennium Advanced Platform, and now Chief Architect at Yaala Labs. How has this journey shaped your perspective on building and leading technology-driven products?

One of the biggest things I've realized through this journey is that being a good architect is not just about technical brilliance – it's about having a multifaceted understanding of the entire ecosystem. I was fortunate to gain exposure to high-performance system design, fault tolerance, SDLC, team management, and client handling very early. All of those experiences feed into architectural decisions.

In practice, design decisions are not purely technical. It is a compromise between multiple goals – timelines, the capability of the team, available technology, business priorities, and even corporate strategy and profitability. You always have to balance the ideal solution with the practical reality.

So to answer the question directly – this journey shaped my perspective by showing me that architecture is never just about technology. It's equally about SDLC, people, management skills, client expectations, and corporate strategy. Those are the things you don't typically learn at university, but you definitely understand once you start working in the industry.

3. Looking back at your university years, what experiences or turning points guided you toward the field of software engineering and, eventually, into architecture?

Honestly, I didn't turn toward software during university – I was already on that path long before that. My journey with programming started back in year 8, when my uncle introduced me to BASIC. From there I moved to C, and that's where I really started enjoying building things through code. Before getting admitted to the university, I worked as a trainee software developer. So by the time I entered university, I already had a solid software background and hands-on industry exposure.

What pulled me toward Electronics and Telecommunication as a degree wasn't a shift in interest, but a desire to go deeper and understand the hardware layer on which all software runs. If you really want to push performance of a system, you need to know what's happening underneath. I also had a natural interest in electronics from childhood, so that practical mindset carried over.

After graduating, joining MillenniumIT was an easy choice. At that time, it was the most innovative software company in the country, and it gave me the environment to apply both the software skills I already had and the systems-level understanding I gained from electronics. If I were to name the real turning point, it wasn't in university – it was way back in Grade 8, the day I was first exposed to programming.

4. Moving from hands-on software development into architectural leadership is a significant transition. What inspired that change, and what were some of the key lessons you learned during that shift?

To be an architect, strong technical depth alone is not enough. You also need people leadership and communication skills to work with clients. You can have the best architecture in your head, but without the right people to execute it, nothing gets built.
Rather than a transition, this is a continuation of what I was already doing as a developer: working in R&D, leading small teams, then eventually larger teams, while still staying close to the technology. As you gain more experience, you naturally start taking on more responsibility. I strongly believe architects must remain hands-on. You must try things out yourself. That first-hand knowledge gives you conviction and credibility when you make a decision or guide your team.
Another important lesson is around leadership attitude: I never ask a junior to do something I'm not willing to do myself. Everyone wants to work on the "cool" new designs but industry work also includes other duties such as maintenance, refactoring, or bug fixing. If a task is tough or unappealing, I'll do it first and show the team how it should be done. That's the kind of philosophy in my work. So it wasn't a shift away from development. It was a growth of the same path. The hands-on work is what keeps me relevant as an architect, and the leadership aspect simply evolved from doing the work with the team.

5. You've worked on large-scale, mission-critical financial platforms where performance and reliability are crucial. What guiding principles do you follow when designing systems at such scale?
The guiding principle I always follow is very simple: keep it simple. The KISS principle – *"keep it simple and stupid"* – has been my guiding light throughout all large-scale designs.
Even though I've worked on highly complex, distributed, high-performance systems, we always start from simple foundations and add complexity only when it is required. If you start by over-engineering just because it "sounds advanced", you will eventually create a system that is fragile, difficult to understand and maintain, and filled with more failure points. A simple system is easier to evolve and change, minimizing failure points, making debugging manageable, and helping the team quickly understand its operation.
I'll give a very recent example: just yesterday I reviewed a design done by a relatively junior engineer, and the only major change I suggested was to reduce the complexity. This is something I repeatedly focus on – simplicity first; sophistication only if the problem truly demands it.
So at large scale, reliability is not achieved by adding more layers. It is achieved by cutting unnecessary ones and keeping the architecture clean and understandable.

6. In your opinion, what defines a truly effective software architect? Beyond technical expertise, how do you balance innovation with practicality and ensure alignment with broader business objectives?
At the end of the day, every architectural or technical decision is a compromise of many goals – timelines, cost, team capability, technology choices, maintainability, and business outcomes. There are no fixed formulas for this; you mostly learn it through experience, especially the mistakes. Guiding principles for effective architecture include the need to start with the real requirement, not the imagined one, as most client requirements are far less complicated when you dig deeper. You must also not over-engineer. The second rule is to know your team: you are only as effective as they are, so you must understand individual strengths and weaknesses and assign work based on that. Further, you need to keep a small stream of innovation alive with constant R&D to ensure your product stays relevant. While technology changes constantly, you must not follow trends blindly and ensure your principles remain solid. Finally, always be conscious of timeline and cost impact. These are not magic rules. With experience, you naturally learn how to balance innovation with practicality and align architecture with real business outcomes.

7. Technology continues to evolve rapidly, from the rise of cloud-native systems to advancements in AI and data-driven architectures. How do you and your teams stay ahead of these changes and prepare for what's next?
Nowadays, so many new technologies appear almost weekly. No individual, and not even a single team, can keep up with everything.
In Yaala Labs, we operate with multiple small teams – typically five or six people and this gives us bandwidth to study different technologies in parallel. First, there must always be a *proper use case*. If there is a requirement, we shortlist a few technologies and usually run a proof of concept (POC). Since different groups experiment with different technologies, the collective knowledge that is shared covers a decent amount of latest trends.
That's how we stay current without losing focus or wasting effort.

8. Finally, as someone who has navigated an impressive career journey, what advice would you give to undergraduates aspiring to become future architects or technology leaders?
This is a very important question and I think it matters now more than ever. The entry barrier today is much higher, largely because of modern AI tools, unlike the environment which was much easier before.
Our own assessment at Yaala Labs, across senior architects and tech leads, is that today's AI tools already perform at the level of a software engineer with about two years of experience. That means, when you graduate, you are effectively competing with something that can produce "two-plus-years" output instantly at keystroke speed. So the question becomes: why should a company hire you instead of using AI?
The only way forward is to become better than the tools – not by speed, but by depth. Simply copying code from AI or other forums without understanding the underlying concepts might yield quick results, but you remain hollow inside. You look productive, but you are not actually growing.
So my strongest advice is: Go deep. Don't just use a solution – understand why it works. Read APIs and documentation, and spend time to find out answers. Because if AI can already handle junior-level output, companies will increasingly hire fewer fresh graduates. You need to pass that barrier during university.
You only realize it if you invest in deep technical thinking, not shortcuts. That is what will keep you relevant long enough to grow into leadership and architecture roles.

Diffusion Language Models

by Senum Dodangoda

Diffusion models have transformed artificial intelligence, first gaining attention through image-generation systems such as Stable Diffusion and DALL·E[1]. These models create images by gradually removing noise from a random noise pattern. Recently, researchers have begun applying the same idea to language, introducing Diffusion Language Models (DLMs), a new family of generative models that offer faster, more coherent, and more controllable text generation[8].

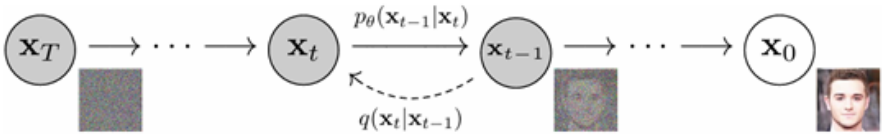


Figure 1- Forward and Reverse Processes of Diffusion

In image diffusion, two phases occur. The forward process gradually adds noise to an image until it becomes pure static. The reverse process, which the model learns, removes this noise step by step to reconstruct a meaningful image[1].

Diffusion language models follow the same principle, but instead of modifying pixels, they corrupt and denoise text sequences.

Traditional language models such as GPT-5, GPT-4o, and LLaMA operate using an autoregressive (AR) method. They generate text one token at a time, always moving left to right. While this approach has achieved state-of-the-art performance, it has clear limitations. Because generation is sequential, it becomes slow, and the model cannot revise earlier tokens using information that appears later. Error accumulation and unidirectional context also limit global coherence.

Diffusion Language Models break away from this structure[4]. Instead of predicting the next token, DLMs begin with a fully corrupted or noisy sequence and refine it in parallel across many steps. Each step "denoises" the entire sequence at once, allowing the model to use full bidirectional context. This results in faster inference, improved consistency across sentences, and better controllability, qualities especially attractive for editing tasks, rewriting, and structured generation.

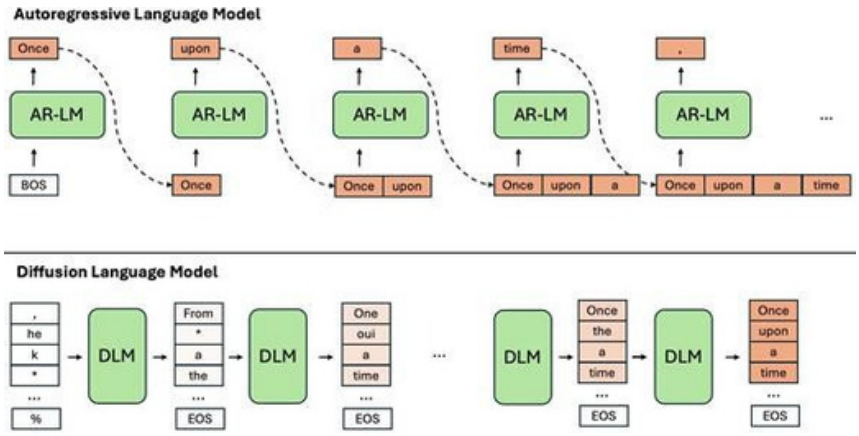


Figure 2- Autoregressive vs Diffusion Generation

There are two main types of diffusion language models. Discrete diffusion models operate directly on vocabulary tokens[3]. Methods like D3PM introduce categorical noise using transition matrices, while SEDD (Score Entropy Discrete Diffusion) improves efficiency by modeling score ratios, delivering 25–75% better perplexity[3] (Perplexity is a measure of how uncertain a language model is when predicting text, lower perplexity means the model is more confident and better at forecasting the next word) than previous approaches. Other models, such as DiffusionBERT[3], Plaid, and MDLM show strong performance at scale.

Continuous diffusion models, in contrast, work in the embedding space. Tokens are mapped into continuous vectors, Gaussian noise is added, and a denoising process recovers meaningful representations[2]. Examples include Diffusion-LM, SSD-LM[2], and hybrid systems like CCDD, which combine both discrete and continuous components for stronger semantic expressiveness.

