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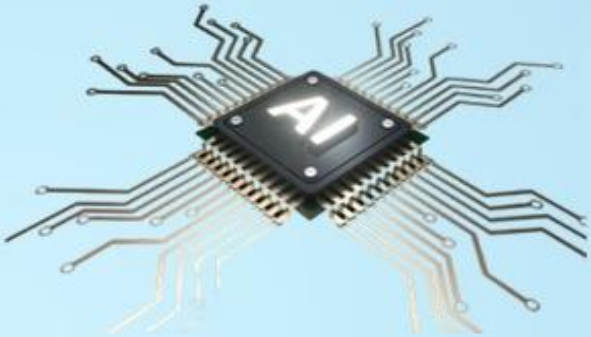

DEPARTMENT OF COMPUTER TECHNOLOGY AND INFORMATION TECHNOLOGY

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GOOGLE PIXEL TABLET WITH TENSOR G2 CHIP, MAGNETIC CHARGING SPEAKER: PRICE AND SPECIFICATIONS

Google Pixel Tablet was unveiled at the Google I/O event alongside the Google Pixel Fold and the Pixel 7a. The company has touted it as the "only tablet engineered by Google." The tablet ships with a multi-purpose magnetic charging speaker dock which serves as a charging platform for the tablet and simultaneously acts as an additional speaker which is claimed to offer four times more bass than the tablet. The Google Pixel Tablet is available for pre-order now and will go on sale in select.

Google Pixel Tablet price, availability

Google Pixel Tablet starts at $499 (roughly Rs. 40,900) with the magnetic charging speaker dock in the box, alongside the tablet. It is available in two storage configurations - 8GB + 128GB and 8GB + 256GB. The latter is priced at $599 (roughly Rs. 49,100). The tablet is available for pre ordering in the US, Canada, the UK, Germany, France, Sweden, Denmark, Norway, the Netherlands, Japan, and Australia via the Google Store and other select retailers in these countries. It will be offered in Hazel, Porcelain and Rose colour options.

Google Pixel Tablet specifications and features

Sporting a 10.95-inch WQXGA (2,560 x 1,600 pixels) screen, the Google Pixel Tablet's display has an aspect ratio of 16:10, a peak brightness level of 500nits and a pixel density of 276ppi. The screen is also compatible with a USI 2.0 touch pen.

Powered by an in-house octa-core Google Tensor G2 SoC and a Titan M2 security chip, the Pixel Tablet comes equipped with 8GB of LPDDR5 RAM, and up to 256GB of UFS 3.1 inbuilt storage. The tablet boots Android 13 out-of-the-box.

Both the rear and front cameras of the Pixel Tablet sport an 8-megapixel sensor each, with an LED flash unit on the back panel. The tablet comes with quad speakers and Google Assistant support. The company packs an additional magnetic dock with pogo pin connector support alongside the tablet which acts as an additional 43.5mm full-range speaker and a charging device.

Backed by a 27Wh battery, Google claims that the tablet offers up to 12 hours of video playback. Using the magnetic dock and a USB Type-C charging cord (sold separately), the Pixel Tablet supports 15W charging. For security, the Pixel Tablet is equipped with a fingerprint sensor. It supports Wi-Fi 6 and Bluetooth 5.2 connectivity, a 4-pin accessory connector and a USB Type-C charging port. Weighing 493 grams, the tablet measures 258mm x 169mm x 8.1mm in size.

B.THARNIKA

III B.Sc. (Information Technology)

QUILLBOT: AI GRAMMAR AND WRITING TOOL

Improve Your Writing with QuillBot's Grammar Checker, Paraphrasing Tool & Summarizer. The Chrome extension for QuillBot's AI writing platform helps you write faster, smarter and better. Save time and instantly improve your writing with our cutting-edge grammar checker, paraphrasing tool, and summarizer. Join 30+ million people worldwide who have used QuillBot's AI writing platform to enhance their writing and streamline their workflow.