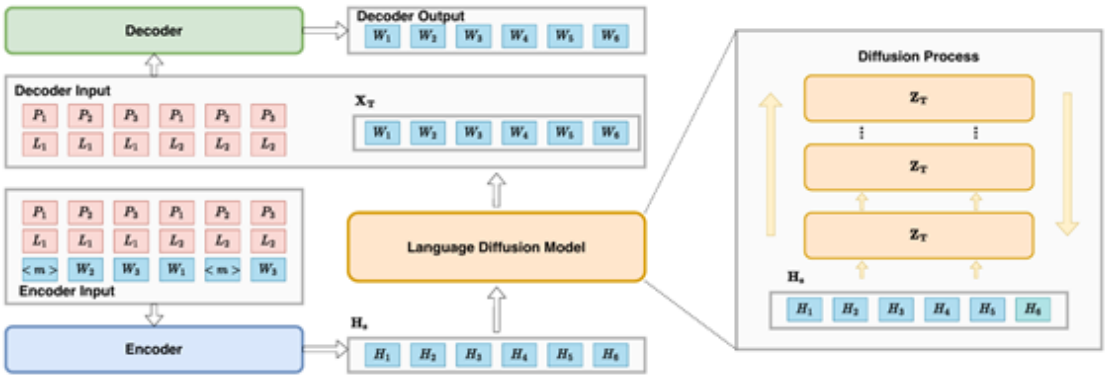


Figure 3- Discrete Diffusion Concept

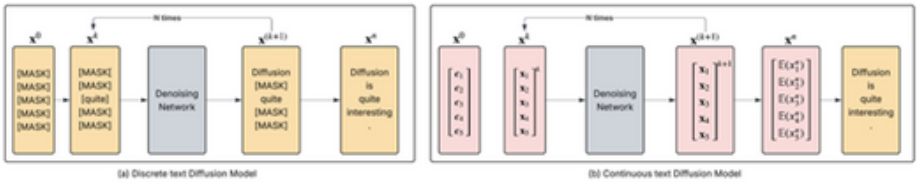


Figure 4- Continuous vs Discrete Diagram

The mechanics of DLM generation closely mirror image diffusion. A forward process corrupts clean text across T timesteps, while a learned reverse model reconstructs the original structure[1]. Unlike autoregressive systems, the model does not predict a next token but instead refines an entire noisy sequence into coherent text. This enables parallel generation and reduces the latency associated with left-to-right decoding.

Several diffusion-based language models are already implemented. Plaid is the first diffusion LLM trained to maximize likelihood and has demonstrated that, at scale, diffusion can outperform GPT-2[3]. SEDD is open-source and widely used as a research foundation. LLaDA, an 8B-parameter diffusion LLM, rivals LLaMA3-8B in performance[6]. Google DeepMind's Gemini Diffusion explores large-scale diffusion for advanced text generation[6], while DiffuGPT and DiffuLLaMA adapt existing AR models[5] into diffusion objectives, showing how both paradigms can complement each other.

Diffusion language models represent more than a technical novelty; they offer a fundamentally different way for machines to write. Their bidirectional refinement, fast parallel generation, and controllability make them strong contenders to complement or even replace autoregressive models in future language systems. As research accelerates, DLMs may reshape natural-language processing much like diffusion reshaped image generation[8].

References

[1] J. Ho, A. Jain, and P. Abbeel, "Denoising diffusion probabilistic models," in Proc. Adv. Neural Inf. Process. Syst. (NeurIPS), vol. 33, pp. 6840–6851, 2020.
[2] X. Han, S. Kumar, and Y. Tsvetkov, "SSD-LM: Semi-autoregressive simplex-based diffusion language model for text generation and modular control," in Proc. 61st Annu. Meet. Assoc. Comput. Linguistics (ACL), 2023.
[3] Z. He, T. Sun, K. Wang, X. Huang, and X. Qiu, "DiffusionBERT: Improving generative masked language models with diffusion models," in Proc. 61st Annu. Meet. Assoc. Comput. Linguistics (ACL), 2023.
[4] M. Arriola, A. Gokaslan, J. T. Chiu, et al., "Block diffusion: Interpolating between autoregressive and diffusion language models," in Proc. Int. Conf. Learn. Representations (ICLR), 2025.
[5] S. Gong, S. Agarwal, Y. Zhang, et al., "Scaling diffusion language models via adaptation from autoregressive models," arXiv preprint, 2024.
[6] J. Tae, H. Ivison, S. Kumar, and A. Cohan, "TESS 2: A large-scale generalist diffusion language model," in Proc. 62nd Annu. Meet. Assoc. Comput. Linguistics (ACL), Long Papers, 2025.
[7] T. Chen, S. Zhang, and M. Zhou, "DLM-One: Diffusion language models for one-step sequence generation," arXiv preprint, 2025.
[8] T. Li, M. Chen, B. Guo, and Z. Shen, "A survey on diffusion language models," arXiv preprint, 2025.

Domain Adaptive Object Detection

by Pasindu Dodampegama

Object detection is one of the core tasks in computer vision with applications spanning across many industries. From autonomous vehicles, security & surveillance, agriculture, manufacturing to medical imaging, robotics and sports, object detection plays a crucial part in our lives, and its influence on us is only getting bigger. Object detection can be simply described as a technique used to identify and locate specific objects, like people, cars, or animals, within an image or video by drawing bounding boxes around them and classifying their type.

Domain Adaptive Object Detection (DAOD)

During object detection, it can often be the case that models may be trained on different datasets than what they'll be used for (e.g., trained on synthetic data like simulations for real-world scenarios). These training datasets are known as source domains. Without domain adaptation techniques, models may perform poorly on their final tasks[1], often failing when deployed in practical environments, which are our target domains due to domain shifts such as differences in lighting, weather, sensor types, or scene structure. Domain adaptive object detection can be useful across various fields and helps make datasets more robust and models more tolerant of changing environments. As shown in Figure 1, by adapting knowledge learned from a labeled source domain to an unlabeled or differently distributed target domain, these methods can help detectors perform more reliably.

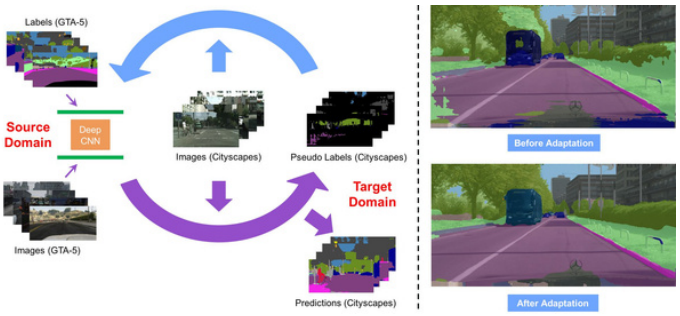


Figure 1: Before and after domain adaptation[2].

Domain Adaptive Object Detection (DAOD)

1. Autonomous Driving

Source domain: Synthetic driving datasets (GTA-V, SYNTHIA, CarlaScenes, Foggy Cityscapes, VKITTI 2).

Target domain: Real-world driving images (Cityscapes, KITTI). Collecting and training with real-world data is time-consuming and prohibitively expensive. Through simulations, we can generate unlimited labeled data at a relatively low cost, but models trained on it may fail due to domain gaps such as lighting, texture, or weather condition differences.

Figure 2: Real vs synthetic driving scenes. This grid illustrates the synthetic → real domain gap commonly used in DAOD benchmarks[3][4].

In Figure 2, we can see samples from the real KITTI dataset alongside the synthetic Virtual KITTI datasets, highlighting both their visual similarities and domain shifts that call for domain adaptation.

2. Satellite Imagery

Source domain: Satellite imagery from one region or sensor.

Target domain: Imagery from another region, season, or sensor type.

We can train on labeled imagery from one region or sensor and adapt the model to unlabeled imagery from another region, season, or sensor. Even when sensors differ in resolution, spectrum, and viewing angle, DAOD reduces the need for costly re-annotation and improves target performance by enabling reliable detection of building footprints, roads, vehicles, and environmental changes (e.g., deforestation, flood extent). Figure 3 illustrates an example of this domain translation where pixel-level appearance adaptation helps bridge the gap between map tiles and aerial imagery. Applications can include military reconnaissance and disaster response.

Figure 3: Style/appearance transfer example (pix2pix): map ↔ aerial photo on Google Maps. The model translates map tiles to aerial imagery and vice versa[5].

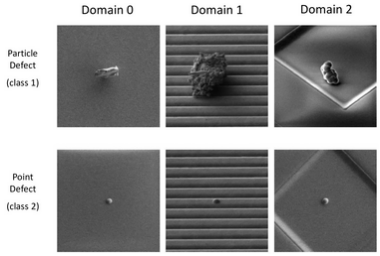


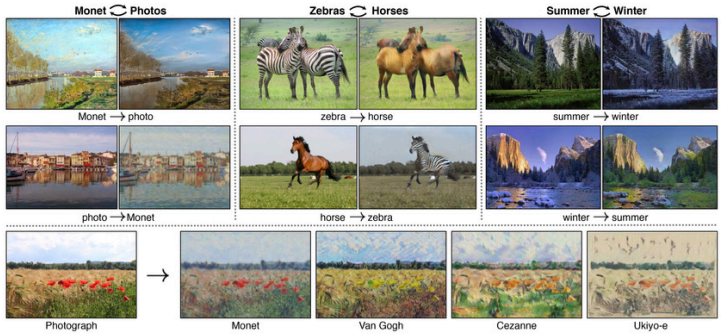
Figure 4: Semiconductor defect domains and classes: Each column represents a distinct domain and the rows represent particle defects and point defects.[6].

3. Industrial & Manufacturing Inspection
Source domain: Synthetic or lab-generated defect images.
Target domain: Real-world factory production lines.

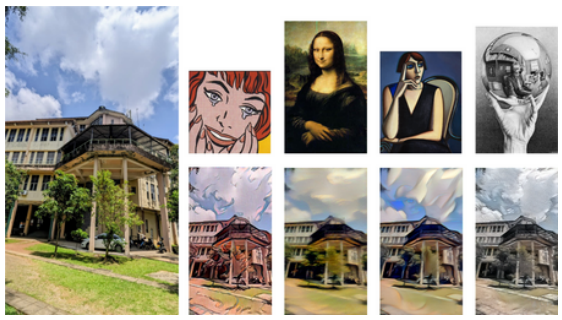
Real manufacturing defects are rare, so instead of overfitting on a handful of real examples, we can train on fully labeled synthetic/CAD renders that can be captured from multiple viewpoints and adapt the model to real factory footage. As illustrated in Figure 4, even identical defect types can exhibit noticeably different appearances across domains. Domain adaptation helps bridge these gaps by accounting for variations in texture, lighting, backgrounds, and sensor characteristics. This enables reliable detection of scratches, cracks, dents, or misaligned components and can be scaled for automated quality control in large-scale manufacturing (e.g., automobiles, electronics).