★ Grammar Checker

- Checks your writing for grammar and punctuation errors
- Includes a powerful spell checker to help you double-check your spelling and avoid misusing words
- Gives your written work a final polish even when you don't feel like doing it

★ Paraphrasing Tool

- Helps to overcome writer's block and other common writing challenges
- Offers different ways of writing your text
- Helps non-native English writers articulate their ideas faster and more fluently
- Provides statistics about the tone and style of your writing

★ Summarizer

- Condenses everything from news articles to emails to academic papers into digestible key points
- Allows English language learners to compare their manual recap to an AI-generated summary to test reading comprehension and summarizing skills
- Analyzes any piece of writing to see what the AI thinks the main points are
- Helps with reading comprehension for dense or tricky texts

M. HARINI

I B.Sc. (Computer Technology)

MONGODB: THE DEVELOPER DATA PLATFORM

MongoDB is a source-available cross-platform document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas. MongoDB is developed by MongoDB Inc. and licensed under the Server Side Public License (SSPL) which is deemed non-free by several distributions.

10gen software company began developing MongoDB in 2007 as a component of a planned platform as a service product. In 2009, the company shifted to an open-source development model with the company offering commercial support and other services. In 2013, 10gen changed its name to MongoDB Inc. On October 20, 2017, MongoDB became a publicly traded company, listed on NASDAQ as MDB with an IPO price of $24 per share. MongoDB is a global company with US headquarters in New York City, USA and International headquarters in Dublin, Ireland. On October 30, 2019, MongoDB teamed up with Alibaba Cloud who will offer its customers a MongoDB-as-a-service solution. Customers can use the managed offering from BABA's global data centers.

Features

Ad-hoc queries

MongoDB supports field, range query, and regular-expression searches. Queries can return specific fields of documents and also include user-defined JavaScript functions. Queries can also be configured to return a random sample of results of a given size.

Indexing

Fields in a MongoDB document can be indexed with primary and secondary indices or index.

Replication

MongoDB provides high availability with replica sets. A replica set consists of two or more copies of the data. Each replica-set member may act in the role of primary or secondary replica at any time. All writes and reads are done on the primary replica by default. Secondary replicas maintain a copy of the data of the primary using built-in replication. When a primary replica fails, the replica set automatically conducts an election process to determine which secondary should become the primary. Secondaries can optionally serve read operations but that data is only eventually consistent by default.

If the replicated MongoDB deployment only has a single secondary member, a separate daemon called an arbiter must be

added to the set. It has a single responsibility which is to resolve the election of the new primary. As a consequence, an idealized distributed MongoDB deployment requires at least three separate servers, even in the case of just one primary and one secondary.

Load balancing

MongoDB scales horizontally using sharding. The user chooses a shard key, which determines how the data in a collection will be distributed. The data is split into ranges (based on the shard key) and distributed across multiple shards. (A shard is a master with one or more replicas.) Alternatively, the shard key can be hashed to map to a shard – enabling an even data distribution. MongoDB can run over multiple servers, balancing the load or duplicating data to keep the system up and running in case of hardware failure.

File storage

MongoDB can be used as a file system, called GridFS with load balancing and data replication features over multiple machines for storing files. This function, called grid file system is included with MongoDB drivers. MongoDB exposes functions for file manipulation and content to developers. GridFS can be accessed using mongofiles utility or plugins for Nginx and lighttpd. GridFS divides a file into parts, or chunks, and stores each of those chunks as a separate document.

Aggregation

MongoDB provides three ways to perform aggregation: the aggregation pipeline, the map-reduce function and single-purpose aggregation methods. Map-reduce can be used for batch processing of data and aggregation operations. But according to MongoDB's documentation, the Aggregation Pipeline provides better performance for most aggregation operations. The aggregation framework enables users to obtain the kind of results for which the SQL GROUP BY clause is used. Aggregation operators can be strung together to form a pipeline – analogous to Unix pipes. The aggregation framework includes the $lookup operator which can join documents from multiple collections as well as statistical operators such as standard deviation.

Server-side JavaScript execution

JavaScript can be used in queries, aggregation functions (such as MapReduce), and sent directly to the database to be executed.

Capped collections

MongoDB supports fixed-size collections called capped collections. This type of collection maintains insertion order and once the specified size has been reached, behaves like a circular queue.

Transactions

MongoDB claims to support multi-document ACID transactions since the 4.0 release in June 2018. This claim was found not

to be true as MongoDB violates snapshot isolation.

Editions

MongoDB Community Server

The MongoDB Community Edition is free and available for Windows, Linux and macOS.