Domain Adaptation Methods for Object Detection

1. Pixel-level Adaptation (Style Transfer / GAN-based)
We can reduce appearance gaps (e.g., synthetic → real, day → night, clear → misty) by transforming labeled source images to look "similar" to the target domain, so that a detector trained on the transformed data can generalize better to the target domain without additional data collection or labeling. In practice, we can use style-transfer methods like **CycleGAN**[7], **Neural Style Transfer**[8], or lightweight **Fourier Domain Adaptation** and train with a mix of translated and original source images to prevent over-stylization. We also aim to avoid pitfalls such as artifact learning and semantic/geometry drift. Style transfer can be most effective when paired with self-training (pseudo-labels) or feature-level alignment, leading to more stable gains on the target domain.
Figure 5 depicts two representative pixel-level adaptation approaches. Subfigure (a) shows a CycleGAN-based transformation, which learns to map source images to the target domain style while preserving semantic content. Subfigure (b) demonstrates Neural Style Transfer applied to the source image, producing a stylized version that mimics the target domain's appearance.



(a) CycleGAN[7]



(b) Neural Style Transfer[8][9]

Figure 5: Pixel-level adaptation examples.

2. Mix-up–based Adaptation (CutMix / ConfMix)
CutMix[10]
CutMix generates training samples by choosing a labeled source image as the base and replacing a random rectangular region of it from an unlabeled target image. As illustrated in Figure 6, the resulting mixed samples lead to distinct class activation patterns for different prediction labels. After replacement, we keep only the source boxes that are fully or mostly visible and do not add target boxes since the target is unlabeled. In this way we can regularize against overfitting to source textures and inject target appearance without full style transfer. However, masks can overwrite important objects or context and introduce label noise, especially for small objects or large replaced regions. By keeping mask sizes moderate and dropping boxes that become too small after cutting and combining with standard augmentations (e.g. color jitter, random crop), we can unlock the full potential of this method.

Figure 6: Class activation mapping (CAM) visualizations on 'Saint Bernard' and 'Miniature Poodle' samples[10].

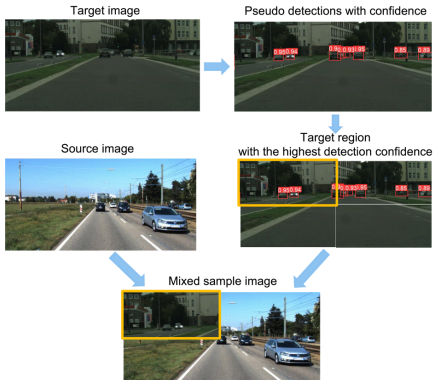


Figure 7: ConfMix combines the source image and the target region with the highest pseudo detection confidence[1].

ConfMix[1]

ConfMix generates training samples by choosing a labeled source image as the base and pasting only high confidence regions from an unlabeled target image (e.g., detections after NMS (Non-Maximum Suppression)).

Figure 7 demonstrates the process, where the target region with the highest pseudo-detection confidence is selected and inserted into the source image to form a mixed sample. For each of the pasted regions, we attach the corresponding pseudo-labels and keep only the source boxes that remain fully or mostly visible. Boxes that are cut through will be dropped or clipped. This focuses learning on target objects while preserving clean source context, and is typically less noisy than random CutMix. The trade-offs include the extra mining pass to gather confident target patches, the limited number of patches available early in training when confidence is low and limited augmentation of target backgrounds. In practice we can avoid boundary artifacts by setting a cap on the number of pasted instances per image, applying colour and blur jitter to pasted regions and pairing ConfMix with self-training so pseudo-labels will improve and, in turn, the model's performance will improve over time.

Conclusion

In conclusion, domain adaptation is not just about boosting accuracy across domains. It unlocks previously unusable datasets, builds resilient models for real-world use, and bridges the gap between synthetic training data and practical applications. More than a technical fix, it can be the savior of efforts that push boundaries with limited means, transforming constraints into opportunities for innovation.

References

[1] G. Mattolin, L. Zanella, E. Ricci, and Y. Wang, "Confmix: Unsupervised domain adaptation for object detection via confidence-based mixing," in 2023 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), pp. 423–433, 2023.

[2] Y. Zou, Z. Yu, B. V. K. Vijaya Kumar, and J. Wang, "Unsupervised domain adaptation for semantic segmentation via class-balanced self-training," in Computer Vision – ECCV 2018: 15th European Conference, Munich, Germany, September 8–14, 2018, Proceedings, Part III, (Berlin, Heidelberg), p. 297–313,Springer-Verlag, 2018.

[3] Y. Cabon, N. Murray, and M. Humenberger, "Virtual KITTI 2," arXiv preprint arXiv:2001.10773, 2020.

[4] A. Gaidon, Q. Wang, Y. Cabon, and E. Vig, "Virtual worlds as proxy for multi-object tracking analysis," in Proceedings of the IEEE conference on Computer Vision and Pattern Recognition, pp. 4340–4349, 2016.

[5] P. Isola, J.-Y. Zhu, T. Zhou, and A. A. Efros, " Image-to-Image Translation with Conditional Adversarial Networks ," in 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), (LosAlamitos, CA, USA), pp. 5967–5976, IEEE Computer Society, July 2017.

[6] A. Poniatowski, N. Gentner, M. Barusco, D. D. Pezze, S. Salti, and G. A. Susto, "Domain adaptation for image classification of defects in semiconductor manufacturing," IEEE Transactions on Automation Science and Engineering, pp. 1–1, 2025.

[7] J.-Y. Zhu, T. Park, P. Isola, and A. A. Efros, "Unpaired image-to-image translation using cycle-consistent adversarial networks," in Proceedings of the IEEE International Conference on Computer Vision (ICCV),
Oct 2017.

[8] L. Gatys, A. Ecker, and M. Bethge, "A neural algorithm of artistic style," Journal of Vision, vol. 16, no. 12, p. 326, 2016.

[9] yunjey, "pytorch-tutorial: neural style transfer." https://github.com/yunjey/pytorchtutorial/tree/master/tutorials/03-advanced/neural style transfer, 2025. Accessed: 2025-11-27.

[10] S. Yun, D. Han, S. Chun, S. J. Oh, Y. Yoo, and J. Choe, "Cutmix: Regularization strategy to train strong classifiers with localizable features," in 2019 IEEE/CVF International Conference on Computer Vision (ICCV), pp. 6022–6031, 2019.

The Mathematics of Memory: Inside the JPEG Algorithm

by Muftee Mysan

Introduction and Context

For nearly three decades, the JPEG standard has been at the forefront of digital imaging. It is the reason we can seamlessly share photos and why the World Wide Web is a visual medium rather than just a collection of text. But have you ever wondered how it works?

Consider a standard 1920 x 1080 pixel image with each color represented by 8 bits:

1920 x 1080 x 3 bytes (RGB) = 5.93 MB

That is just for a standard frame; professional RAW or 4K images are exponentially larger. So, how do we store these files efficiently while preserving detail?

That's where JPEG comes in. Strictly speaking, "JPEG" is a compression method, not a file format (though the terms are often used interchangeably). The actual format is JFIF (JPEG File Interchange Format), and .jpg is simply the container. The standardization of this algorithm enabled global digital image transfer.

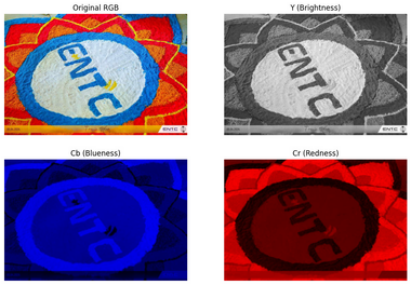
The core of JPEG is Lossy Compression. Unlike a .zip or .png file, which must restore every bit perfectly, JPEG approximates the original image. By sacrificing mathematical perfection for perceptual accuracy, it achieves massive compression ratios, often 10:1 or 20:1, by discarding data the human eye is likely to miss.

The engine behind this process is the Discrete Cosine Transform (DCT), which takes advantage of two biological facts:

1. **Color Sensitivity:** We see brightness (Luminance) much better than we see color (Chrominance).
2. **Spatial Frequency:** We are bad at perceiving high-frequency changes (fine detail) compared to low-frequency areas.

Note: While the wavelet transform was proposed to be used in the JPEG2000, the DCT-2 based JPEG is still the more popular choice.

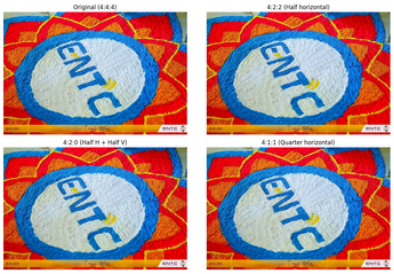
Image Preparation and Pre-Processing



Color Space Transformation (RGB → YCbCr)

Because the human eye is far more sensitive to brightness than color, the first step is converting the image from RGB to the YCbCr color space. This separates Luminance (Y), the grayscale brightness, from Chrominance (Cb and Cr), the blue and red color-difference channels.

At this stage, the memory requirement is actually unchanged (we are just swapping one set of 3 values for another). We have not compressed anything yet; we have just reorganized the data to make it easier to attack.



Exploiting Biology

Here is the first trick. Since we struggle to distinguish fine color details, we can aggressively downsample the Chrominance components without anyone noticing.

Commonly, we reduce the resolution of the color channels by 50% or 75% (a technique known as 4:2:0 subsampling), while keeping the brightness (Y) at full resolution. This immediately discards a significant chunk of data before the complex math even begins.

Blocking and Level-Off

The image is then sliced into 8 x 8 pixel blocks. If the image dimensions (M x N) are not multiples of 8, the edges are padded with dummy pixels before slicing.

Finally, the system subtracts 128 from every pixel value (assuming standard 8-bit depth). This shifts the range from [0, 255] to [-128, 127], centering the values around zero.

Why do we do this?

- **The Shift:** Since cosine waves oscillate between positive and negative ([-1, 1]), centering our pixel data around zero makes the math much cleaner and reduces the size of the numbers we have to store later.
- **The Slice:** We break the image into blocks because calculating the frequencies for a whole 12-megapixel image at once would take forever. The 8 x 8 grid is the "Goldilocks" size: small enough to process instantly, but large enough to capture meaningful patterns.

The Discrete Cosine Transform (DCT)

From Pixels to Waves: The Frequency Domain

This is the heart of the algorithm. We are about to convert our 8 x 8 block from the Spatial Domain (where we look at pixels) to the Frequency Domain (where we look at patterns).

Think of it this way: How do you describe a complex sound? You could describe the air pressure at every millisecond (Time Domain), or you could just list the musical notes that make up the chord (Frequency Domain). JPEG does the same thing, but for images.

The Theory of Waves: A cosine wave is a simple curve that alternates between -1 and 1. If you take several cosine waves of different frequencies and stack them on top of each other, they interfere to create complex shapes.

By calculating the right weight (or coefficient) for each wave, we can reconstruct the image block perfectly.

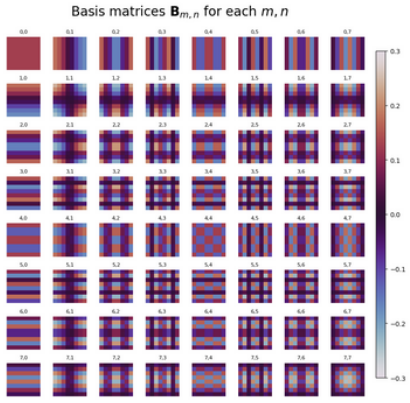
- **Low Frequencies:** Broad, slow waves represent smooth gradients (like a sky).
- **High Frequencies:** Rapid, tight waves represent sharp edges (like text or noise)

The Math behind the DCT

To perform this conversion, we use the **2-D Discrete Cosine Transform**. It calculates the specific weight (coefficient) needed for each of the 64 basis waves to recreate our pixel block.

The formula for the coefficients F(u,v) is:

$$F(u,v) = \frac{1}{4}C(u)C(v)\sum_{x=0}^{7}\sum_{y=0}^{7} f(x,y)\cos\left[\frac{(2x+1)u\pi}{16}\right]\cos\left[\frac{(2y+1)v\pi}{16}\right]$$



Energy Compaction

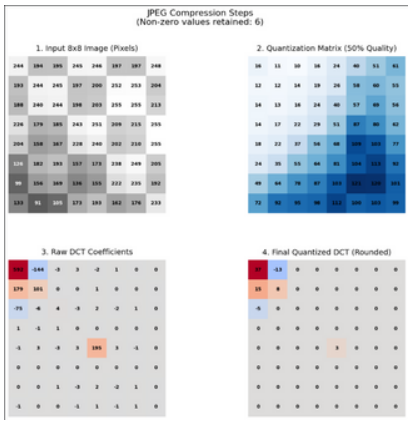
The matrix is organized by frequency. The top-left elements represent low-frequency data, while moving right and down reveals high-frequency components.

The element at (0,0) is the DC Coefficient, representing the block's average brightness. The remaining 63 are AC Coefficients, capturing finer details and noise. As you might have guessed, in a smooth image (like a blue sky), these high-frequency coefficients are almost zero.

Quantization: The lossy step

Until now, the process has been reversible (lossless). Quantization is where the actual compression, and data loss occurs.

- The mechanism: We divide our DCT matrix (C) by a standard Quantization Matrix (Q) and round to the nearest integer.
  $S_{ij} = \text{round}(C_{ij} / Q_{ij})$
- Quality Control: The values in Q act as the "quality setting". High compression uses larger numbers in Q. When we divide the small high-frequency coefficients by these large numbers and round, they turn into zeros. We effectively delete the image's fine texture while preserving the broad shapes. This explains why compressed JPEGs look fine in busy textures (like grass) but show "ringing" artifacts around sharp edges (like text).
- **The Result:** The matrix is now filled mostly with zeros. This "sparsity" is exactly what we need for the final step.



Coding and Decompressing

Encoding

After quantization, we are left with a matrix full of zeros, especially in the bottom-right corner.

1. **Zig-Zag Scan:** We read the matrix in a specific zig-zag pattern. This groups all those trailing zeros into long, continuous sequences.
2. **Entropy Coding:** We then use Run-Length Encoding (RLE) followed by Huffman Coding to compress these zero-sequences efficiently.

Decompression

When you open the file, your device simply reverses the process:

1. **Unquantization:** Multiply the data by matrix Q.
2. **IDCT:** Apply the Inverse DCT to restore spatial pixel data.
3. **Un-shifting:** Add 128 back to the values to restore the original brightness levels.

Conclusion

The success of a compression algorithm is often measured by its Peak Signal-to-Noise Ratio (PSNR), which compares the original signal power to the error introduced by compression. However, modern engineers also rely on the Structural Similarity Index (SSIM), which is designed to model how the human eye actually perceives those errors.

Despite the emergence of newer, more efficient formats (like HEIC), JPEG remains the undisputed king of digital imaging. It strikes a perfect balance between high efficiency and low computational complexity. It is the "MP3 of images", perhaps not the technically "best" anymore, but by far the most compatible.

Sneak Peek: Vector Quantization and Color Reduction

While JPEG manipulates **frequencies**, another strategy manipulates the **palette**. This is **Vector Quantization (VQ)**.

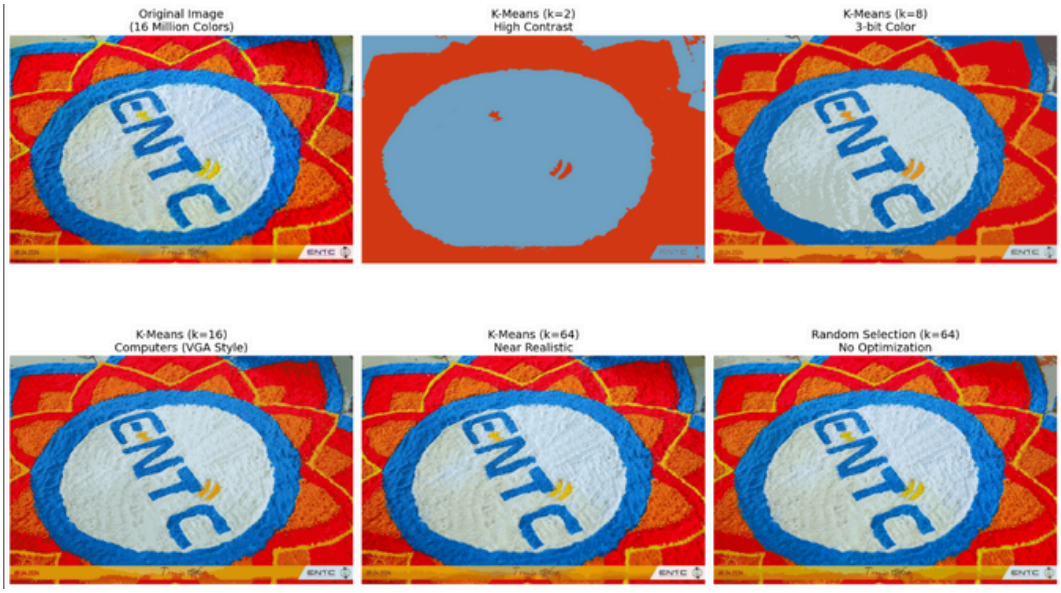
A Palette Approach

An 8-bit grayscale image uses 256 distinct shades. VQ asks: Can we represent this image using only 8? By reducing the palette from 256 options (8 bits) to 8 options (3 bits), we reduce the memory footprint by a factor of approximately 2.5.

The Role of K-Means Clustering: How do we pick which 8 shades to keep?

Uniform Sampling: We could pick 8 shades that are equally spaced (0, 36, 72...). This is inefficient because an image might be mostly dark, meaning the lighter shades we picked are wasted.

K-Means Clustering: This algorithm treats pixels as data points and finds 8 "clusters" where the data is most dense. It calculates the optimal **Centroids** to represent the actual colors in the image

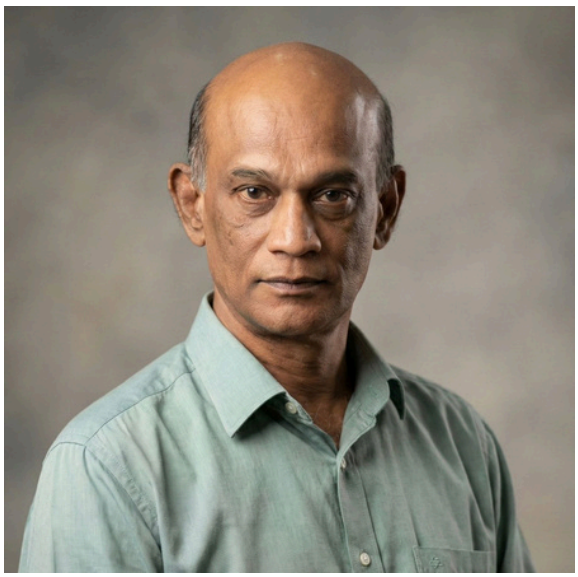


The outcome

If JPEG is like rewriting a song using only the loud notes, Vector Quantization is like repainting a masterpiece using only the 8 most important tubes of paint. By using K-Means to select that palette optimally, the reconstructed image retains high fidelity despite the massive reduction in data.

Farewell Tribute to Senior Professor Kapila Jayasinghe

by Kavishka Jayakody



For over forty years, Senior Professor Kapila Jayasinghe has been a cornerstone of the Department of Electronic and Telecommunication Engineering, shaping its direction, culture, and academic excellence.

His journey into engineering began at Ananda College, where time spent with a teacher who built radios sparked a lifelong passion for electronics. Encouraged to aim for the University of Moratuwa, he chose Electronics at a time when Civil Engineering was the more popular path, an early sign of his clarity and conviction. His choice even influenced several friends to follow the same route. He entered the University of Moratuwa in 1979 and graduated in 1983 with a First Class degree. The broad, interdisciplinary training he received as an undergraduate shaped his approach to engineering and later guided the design-focused teaching he championed.

In 1984, he joined the Department as an Assistant Lecturer during a period when many academics were leaving the country. His decision—and later that of Professor Dileeka Dias, to return after postgraduate studies played a pivotal role in reversing that trend.

Supported by the NUFFIC program, he completed his M.Eng. and Ph.D. in the Netherlands, gaining exposure to industrial-grade research environments. His doctoral work in VLSI design led to a first-time silicon success, recognition at the Custom Integrated Circuits Conference, and an invited publication in the IEEE Journal of Solid-State Circuits, an exceptional achievement early in his career.

He returned immediately to Sri Lanka, guided by the values he still emphasizes today: discipline, honesty, and commitment. Over the years, he taught a wide range of courses across telecommunications, electronics, product design, and manufacturing, shaping thousands of students with his insistence on clarity and professionalism. From 1996 to 1999, as Head of the Department, he helped secure the Japanese Government grant that funded the current ENTC building and revitalized the long-dormant Master's program. His contributions extended far beyond departmental duties: he drafted the University's first Intellectual Property Policy, chaired the IP Advisory Committee for nearly a decade, and strengthened collaborations with NIPO, WIPO, and the U.S. Department of Commerce.

His impact on national development is equally significant. He led the creation of Sri Lanka's first locally engineered Road Traffic Signal System, Moratuwa's first patented invention, which deployed over 50 systems across the country. In 2000, he founded the Engineering Design Centre, which went on to deliver nationally recognized innovations including the Tea Colour Sorter and the country's first Rapid Prototyping Facility. At the national level, he served in key leadership roles such as Chair of the NSF Committee on Robotics and Co-Chair of the National Council on Electronics & Robotics under COSTI. Much of his industry work, especially supporting SMEs and robotics development, remains confidential under NDAs, yet its impact is felt widely.

Reflecting on his career, he describes its foundation as three pillars: teaching, research, and national development. He encourages the Department to continue strengthening all three and to cultivate more professors who uphold this balance.