MongoDB Enterprise Server

MongoDB Enterprise Server is the commercial edition of MongoDB and is available as part of the MongoDB Enterprise Advanced subscription.

MongoDB Atlas

MongoDB is also available as an on-demand fully managed service. MongoDB Atlas runs on AWS, Microsoft Azure and Google Cloud Platform. On March 10, 2022, MongoDB warned its users in Russia and Belarus that their data stored on the MongoDB Atlas platform will be destroyed due to U.S. sanctions over the war in Ukraine.

D.UDHYAKUMAR

III B.Sc. (Computer Technology)

PaLM 2-THE AI MODEL POWERING GOOGLE BARD

Google claims that PaLM 2 is "heavily trained on multilingual text" and can function in more than 100 languages and this empowers its ability to understand, generate and translate nuanced text.

PaLM 2 also has strong reasoning abilities with a wide-ranging dataset. Additionally, PaLM 2 was pre-trained on publicly available source code datasets, making it great at popular programming languages such as Python and JavaScript and other like Prolog, Fortran and Verilog.

PaLM 2 available in four sizes from smallest to largest: Gecko, Otter, Bison and Unicorn. Gecko is so lightweight that it can work on mobile devices and is fast enough for great interactive applications on-device, even when offline.

The company aims to use the versatility of the PaLM 2 model and help it integrate in a plethora of whole product classes and make it more helpful for people. Google has

successfully incorporated the advanced PaLM 2 LLM into 25 of its core products, including Google Bard and Google Workspace apps. In addition, Google's health research teams have developed Med-PaLM 2 which is trained with medical knowledge to provide insightful summaries and answers to complex medical queries based on a range of dense medical texts.

Acknowledging the impact of AI models, Google said, "versatile AI models reap real benefits for everyone. Yet just as we are committed to releasing the most helpful and responsible AI tools today, we're also working to create the best foundation models yet for Google."

Google is currently developing Gemini, the next generation AI model which they plan to eventually replace PaLM 2 within certain products such as Google Bard once it is deemed ready for widespread use.

P.S. MOHANKUMAR

II B.Sc. (Computer Technology)

LATEST ROBOTICS INNOVATIONS

The machines have long moved out of research labs to venture into new spheres. They are expected to continue the epic migration towards pharmacies, the automotive sector and more. Countless robots are already contributing to higher quality products and shorter turnaround times in the manufacturing sector.

These robots are proving to be effective at basic tasks and jobs. Robots are prone to fewer errors, require less downtime, and are more cost-effective. As a result, they enjoy higher retention rates. But with every machine, there has to be someone to operate it and repair it should it break down. This is where people trained in the field of mechatronics come in. Here are some of the latest robotics innovations, repaired and maintained by skilled mechatronics engineering technologists.

1. Google's worker robots

Google is planning to produce worker robots with personalities. The technology giant recently won a patent for the ambitious project. Engineers will enable the machines to download personalities from a cloud-based system. The robots have the capacity to store and display multiple personalities when interacting with humans.

2. Multi-tasking bots

Momentum Machines developed a multi-tasking bot capable of preparing a gourmet hamburger in as little as 10 seconds. If all goes well, the robot could eventually be used in fast food restaurants.

3. UR3 arm

An automated device created by Universal Robots known as UR3 can build

its own replacement parts on the fly. The cute and nimble robot can handle a variety of tasks such as gluing, painting, soldering, and grasping.

4. Saul Robot

Saul Robot is designed to help fight deadly diseases like the Ebola virus. The machine was deployed by the Air Force to eliminate the Ebola virus in rooms where quarantine procedures are conducted on aid workers. Developed by Xenex, Saul eradicates traces of Ebola using powerful pulses of highly energetic ultraviolet rays. It breaks down and weakens cell walls of the virus.

5. Asus Zenbo

Asus Zenbo is a low-cost robot capable of rolling around autonomously and it understands verbal commands. Asus developed the device to help individuals remember daily tasks such as exercise and medication schedules as well as doctor's appointments. Zenbo can also monitor the surroundings to detect any emergencies. It is capable of connecting to smart-home components like security cameras, lights and door locks.

6. Paro

Paro is a therapeutic robot with the appearance of a baby harp seal. The furry device is intended to help lower stress levels and stimulate interaction between caregivers and patients. It has proven effective when it comes motivating and assisting patients to relax. The psychological effects are drawn from the documented benefits of animal therapy. It comes with five different sensors, including posture, light, tactile, audition and temperature sensors.

7. Pepper

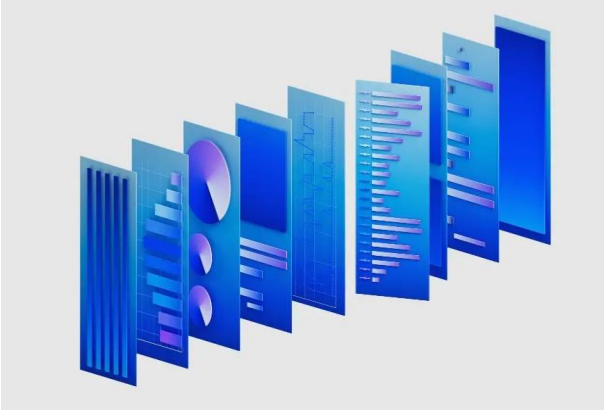
Pepper is a talking humanoid robot that adapts its attitude based on how it perceives the mood of humans around it. The device detects emotional states like sadness, surprise, joy and anger. It responds in a natural and appropriate fashion. Pepper uses multi-directional microphones to detect sounds. The clever machine analyzes the lexical field to assess tone of voice. This allows it to accurately understand emotional context. For vision, Pepper employs a combination of 2HD and 3D cameras to recognize shape of objects. Its developers embedded up to 20 engines in the head, back and arms to regulate movements.

G.AAKASH

II B.Sc. (Information Technology)

THE NEEDS OF MODERNIZED SOC FOR HYBRID CLOUD

Cybersecurity has made a lot of progress over the last ten years. Improved standards (e.g., MITRE), threat intelligence, processes and technology have significantly helped improve visibility, automate information gathering (SOAR) and many manual tasks. Additionally, new analytics (UEBA/SIEM) and endpoint (EDR) technologies can detect and often stop entire classes of threats. Now we are seeing the emergence of technologies such as attack surface management (ASM) which are starting to help organisations get more proactive and focus their efforts for maximum impact.



However, the move to cloud and the associated expansion of the attack surface is now substantially adding to the complexities of the landscape. The 2022 IBM Security X-Force Cloud Threat Landscape Report found the continued expansion of hybrid cloud environments to be a significant challenge for security teams. X-Force observed a 28% increase in new cloud vulnerabilities compared to the year prior. Further, vulnerable public-facing applications running in a cloud environment have become common targets for attackers, and it can be difficult for organizations to catalogue all applications running in the environment to ensure that all remained patched.

This in turn causes three things to happen:

More data: The need to collect more security telemetry data to provide the necessary visibility. As most of this data is being generated in cloud platforms, it is driving up costs and complexity, especially as shifting data between clouds isn't free.

More tools: The deployment and use of even more security tooling to provide protection, visibility and response into the new cloud infrastructure (e.g., CWPP, ITDR, CDR, etc.). In many cases, security teams are literally handed new security tools from DevSecOps or the CIO due to expediency.

More UX complexity and more alerts: More tools, more data, more moving parts result in more headwinds for security teams to keep ahead of the attackers. They are faced with additional integration and configuration work, as well as new UXs to become experts in, as they pivot from one to the other to chase down threats. According to the 2023 IBM Global Security Operations Center Study, surveyed SOC professionals said they only review 49% of alerts they should during a typical workday,

and nearly two-thirds of those are low priority or false positives. Further, 81% of those surveyed say they are slowed down by manual investigation their most common drag on threat response time.

All organisations are looking for ways to control costs by leveraging existing investments and leveraging capabilities that are 'included,' as well as increasing the productivity of their teams. Unfortunately, exponentially increasing data volumes, additional security tooling, and traditional tooling with complex and costly licensing models are providing significant headwinds.

DINESH S

I B.Sc. (Computer Technology)

FUNCTIONAL PROGRAMMING

Functional programming (FP) is an approach to software development that uses pure functions to create maintainable software. In other words, building programs by applying and composing functions.