As he steps into retirement, his message to the next generation stays true to his life's example:

"Work honestly. Be disciplined. Avoid conflicts of interest. And let your work serve the nation".

Professor Kapila Jayasinghe's legacy is one of integrity, innovation, and service. His influence will endure through every student he taught, every initiative he began, and every piece of progress he quietly enabled. We extend our deepest gratitude and wish him the very best for the years ahead.

SPARK - School Workshops

by Wageeth Wijesekara

Bringing technology and innovation directly to schools. Alongside the SPARK Challenge 24/25, the branch organized a series of Raspberry Pi programming workshops aimed at inspiring students in technology and innovation. The SPARK branch took a significant step in expanding its outreach this year by hosting.

The first two workshops took place at Jaffna Hindu College and Hartley College, welcoming nearly 450 enthusiastic O/L students. With the support of the schools' IT sections, these sessions gave students a glimpse into technology and innovation through hands-on coding with Raspberry Pi devices. Another workshop was held at S.W.R.D. Bandaranayake College, Kurunegala, engaging over 100 students. The participants thoroughly enjoyed the program, showing great enthusiasm and curiosity throughout the sessions.

To ensure continued learning, one Raspberry Pi was gifted to each school, encouraging teachers and students to keep exploring. Throughout these initiatives, the SPARK Branch exemplified its commitment to nurturing the next generation of innovators. By empowering young students and giving them access to modern tools and knowledge, SPARK continues to shape a brighter, technology-driven future for Sri Lanka.

ENTC Career Fair

by Rumeth Samarasinghe

The Career Fair of the Department of Electronic and Telecommunication Engineering plays a pivotal role in shaping the future of its undergraduates. Continuing the tradition of organising this annual event, the Electronic Club, with the immense support of its sponsors, Axiata Digital Labs, Codegen, ZeroBeta and NCINGA, successfully concluded the event on the department premises on the 30th January 2025.

This year's event welcomed the participation of more than 20 leading industry giants, including Axiata Digital Labs (ADL), Codegen, ZeroBeta, NCINGA, IFS, Yaala Labs, Paraqum Technologies, Huawei, Sri Lanka Telecom (SLT), WSO2, WealthOS, ISA, Thakshana, Dialog, RAD, IronOne, Envoy, who came together to connect with the young talent nurtured by the department.

These industry leaders presented final-year students with unique opportunities to take their first firm steps in climbing the career ladder. The day was vibrant, with final year students showcasing their skills and paving their own paths through on-the-spot interviews. The event concluded with an appreciation of the companies that extended their immense support to the department and its students, solidifying old bonds, fostering new ones, and paving the way for future collaborations between the growing industry and the Department of Electronic and Telecommunication Engineering.

Beyond the graduating batch, the junior students of the department, as well as aspiring undergraduates from across the University of Moratuwa, gained firsthand exposure to the workings of the fair, offering them valuable insights into current industry trends and a clearer view of their future prospects.

SLRC '25: Where Young Minds Revolutionise the Future of Robotics

by Wageesha Lenmini

Innovation lit up the arena once again as the Sri Lankan Robotics Challenge (SLRC) returned for its 12th ground-breaking edition. Spearheaded by the Department of Electronic and Telecommunication Engineering of the University of Moratuwa, the April 6th showdown marked the electrifying grand finale, bringing together the sharpest minds from schools and universities across the island in a high-stakes battle for tech supremacy in Sri Lanka's most prestigious robotics arena.

With the registrations of 12 school teams and 11 university teams, the competition was officially set in motion. And as their robots rolled into the arena, with every gear in motion and every sensor primed, the message was clear that these young innovators came to conquer, and the arena was their proving ground.

Adding an exciting twist to this year's edition, a brand-new challenge titled the "Hidden Task" was introduced for both categories. This surprise element was revealed to all participants during the event, giving them just one hour to adapt and program their robots to complete the unexpected task. It was the first time such a dynamic concept had been introduced in a local robotics competition. That initiative not only raised the level of excitement but also served as a powerful stage to spotlight real-time problem-solving skills and uncover true engineering talents.

In the school category, the judging panel, Mr. Punsara Mahawela, Mr. Wikum Jayasanka, and Mr. Supun Kuruppu, brought their deep knowledge in robotics and engineering to the table, evaluating each team's creativity, precision, and innovation. Meanwhile, in the university category, the task of evaluating the cutting-edge, complex designs fell to Mr. Janith Gunarathna, Mr. Dilanka Wickramasinghe, and Mr. Supun Wanniarachchi. With their wealth of academic and industry experience, they were able to identify and assess the next level of technical mastery demonstrated by the university teams.

Breaking the tension of anticipation, and after a tough round of meticulous evaluation, the results of the Sri Lankan Robotics Challenge were finally unveiled, spotlighting the trailblazers of technological innovation and mechanical mastery. Against all odds and after countless hours of preparation, three school teams rose above the rest. Thew's Bot earned third place, Trojan Back claimed second, and Future Tech emerged as the champions, setting a new benchmark for school-level robotics in Sri Lanka.

The university category saw robots clash, code dominate, and minds shine. Anyhow, at the end, Xlydder powered their way to third place, Pulzetrones earned the runner-up title, and Zeven took the crown with a game-changing performance. It was obvious that innovation, resilience, and teamwork defined them.

As the lights dimmed on this year's SLRC, one thing was clear - Sri Lanka's future innovators have already begun to shape the world of tomorrow. SLRC 2025 may have concluded, but its legacy lives on - in every gear turned, every line of code written, and every young mind now daring to dream bigger than ever before. We have proved that Sri Lanka's tech future is not just bright, it's unstoppable.

Tronic Avurudu '25

by Rusiru Fernando

The Sinhala and Tamil New Year brought vibrant colors and laughter to the ENTC premises as students gathered to celebrate “Tronic Avurudu ’25” on 1st May 2025. Students from the 20, 21, 22, and 23 batches joined to create an unforgettable day filled with fun, competition, and celebration.

Upon entering, attendees were welcomed by a beautifully designed “Kolam”, a symbol of prosperity and creativity, crafted by our Tamil brothers and sisters. The festival spirit continued with the “Avurudu Kema Mesaya”, where mouthwatering traditional delicacies such as “Kevum”, “Kokis”, “Aluwa”, and “Asmi” were served.

Staying true to tradition, the event began with the "Kiri Ithira Weema." It symbolizes blessings and prosperity for the year ahead. The air then came alive with rhythmic beats and joyful music as students showcased their talents in dancing.

The highlight of the day was the lineup of exciting Avurudu games. The field echoed with cheers during “Kaba Adeema”, as teams battled fiercely in tug-of-war matches, testing strength and teamwork. The excitement continued with “Pani Bambare”, a hilarious challenge that had everyone laughing uncontrollably. Then came the ever-thrilling “Gama Haraha Diweema”, where participants raced with energy and determination, displaying the true competitive spirit of Avurudu.

Tronic Avurudu ’25 was more than just a celebration; it was a reminder of the bonds we share as the ENTC family. From the well-organized games to the heartwarming performances, every moment reflected the dedication and spirit of our students.

This year’s Avurudu festival was a resounding success, blending tradition, unity, and youthful enthusiasm into one vibrant day.

TPL'25: The Annual Battle of ENTC Cricket Enthusiasts

by Ravin Samarasekara

Tronic Premier League, the most awaited annual cricket tournament of the department, commenced on 17th March 2025 at the university Grounds. The tournament began with the HOD's inspiring speech, and turned out to be thrilling and fierce, with players displaying their all-around skills.

After a fierce battle in the qualifier rounds, two teams, the "Kajukale Warriors" and the "Katubedda Knight Riders", reached the finals. A notable highlight of the event was the match between the students' and the department's staff teams, which concluded with a thrilling finish, with the staff team emerging victorious. The vibrant backdrop added a festive atmosphere to the field, creating a colorful memory for the crowd.

By the end of the tournament, "Kajukale Warriors" secured the trophy, with "Katubedda Knight Riders" as the runners-up. Beyond the competition, the tournament displayed the bond within the ENTC family. The event will return as TPL'26 next year.

Tronic Pongal: ENTC celebrates with Spirit, Warmth, and Togetherness

by Ravin Samarasekara

The Department of Electronic and Telecommunication Engineering joyfully celebrated the "Pongal" festival this year on 7th February 2025 at the department premises, reflecting the spirit, gratitude, and togetherness of Tamil culture. Students dressed in traditional "White vesti" and "Sarees" added a vibrant touch to the celebration.

The festival began with the preparation of "Pongal rice" and offering to the sun God, symbolizing prosperity and gratitude for helping sustain agriculture and life. It was later shared among all the students and staff present. The traditional "Kolam" decoration, and the lively music and dances of the ENTC Tamil students brought a festive charm to the occasion, creating an atmosphere of happiness and cultural vibe.

Throughout the occasion, the ENTC family not only paid homage to the essence of Thai Pongal but also strengthened community bonds through celebration in harmony.

Electronic Club AGM 2025/26: New Leadership and Plans

by Thusajiny Ahilakumaran

The Electronic Club of the University of Moratuwa held its AGM for 2025/26 on 27th August 2025 at ENTC 1 Hall. The meeting started at 6:20 PM, with the lighting of the oil lamp and a welcome speech by outgoing President Mr. Dilupa Vinod.

The Secretary, Ms. Sanjana Kapukotuwa, presented the minutes of the last AGM, and the Treasurer, Mr. Ruchith Sandeep, presented the financial report. Members suggested using online banking to streamline the club's financial operations. Speeches by Staff Advisor and Senior Treasurer Dr. Ranga Rodrigo and Head of the Department Dr. Thayaparan Subramaniam encouraged teamwork, innovation, and participation

Elections were held for the Top Board, with Mr. Mihiruth Sehara as President, Ms. Samudra Uduwaka as Secretary, and Mr. Uvindu Kodikara as Junior Treasurer for the Electronic Club term 25/26. After those, elections for the Branch office bearers were also held.

The AGM featured a "Down the Memory Lane" video and certificates of appreciation for outgoing members, the Head of Department, and the Staff Advisor. The meeting ended at 8:30 PM, marking the start of a new chapter for the club under its new committee.

Promoting Robotics Skills and Creativity Through SLRC Workshops

by Nethmi Pathirana

As part of the Sri Lanka Robotics Challenge (SLRC), the SLRC Branch of the Electronic Club conducts robotics workshops for school students to enhance their knowledge and inspire their interest in robotics. These sessions are designed to be interactive and hands-on, allowing students to gain practical experience while exploring the exciting world of technology and innovation.

The first workshop was held on September 26 at Ruhunu Vijayaba College, Beliatta, with over 100 eager participants. It offered students an engaging introduction to robotics, covering both fundamental concepts and practical applications. Participants completed simple Arduino tasks that laid the foundation for robotics, helping them understand core concepts of coding and robotic operation. The workshop left a lasting impact on the students, stimulating their curiosity and enthusiasm for the subject.

The second workshop took place on October 3, once again at Ruhunu Vijayaba College, Beliatta. The event brought together enthusiastic participants from over ten schools in the area. The students gained valuable hands-on experience throughout the sessions, which evoked creativity and curiosity among them. The excitement and exposure from the workshop inspired them to further explore the field of robotics.

These workshops marked a meaningful step toward nurturing young talent in the field of robotics and technology. By sparking curiosity and inspiring innovation, the SLRC workshops continue to empower school students to think creatively and pursue their passion for robotics. Ultimately, these initiatives have inspired young minds who represent the next generation of innovators in Sri Lanka.

SPARK Challenge 24/25

by Geeth Sathsara

The SPARK Challenge 2024/25, a platform for sustainability and environmental innovation inspired by the UN Sustainable Development Goals (SDGs), concluded on 3rd August 2025. From 21 proposals, the top five teams reached the finals, where they presented their ideas to a panel of experts.

Team Cypher secured the champion title with their project BSFix, a game-changing solution for sustainable waste management. By incorporating Black Soldier Fly (BFS) farming, BSFix transforms organic waste into highly valuable resources. With its real-time, scalable design, their project redefines eco-innovation in Sri Lanka and supports SDG 13 - Climate Action. The bright minds behind BSFix were Demitha, Muftee, Rusiru, Lithira, and Chamudi.

Team Dyson Sphere claimed second place with SEIAN (Smart Energy Integration And Automation Network). SEIAN tackles one of the most prominent challenges in renewable energy - grid reliability during faults, paving the way towards a sustainable energy future in Sri Lanka. The project aligns with SDG 7 - Affordable and Clean Energy. The team members were Rusula, Thilina, Ishan, Mathisha, and Anjana.

Team Rysera secured third place with their project URO-MONITOR, an IoT-based real-time urine output tracker, designed specifically for Intensive Care Units (ICUs) and dengue wards. By enhancing patient care and easing clinical monitoring, URO-MONITOR supports SDG3 -Good Health and Well-Being. The team consisted of Sahan, Rivikula, Agra, Aazir, and Praveen.

The SPARK Challenge has once again turned innovative ideas into reality. And it doesn't stop here - the 2026 chapter has already been launched, this time open to the entire university. A series of introductory sessions and workshops with industry experts will kickstart the next wave of bright ideas. Let's see what comes next!

The Inaugural Vinoj Jayasundara Memorial Prize: Commemorating Legacy and Innovation

by Sanugi Wickramasinghe

The Vinoj Jayasundara Memorial Prize for Research Excellence honors the legacy of Vinoj Jayasundara, a former alumnus of the Department of Electronic and Telecommunication Engineering, University of Moratuwa. This award celebrates exceptional research achievements in Machine Learning and Computer Vision by students of the University of Moratuwa, recognizing and supporting impactful research that upholds Vinoj's enduring spirit of excellence, innovation, and positive contribution to the field.

The first edition, organized by Vinoj's classmates from the 14th Batch, welcomed research completed and published between December 2024 and August 2025. The projects included applications in industrial and structural systems, advanced neural network architectures, and AI-driven automation. A distinguished panel of lecturers and researchers evaluated the submissions based on innovation, research quality, and potential impact, ensuring a rigorous and fair selection process.

The awards ceremony took place on 30th August 2025, at the Department of Electronic and Telecommunication Engineering, University of Moratuwa. The event was attended by the family of Vinoj Jayasundara, Mrs. Chamani Wijayananda, Mr. Nevil Jayasundara, and Dr. Samadhi Jayasundara, alongside esteemed academics, department staff, and supportive alumni. The ceremony highlighted the remarkable talent of the participants and the breadth of research undertaken by students.

The winners of the inaugural Vinoj Jayasundara Memorial Prize are:

Champion:
Meenambika Chandirakumar,
Thanushanth Kanagarajah, and Nithursika Kalanatharasa
Human Activity Recognition Using Spatio-Temporal Dual Attention with Cross-Sensor Attention.

1st Runner-up:
Chamika Wanasinghe
Multiscale Modelling and Explainable AI for Predicting Mechanical Properties of Carbon Fibre Woven Composites.

2nd Runners-up:
Pasindu Darshana, Praveen Wijesinghe, Naveen Basnayake, and Keshawa Jayasundara
cktFormer: Transformer-Based Approach for Automated Analog Circuit Design.

The inaugural edition was a resounding success, highlighting the depth of talent and research potential within the University of Moratuwa. The Vinoj Jayasundara Memorial Prize will continue to motivate and support future generations of student researchers, and next year's edition promises to be even bigger and more impactful.

Celebrating Excellence beyond Academics

by Manuri Boralugoda

The past academic year has been a remarkable one for the Department of Electronic and Telecommunication Engineering, filled with milestones that reflect the passion, ingenuity, and perseverance of our students. From national victories to international recognition, our teams continue to make their mark in innovation, design, and problem-solving.

Synth-Z Shines at the International Stage

Representing the department on a global platform, Team "Synth-Z", comprising Thuvaragan Sooriyakumaran, Prabath Wijethilaka, and Sundarbavan Thanaraj from Batch 21, secured the Runner-up title at DVCON (Design and Verification Contest) 2025, held on September 10-11 at the Radisson Blu, Marathahalli, Bengaluru. Their project involved designing an accelerator for the Vega AT1051 SoC and deploying a complete inference pipeline of Qwen3 on bare metal, demonstrating world-class expertise in SoC design and verification.

Competing against top university and industry teams in the region, their success brought immense pride to the department and showcased its increasing strength in advanced hardware design.

Team Zyhper - Innovating for a Sustainable Future

Team "Zypher", comprising Demitha Manawadu, Muftee Mysan, Chamudi Ransika, Rusiru Fernando, and Lithira Budvin from Batch 22, made a remarkable impact with their project BSFix: an IoT-based system that transforms Black Soldier Fly (BSF) farming into an automated, intelligent, and scalable waste-to-value solution. By integrating smart sensing, real-time monitoring, adaptive control, and a connected web platform, BSFix not only optimizes the biological process but also creates a community-driven ecosystem for sustainable waste management. Their innovation stands out for blending technology, environmental responsibility, and social awareness to convert organic waste into high-value outputs through a climate-aligned approach.

Their excellence was recognized across premier innovation platforms in Sri Lanka, earning Championship titles at SLIoT (organized by the Department of Computer Science & Engineering and SLT), SPARK (organized by the Electronic Club for climate-focused innovation), and the IESE Grants (awarded by SIEE for entrepreneurial student engineering). In addition, the team secured the First Runners-up position at FINCC - Future Innovators Challenge (organized by the IEEE Student Branch of UoM). These achievements position Team Zypher among the most impactful and forward-thinking innovation teams of 2025.

Algorithmic Mastery by Evobots

Team "Evobots", which included Ravindu Rashmika from Batch 22, won First Place at Algothon 2024, organized by SLIIT as part of the annual Codefest competition. The team's precise algorithms and strategic approach helped them outperform over 150 competitors in this intense programming challenge. Their success showcases the department's solid foundation in computational thinking and problem-solving excellence.

Beyond Circuits and Signals – Masterminds Making Impact

by Pabasara Maduwage

Ever since, the Department of Electronic and Telecommunication Engineering has been nurturing exceptional undergraduates who leave an enduring legacy both within the country and beyond. Let us review a few remarkable achievements our students have recently made.

WaveLink Links the Future

Team “WaveLink”, consisting of Viyathma Vidumini, Nipuni Indeewari Herath, and Udula Abeysinghe from Batch 21, emerged as champions at Commfix '25, a national communication ideathon organized by the IEEE Communications Society Student Branch Chapter of the University of Moratuwa. Bringing together top student teams from universities across Sri Lanka to solve real-world communication challenges, Commfix '25 provided a platform to showcase the participants’ creativity, technical expertise, problem-solving, and teamwork. The team, which developed a smart emergency vehicle routing system using C-V2X communication, competed through multiple rounds and shone at the grand finale held on June 1st, 2025, at ENTC 1, Department of Electronic and Telecommunication Engineering, University of Moratuwa, owing to their technical prowess, dedication, and hard work. Utilizing both cutting-edge software and hardware, their infrastructure-aware solution enables ambulances and fire trucks to clear paths rapidly and reliably through congested urban traffic, taking another step closer to smarter, safer cities.

Outlaws’ Outstanding Achievements

Pasindu Dodampegama, Praveen Wijesinghe, Naveen Basnayake, and Keshawa Jayasundara from Batch 22 went global as team "Outlaws." Under the guidance of Dr. Tharindu Bandaragoda, the team emerged as a finalist in the IEEE Industrial Electronics Society (IES) Generative AI Hackathon Challenge 2025. This achievement brought glory to both the department and the university. The hackathon drew over 300 submissions from 28 countries and covered 10 sprints from February to June 2025. Organized by the IEEE Industrial Electronics Society (IES), it focused on responsible Generative AI solutions for industrial applications. The team advanced through several rounds, including proposals, mentoring, prototyping, and evaluations by industry experts. They secured a spot among the top teams worldwide. This granted them the opportunity to present their peer-reviewed paper at IECON 2025 in Madrid. Held from October 14 to 17, 2025, in Madrid, IECON is a premier international conference organized by IEEE IES. Furthermore, their paper secured second place in the Vinoj Jayasundara Memorial Prize for Research Excellence, which honors Vinoj Jayasundara's legacy of excellence and supports impactful research in Sri Lanka.

Keatha Karuwo Solves the Maze

Among the high achievers are Hiruna Kariyawasam and Lasan Perera from Batch 23, who constitute the team “Keatha Karuwo”. Their proficiency in robotics, programming, and problem-solving earned them the 2nd runners-up position in “Micromaze 2.0”, organized by the IEEE Robotics and Automation Society Student Branch of the Informatics Institute of Technology (IIT). This competition challenges participants to design and develop a micro mouse capable of efficiently navigating and solving a maze within a designated time frame. While demanding a high level of precision and accuracy, it offers undergraduates a unique opportunity to apply their theoretical knowledge in a practical environment, fostering teamwork, innovation, and experiential learning. Furthermore, the team demonstrated an exceptional performance in the finals and ranked 1st in the qualifier round beforehand.

From Classroom to World Stage: ENTC's Rising Stars

by Manuth Kuruppu

Team Axion - Building Stronger Networks, One Connection at a Time

Showcasing technical excellence and teamwork, Team "Axion", Nipuni Herath, Chandeepa Janith, and Dilsha Mihiranga from Batch 21, secured Third Place at NetCom 2025, a national networking and system administration competition organized under CODEFEST by SLIIT. The event challenged teams to solve real-world networking problems through configuring Cisco routers and switches, setting up VLANs, managing Linux servers, and troubleshooting system-level issues under tight time limits.