Functional programming harnesses language support by using functions as variables, arguments and return values creating elegant and clean code in the process. FP also uses immutable data and avoids concepts like shared states. This is in contrast to object-oriented programming (OOP) which uses mutable data and shared states.

Functional programming languages focus on declarations and expressions rather than the execution of statements. Functions are also treated like first-class citizens meaning they can pass as arguments, return from other functions, and attach to names. FP focuses on the results, not the process, while iterations like loop statements and conditional statements (e.g., If-Else) aren't supported.

FP evolved from the lambda calculus (λ-calculus), a simple notation for functions and applications that mathematician Alonzo Church developed in the 1930s. Many programming languages and dialects use the functional paradigm, including Scheme, Common Lisp (CL), and Elixir. Many of today's top programming languages including C#, Java, JavaScript, PHP, and Python support programming in a functional style or use features found in FP.

Pure Functional Programming

Purely functional programming is a subset of FP that treats all functions as deterministic mathematical or pure functions. In deterministic mathematical functions, the development of future states of the system does not allow any randomness. Pure functions, meanwhile, have function return values that are

identical for identical arguments. The function application also has no side effects (i.e. it does not modify state variable values outside its local environment).

A side effect occurs in a program when you insert external code into your function. This prevents the function from properly performing its task. Impure functions, in contrast, contain one or more side effects. To see pure functions in action, refer to the following JavaScript code:

```
function updateMyAddress(newAddress) {
  constmyAddress=[“ChurchSt”,
“CovingtonCross”];
  myAddresses[myAddresses.length]=
newAddress;
  return myAddresses;
}
```

updateMyAddress() doesn’t need any external code to accomplish its tasks. This means it’s a pure function.

Impure Functional Programming

To see impure functions in action, check out this JavaScript code:

```
constmyAddresses=[“ChurchSt.”,
“CovingtonCross”];
function updateMyAddress(newAddress)
 {
  myAddresses.push(newAddress);
  return myAddresses;
}
```

updateMyAddess() is an impure function since it contains code (myAddress). This code mutates an external state which gives updateMyAddress() some side effects. While FP has generally been less popular than object-oriented programming, it has grown in popularity in recent years due to the rise of machine learning and big data. Functional programming is notable for its ability to efficiently parallelize pure functions. Code for data analysis workflows and tasks is easier to analyze, test and maintain using the functional programming paradigm. Due to its pure nature, FP is ideally suited for analyzing extensive data sets and machine learning. Pure functions will always generate the same results with no outside values to influence the final results.

Algorithms created using FP can also quickly identify and correct errors. Many programmers and software developers would rather work with a programming paradigm that is easy to debug because of its pure functions.

As highlighted in a paper published by John Hughes of the University of Glasgow, functional programming plays a crucial role in future tech development because of its modularity. Modularity breaks down large and complex projects into simpler modules.

Advantages of Functional Programming

Modularity: As previously mentioned, functional programming is highly modular. This makes the resulting code shorter and easier to read. Anyone who has tried to decipher monolithic code would appreciate the simplicity.

Implement lambda calculus in the program: Use this calculus to solve complex problems.

Contains many functional constructs: These include lazy map, lazy evaluation and lists.

Some programming languages support nested functions: This significantly improves the maintainability of the code.

Problems are easier to pinpoint and solve: FP's reliance on pure functions makes debugging and unit testing easier. Pure functions also prevent confusing issues and errors from developing in the code.

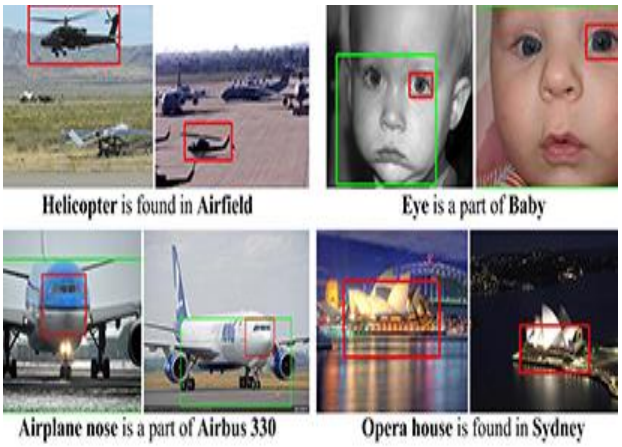
Keeps concurrency safe: Code is thread-safe when no two concurrent processes try to access the same data simultaneously. This bug is a race condition. Since pure functions never share a state with other sections of the program, race conditions can't occur.