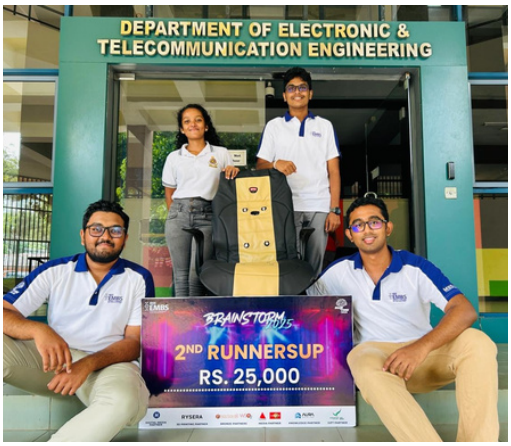
Competing among top university teams from across Sri Lanka, Team Axion's methodical approach, hands-on skills, and clear understanding of networking fundamentals distinguished them from the rest. Their achievement reflects not only their personal dedication but also the strong technical foundation and innovative mindset that have been fostered within the ENTC community at the University of Moratuwa.

Team Bioplastic Revolution - Engineering a Greener Tomorrow

The "Bioplastic Revolution" team, a five-member group comprising Banuka Liyanage, Demitha Manawadu, and Sahas Eashan from Batch 22, is addressing plastic pollution through innovative solutions centered on sustainability. Their project focuses on developing a biodegradable, seaweed-based bioplastic that aims to replace conventional plastics by utilizing eco-friendly, local materials.

Their approach extends to an IoT-based water quality monitoring system that can analyze and predict plastic pollution in coastal waters. This multidisciplinary concept has received significant recognition, ranking among the Top 3 innovations at PLEASE Hack 2025, an event organized by UNOPS and funded by the World Bank. It was also awarded the Best Environmental Project at the Battle of University Startups in Russia, and secured championship titles at Genesiz'25 and Xelerate'25, hosted by KDU.

The team's innovation has already attracted investor interest from Sri Lanka, the Maldives, and Pakistan, showcasing how ENTC ideas can evolve into global green solutions.



Team PulseCode - Smart Posture, Healthier Living

In the field of healthcare technology, Team "PulseCode", comprising Abdul Rahman, Budhima Imbulpitiya, Chaleesha Keerawella, and Mokshan Colombage from Batch 23, earned 2nd Runner-Up at Brainstorm 2025, an event organized by the IEEE EMBS Student Branch Chapter of the University of Moratuwa.

Their project, P.A.P.A.Y.A. (Posture Analysis and Proactive Alignment for Your Awareness), is a smart cushion that monitors posture and provides gentle haptic feedback to correct slouching. Lightweight, wireless, and adaptable to any office chair, it promotes healthy sitting habits in a simple and user-friendly way. This innovation highlights how ENTC students blend technology with empathy, creating solutions that quietly improve everyday health and well-being.

Round of Victories for ENTC Bright Minds

by Deelaka de Mel

SmartCare Dominates at SLIoT 2025

The team, "SmartCare", consisting of Pasidu Nethmina, Sahan Madusanka, Lahiru Jayaweera, Akindu Himan, and Sahan Weerasiri from Batch 22, became champions at the leading national level innovation competition, SLIoT, while competing in the open category. Organized by the Department of Computer Science and Engineering of the University of Moratuwa, in collaboration with SLT-MOBITEL and IESL, SLIoT is one of Sri Lanka's largest national competitions. Open to school students, undergraduates, and innovators, it champions AI, IoT, and embedded technology to solve real-world problems, sparking creativity, innovation, and collaboration between industry and academia.

The final round, held on April 27th, 2025, took place at the University of Moratuwa. Their product was an intelligent heart monitoring ecosystem that combined wearable ECG hardware, AI-driven anomaly detection using LSTM, a user-friendly app, a doctor's web dashboard, and secure cloud data handling. It stole the show with its remarkable concept, showing everyone that this was a next-generation Holter monitoring platform.

SocketBurners on the road to grandeur

"SocketBurners" placed 3rd at the Future Innovators Challenge 2025. They also clinched the award for the most popular innovation through Facebook voting. The event was organized by the IEEE Industrial Electronics Society (IES) Student Branch Chapter of the University of Moratuwa. It was held on July 13th, 2025, at the University of Moratuwa.

The team consisted of Ahmed Munavvar, Mohamed Aashir, Muftee Mysa, and Nadha Irshad from Batch 22. They shone bright with their Smart HVAC Solution, which focused on energy efficiency and enhanced guest comfort for the hospitality industry.

They also became the 1st Runner-Up in the Circularity Challenge 2025, held in parallel with the ICRES 2025 conference, having proposed an innovative solution focused on circular economy principles and sustainable engineering practices. The competition took place at GAP School in Colombo on March 3, 2025. The award ceremony was held at Cinnamon Life, City of Dreams, on March 6. Organized by Gap School research center and INSEE, The Circularity Challenge 2025 was an initiative associated with the International Conference on Resource Efficiency towards Sustainability (ICRES 2025) in Sri Lanka, aimed at identifying and recognizing innovative solutions for resource circularity.

RoboCrew at IESL RoboGames 2024

"RoboCrew" finished as the 1st runners-up at the IESL RoboGames 2024. The team, featuring Pasidu Nethmina, Lahiru Jayaweera, Sahan Madusanka, and Oshada Nimantha from Batch 22, brought great pride and glory to the department in the finals held at the University of Moratuwa on March 30th, 2025.

IESL RoboGames is a premier national robotics competition by the Institution of Engineers, Sri Lanka (IESL). It challenges students and innovators to build intelligent robots for real-world tasks, focusing on autonomous navigation, obstacle avoidance, sensor integration, and problem solving, culminating in a final round with the Kobuki mobile robot. The challenge focused on simulating real-world robotics tasks using the Webots simulator and controlling the Kobuki mobile robot in the final round.

The team developed advanced controllers for obstacle avoidance, color detection, task-specific maneuvers, and sensor integration (Xbox Kinect + Raspberry Pi 5), demonstrating their ability to combine simulation with real-world robotic applications.

ENTC Shines at SLUG `25

by Buddhima Imbulpitiya

The veteran sportsmen from the Batch 21 delivered an outstanding performance at the Sri Lanka University Games 2025. Kumal Hewagamage secured gold medals in both individual and team poomsae in Taekwondo. Udula Abeysinghe led the hockey team to a Second Runners-Up finish, while Gavin Botheju secured the Second Runners-Up position for the cricket team.

In Batch 22, Muftee Mysan and Nilakna Varushavithana excelled in cricket and hockey, respectively. Also from the same batch, Luchitha Perera was part of the hockey team that placed as second runners-up. Additionally, Tharindu Rathnayake achieved double gold in both individual and team poomsae in Taekwondo, mirroring the success of his batchmates.

Athletes from Batch 23, Thamindu Ubeysekara and Thejake Dissanayake, emerged as Champions in badminton and chess, respectively. Shalani Upekshani reached the Quarter-Finals in basketball, while Akisara Hansindu secured the Second Runners-Up position in athletics.

From the latest addition to the department, Batch 24, Isath Manvidu represented the team that emerged as the Champion in Basketball.

With these remarkable achievements across multiple sports, ENTC proudly continues its tradition of excellence, teamwork, and determination at SLUG 2025. Our athletes have once again shown that discipline and passion can take us to the very top.

Kumal Hewagamage
Taekwondo
Individual Poomsae - 1st Place
Team Poomsae - 1st Place

Gavin Botheju
Cricket - 3rd Place

Udula Abeysinghe
Hockey - 1st Place

Tharindu Rathnayake
Taekwondo - 1st Place

Luchitha Perera
Hockey - 3rd Place

Muftee Mysan
Cricket- 2nd Runners

Nilakna Warushavithana
Hockey - Quarter Finalist

Thamindu Ubeysekara
Badminton - 1st Place

Thejake Dissanayake
Chess - 1st Place

T. Shalani Upekshani
Basketball - Quarter finalist

M.M. Akisara Dulaj Hansindu
Athletics - University Colors

Isath Manvidu
Basketball - 1st Place

Smashing Success at Shuttle Storm 2025

by Lahirunie Dulsara

On 4th October 2025, the Department of Electronic and Telecommunication Engineering proudly participated in “Shuttle Storm 2025”, the inter-department badminton tournament organized by the Badminton Team of the University of Moratuwa. The event brought together spirited players from across the university, showcasing both competitive skill and sportsmanship.

Four teams representing ENTC from the 21st, 22nd, 23rd, and 24th batches competed in a series of thrilling matches. Each batch displayed remarkable teamwork and determination throughout the tournament.

The 21 and 22 batches emerged as the champions of their respective categories, claiming victory over the Department of Chemical and Process Engineering and the Department of Business Analytics. Meanwhile, the Batch 23 secured the runners-up position after an intense and closely fought final against the Department of Information Technology.

In the end, the Department of Electronic and Telecommunication Engineering achieved an outstanding milestone by winning the overall championship of Shuttle Storm 2025, sharing the title with the Department of Chemical and Process Engineering after tying in total points.

This victory not only highlights the talent, sportsmanship, and resilience of ENTC students but also reinforces the department’s vibrant culture, one that thrives equally in academics, innovation, and extracurricular achievements. The success at Shuttle Storm 2025 stands as yet another reminder that the ENTC spirit continues to shine bright in every arena it steps into.

Prof. Tharaka Samarasinghe

by Hansani Kaumadi

Prof. Tharaka Samarasinghe is an exceptional academic, researcher and a leader whose journey inspires students and colleagues across the University of Moratuwa. His remarkable career, spanning international research excellence and dedicated service to Sri Lanka's engineering education, showcases his unwavering commitment to advancing the field of telecommunications.

Prof. Samarasinghe first entered the University of Moratuwa in 2004, as an undergraduate student with a strong passion for telecommunications. During his undergraduate years, he demonstrated excellence not only academically, but also in extracurricular activities and leadership. A proud Coloursman for all four years, he earned the distinction of being the Coloursman with the highest first year GPA, and the second year GPA, from the entire university. He graduated in 2008 with a First Class, obtaining the B.Sc. Engineering degree in Electronic and Telecommunication Engineering. He also received the prestigious Prof. Dayantha Wijesekera award for the Most Outstanding Graduand of the University of Moratuwa, upon graduation. Alongside his academic accomplishments, he also completed the full CIMA qualification as an undergraduate. His leadership extended into sports, serving as the Vice Captain of the Tennis Team in his third year and the Captain of the gold medal winning team at the Sri Lanka University Games in his final year.