S.JAGADESH

III B.Sc. (Information Technology)

NEVER ENDING IMAGE LEANER (NEIL)

A computer program called the Never Ending Image Learner (NEIL) is running 24 hours a day at Carnegie Mellon University, searching the Web for images, doing its best to understand them on its own and as it builds a growing visual database, gathering common sense on a massive scale.



NEIL leverages recent advances in computer vision that enable computer programs to identify and label objects in images, to characterize scenes and to recognize attributes, such as colors, lighting and materials, all with a minimum of human supervision. In turn, the data it generates will further enhance the ability of computers to understand the visual world.

But NEIL also makes associations between these things to obtain common sense information that people just seem to know without ever saying that cars often are found on roads that buildings tend to be vertical and that ducks look sort of like geese. Based on text references, it might seem that the color associated with sheep is black, but people and

NEIL nevertheless know that sheep typically are white.

"Images are the best way to learn visual properties," said Abhinav Gupta, Assistant Research Professor in Carnegie Mellon's Robotics Institute. "Images also include a lot of common sense information about the world. People learn this by themselves and, with NEIL, we hope that computers will do so as well."

A computer cluster has been running the NEIL program since late July and already has analyzed three million images, identifying 1,500 types of objects in half a million images and 1,200 types of scenes in hundreds of thousands of images. It has connected the dots to learn 2,500 associations from thousands of instances.

The public can now view NEIL's findings at the project website www.neil-kb.com.

The research team, including Xinlei Chen, a Ph.D. student in CMU's Language Technologies Institute, and Abhinav Shrivastava, a Ph.D. student in robotics, will present its findings on Dec. 4 at the IEEE International Conference on Computer Vision in Sydney, Australia.

One motivation for the NEIL project is to create the world's largest visual structured knowledge base where objects, scenes, actions, attributes and contextual relationships are labeled and catalogued.

"What we have learned in the last 5-10 years of computer vision research is that the more data you have, the better computer vision becomes," Gupta said.

Some projects, such as ImageNet and Visipedia, have tried to compile this structured data with human assistance. But the scale of the Internet is so vast Facebook alone holds more than 200 billion images that the only hope to analyze it all is to teach computers to do it largely by themselves.

Shrivastava said NEIL can sometimes make erroneous assumptions that compound mistakes, so people need to be part of the process. A Google Image search, for instance, might convince NEIL that "pink" is just the name of a singer, rather than a color. "People don't always know how or what to teach computers," he observed. "But humans are good at telling computers when they are wrong."

People also tell NEIL what categories of objects, scenes etc.., to search and analyze. But sometimes, what NEIL finds can surprise even the researchers. It can be anticipated, for instance, that a search for "apple" might return images of fruit as well as laptop computers. But Gupta and his landlubbing team had no idea that a search for F-18 would identify not only images of a fighter jet but also of F18-class catamarans.

As its search proceeds, NEIL develops subcategories of objects tricycles can be for kids, for adults and can be motorized, or cars

come in a variety of brands and models. And it begins to notice associations that zebras tend to be found in savannahs, for instance, and that stock trading floors are typically crowded.

K. DURAIMURUGAM

I B.Sc. (Computer Technology)

EXOCORTEX

An exocortex is an external information processing system that augments the brain's biological high-level cognitive processes. An individual's exocortex would be comprised of external memory modules, processors, IO devices and software systems that would interact with and augment, a person's biological brain. Typically, this interaction is described as being conducted through a direct brain-computer interface, making these extensions functionally part of the individual's mind.

The term exocortex is an allusion to the term neocortex, the neuroanatomical region that many believe is responsible for the highest human cognitive abilities including conscious thought, spatial reasoning and sensory perception. The neocortex, literally the "new cortex" is the most recent region of the cortex to develop according to evolutionary neuroscientists. Through this allusion, the term exocortex invokes a similar association with high-level human or even supra-human cognitive processing capabilities.