Following his graduation, he began his professional career at Mobitel, working as an Engineer in Network Planning and Optimization. His passion for communications led him to pursue a PhD at the University of Melbourne in 2009, specializing in wireless communications. He successfully completed his doctoral studies in 2012 and immediately joined Monash University as a Research Fellow, where he contributed for two and a half years. Prof. Samarasinghe returned to Sri Lanka in 2015 and joined the Department of Electronic and Telecommunication Engineering at the University of Moratuwa, where he has continued to serve with dedication ever since. His outstanding contributions earned him a promotion to the post of Professor in January 2024. In the same year, he also took on the role as the Head of the Department of Medical Technology, at the Faculty of Medicine, University of Moratuwa, further broadening his impact on the Sri Lankan education system. Beyond the university, he worked as a Research Fellow at RMIT from June 2022 to 2023, during his sabbatical, and has served in numerous state and non-state universities through lecturing, curriculum and laboratory development, accreditation related activities. He is also a Chartered Engineer of IESL, and has contributed consistently to maintain and enhance the quality of engineering education in Sri Lanka.

Beyond teaching, Prof. Samarasinghe is actively engaged in impactful research in the domains of wireless networks and communication theory. His work extends to vehicle-to-vehicle (V2V) communication, where he has contributed to both theoretical insights and experimental advancements. His research excellence has been recognized nationally, earning him multiple Presidential Awards for Scientific Research. Prof. Samarasinghe's commitment to volunteering and professional activities is equally outstanding. He played a foundational role in strengthening IEEE activities in Sri Lanka, having initiated the IEEE Communications Society Sri Lanka Chapter in 2018 for which he served as Chair for three years. He also contributed as Treasurer of the IEEE Sri Lanka Section in 2020 and currently serves as Vice Chair of the IEEE Sri Lanka Section in 2025. Looking ahead, he is set to take on the role of Chair of the IEEE Sri Lanka Section in 2026, continuing his long standing dedication to the engineering community.

Prof. Samarasinghe emphasizes the importance of balance and holistic development for students aspiring to enter the fields of engineering. He highlights that while maintaining a strong GPA is essential, equal attention should be given to cultivating leadership abilities, communication skills and organizational capabilities. This guidance reflects the values he consistently demonstrates in academic excellence, strengthened by professionalism, character and versatility. He also highlights the importance of ensuring both physical and mental health, which he tries to achieve through sports, music, travelling and family time. Prof. Tharaka Samarasinghe's journey is a testament to discipline, passion and service. His contributions to research, education and professional leadership continue to enrich the University of Moratuwa and the broader engineering community. We wish him continued success and look forward to the lasting impact of his work in the years to come.

Ms. Anuki Chamathka Pasqual

by Upani Gunathunga

Ms. Anuki Chamathka Pasqual is a proud graduate of Batch 20 of the Department of Electronic and Telecommunication Engineering at the University of Moratuwa, who consistently demonstrated excellence in academic distinction, technical depth, and committed leadership while maintaining a perfect cumulative GPA of 4.0/4.0 and earning a place on the Dean's List for all eight semesters.

Visakha Vidyalaya, Colombo, served as the starting point for her remarkable academic journey, where she ranked 1st in the country at the G.C.E. O/L examination in 2016 and secured 4th place in the country at the G.C.E. A/L 2019 in the Physical Science stream. She was a talented chess player from her school days, during which she served as the school chess captain in 2018 and represented Sri Lanka at the 2017 Asian Youth Chess Championship held in Tashkent, Uzbekistan.

Upon entering the Department of Electronic and Telecommunication Engineering, Anuki continued her trajectory of excellence. She consistently excelled academically, achieved success in both local and international competitions, and brought immense pride to the department. She led the development of FlashGuard, a pair of smart glasses designed to provide real-time protection against photosensitive epileptic seizures. This innovation secured the Most Innovative Product Award at the Dialog Innovation Challenge 2024 and 1st place at the Brainstorm Healthcare Innovation Challenge 2023. In another notable achievement, her team emerged as champions at the DVCon India 2024 Design Contest, where she developed a hardware accelerator for a malware detection Vision Transformer model, marking a significant international accomplishment. Her competitive programming performances are equally outstanding, achieving impressive global ranks of 99th and 87th, and national ranks of 3rd and 1st in IEEEXtreme 15.0 and 16.0, out of more than 12,000 participants.

Beyond her academic achievements, her extracurricular activities profile reflects the qualities of a complete all-rounder. Her team won the Inter-University Chess Championship 2022, organized by the Sri Lanka University Sports Association. She was the Women's Chess Captain of the University of Moratuwa Chess Team in 2024 and received the Coloursman with the Highest GPA award in both 1st and 2nd years. Reflecting her strong leadership abilities, she actively contributed to the Electronic Club of UoM, serving as the Head of Industrial Relations in 2025. Further, she was the Event Coordinator of the Gavel Club of the University of Moratuwa for the Term 2023/24.

During her research internship at the University of Melbourne, Australia, she conducted research related to optimizing millimeter-wave network performance in smart industrial networks, which led to a publication titled "Optimized Base Station Deployment and Assignment for Smart Factory Millimeter Wave Networks" in IECON 2024, and also received Best Presentation Recognition in her technical session for presenting the research paper as the first author at the IECON 2024 conference held in Chicago, USA.

For her Final Year Project, she developed a multi-lane vehicle speed measurement and license plate recognition module to enhance automated speed enforcement in Sri Lanka. The system operates in real time with edge processing and is tailored to handle the complex and dynamic road environments in the country. The project has even gained the interest of the Sri Lanka Police.

Her technical enthusiasm stretches across multiple domains, including Hardware Acceleration, Computer Architecture, Embedded Systems, and Embedded Machine Learning. She is currently employed as a Firmware Engineer at Sagence AI, a United States-based company developing an AI inference accelerator, and as an Associate Electronics Engineer at Paraqum Technologies. Also, she is currently engaged with Skill Surf, a non-profit organization providing short courses in collaboration with the University of Moratuwa, channeling her expertise toward work that serves the community.

In the key takeaway shared with us, Anuki encouraged juniors to explore technical areas through competitions and projects alongside academics from the first year to discover their passions and develop skills. She also highlighted the value of extracurriculars in developing soft skills and expressed her gratitude to lecturers, peers, and the department for opportunities to make an impact locally and internationally.

To conclude, the Department of Electronic and Telecommunication Engineering extends its warmest wishes to Ms. Anuki Chamathka Pasqual for her continued journey of excellence.

Mr. Tharusha Sihan Fonseka

by Wageesha Lenmini

Amid the pulse of innovation that drives the Department of Electronic and Telecommunication Engineering at the University of Moratuwa, Mr. Kalutharawedage Tharusha Sihan Fonseka from the 20th batch stands as one of the trailblazers whose dedication and intellectual prowess have established a new standard for excellence. Specializing in Bio Medical Engineering, he exemplifies true academic distinction.

From the revered halls of Ananda College, Colombo, a young mind emerged whose extraordinary talents shone with early promise. Evidently, he attained the best result in the country in the G.C.E. Advanced Level Examination, earning an impressive z-score of 3.1996. In recognition of this remarkable feat, he was awarded the S. A. Wijethilaka Memorial Challenge Cup for the Best Student of Ananda College based on the academic performances for the year 2019. Excelling across all subjects, he topped Combined Mathematics, Physics, and Chemistry, seizing all three “Ananda Pradeepa” awards. Yet his curiosity extended beyond the classroom. He earned silver medals in both the National Physics Olympiad and the National Astronomy and Astrophysics Olympiad. Beyond individual achievements, he demonstrated inspiring leadership. As the lead of the quiz team and chief organizer of the Anandian Astronomical Association, he inspired his peers to delve deeper into the mysteries of science.

Building on the foundation of his early remarkable achievements, he entered the University of Moratuwa with a clear vision, choosing to pursue his passion for Biomedical Engineering, a field that seamlessly blends technology with human well-being. His university journey has been marked by consistent excellence, reflected in a CGPA of 3.94/4.0 and recognition on the Dean’s List in every semester. Additionally, he was honoured with the prestigious Dialog Merit Scholarship for his outstanding performance. Beyond the academics, his innovative spirit shines through competitive arenas. He claimed 1st place in the IEEE Electronic Design Competition and reached the finals of SLIIT Robofest. Demonstrating both creativity and practical impact, his team put forward a proposal for a soil-monitoring device supported by an app featuring a fertilizer guide, market predictions, learning materials, and news updates, earning them 1st Runners-Up in the SPARK Challenge.

Alongside his stellar academic achievements, he has actively embraced a variety of leadership and organizational roles. He served as a student representative for semesters 2 and 3, leading his peers with dedication. Beyond this, his volunteer work spanned numerous events, notably leading the Brainstorm 23 organizing committee and co-chairing the TourEye event under Rotaract, demonstrating an impressive balance of leadership and community engagement.

Leveraging his achievements, he undertook an internship as a research affiliate at the University of Sydney under the guidance of Assistant Prof. Anusha Withana. Immersed in the field of Human-Computer Interactions, he explored the design of wearable epidermal stretch sensors, optimized radar system configurations, and applied machine learning to enhance mmWave radar range resolution.

Continuing the research interests he cultivated during his internship, he spearheaded their final year project, which was well-received and recognized as a highlight of the FYP showcasing day, an articulated humanoid robot head capable of natural interactions, designed to serve as a robot receptionist. As the first expressive humanoid robot head in Sri Lanka is tailored for this purpose, it features 21 degrees of freedom, enabling it to mimic emotional expressions, maintain eye contact, synchronize jaw movements with speech, and recognize users through facial features while communicating verbally. Contributing as the team lead, he was responsible for mechanical and electronics design and control system implementation. These experiences naturally shaped his research focus toward the intersection of robotics and medicine, particularly the application of robotics, control systems, and electronics in healthcare.

Currently, he continues to translate his academic brilliance and research experience into both industry and education. As a Consultant Electronic AI Engineer at Pekoe Pte. Ltd, a startup applying AI solutions to the tea industry, he develops sophisticated instruments and models to assess the properties of tea leaves, blending electronics, sensors, and machine learning to deliver practical innovations. Simultaneously, he nurtures future engineers as a visiting instructor at the University of Moratuwa, teaching Robotics and Autonomous Systems and sharing the knowledge and insights he has gained from his groundbreaking projects and research. Looking ahead, he is preparing to commence his PhD at the National University of Singapore in January 2026, pursuing advanced research in probabilistically intelligent control systems.

From his own wealth of experience, Mr Tharusha wishes to share the guidance with undergraduates to take ownership of their learning, approach assignments with diligence, and let tools like GenAI assist, not replace, their effort. Moreover, he encourages seizing every opportunity to engage in projects, competitions, and exploration, while savouring the richness of university life. At last, what he wanted to convey was to follow your passion but remain open to exploring new paths because success is rarely a straight line, and some of the most rewarding experiences come from venturing into the unexpected.

In closing, we, as the Department of Electronic and Telecommunication Engineering, proudly extend our best wishes to Mr Tharusha Sihan Fonseka for his continued achievements and future endeavours.

ENTC

Electronic and Telecommunication Engineering

Acknowledgment

“Success is not how high you have climbed, but how you make a positive difference.”

-ROY T. BENNETT-

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