ARUNPRAKASH S

II B.Sc. (Information Technology)

KINECT SIGN LANGUAGE TRANSLATOR

A new research prototype from Microsoft Research Asia, the Chinese Academy of Sciences and Beijing Union University uses Kinect technology to translate sign language into spoken language and spoken language into sign language in real time. It translates from one sign language to another (such as between American sign language and Chinese sign language) and helps people who can hear communicate with people who are deaf or hard of hearing.

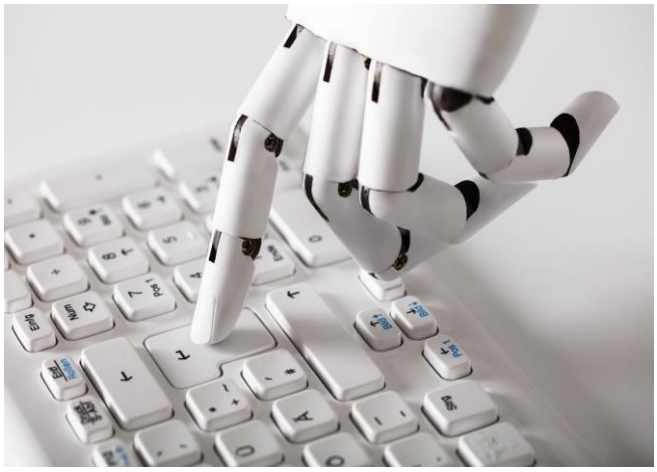
The sign language translator uses computational and sensor technology specifically Kinect’s ability to capture visual and articulation data simultaneously.

Machine learning and pattern recognition enable the tool to interpret the meaning of the different gestures captured by the Kinect device. By reducing communication barriers and facilitating social interactions, this tool has the potential to help improve the quality of life for people who are deaf or hard of hearing.

S. MIRUNALINI
III B.Sc. (Computer Technology)

ChatGPT TOOL FOR R PROGRAMMING

The generative power of OpenAI's GPT 3.5 LLM is now available to R users, with a growing collection of ChatGPT packages and apps to choose from.



Without fine-tuning or being trained on a specific topic, ChatGPT can answer questions about a wide range of technology subjects including how to write R code. That means ChatGPT's power is available to any R programmer, even one knows little about large language models. (A large language model, or LLM, is the technology underpinning AI chatbots like OpenAI'sChatGPT).

An ecosystem is forming around ChatGPT and R, making it easy to incorporate the AI technology into your R language workflow. But before you begin using ChatGPT and tools associated with it for projects in R, there are a few important things to keep in mind:

- Everything you ask with these tools gets sent to OpenAI's servers. Don't use ChatGPT tools to process sensitive information.

- ChatGPT may confidently return answers that are wrong. Even incorrect responses can be a time-saving starting point but don't assume the code will do exactly what you expect. Kyle Walker, an Associate Professor at Texas Christian University and author of the popular tidycensus R package, recently tweeted that ChatGPT can "supercharge your work if you understand a topic well," or it can leave you "exposed for not knowing what you are doing." The difference is in knowing when the AI output isn't right. Always check ChatGPT's responses.

- ChatGPT can generate different responses to the same query and some answers might be accurate while others aren't. For instance, when I asked multiple times for a ggplot2 bar chart with blue bars, the code generated a graph with blue bars sometimes but not others, even though I submitted the exact same request. This is obviously less than ideal if you need a reproducible workflow.

- If there's been a recent update to a package you're using, ChatGPT won't know about it, since its training data ends in 2021.

- Most of the resources in this article require you to have your own OpenAI API key, and the API isn't free to use. While pricing is low at the moment, there's no guarantee it will stay that way. Current pricing is 0.2 cents per 10,000 tokens for the ChatGPT 3.5 turbo model. What does a token get you? As one example, the request to create a scatter plot from a 234-row mpg data set cost 38 tokens, a fraction of a cent.

- Asking ChatGPT for coding help is unlikely to ensnare you in the ethics of AI racial and gender bias. However, there are heated discussions about the wisdom of furnishing OpenAI with yet more data; the ethics of how the training data was scraped and repurposed; and if it's better to use open source large language models (such as H2O.ai's h2oGPT) rather than OpenAI's. Those dilemmas are for every individual and organization to parse for themselves. However, as of this writing, there simply aren't R-specific LLM tools that are comparable to those building up around ChatGPT.

J.KAVYA SHREE

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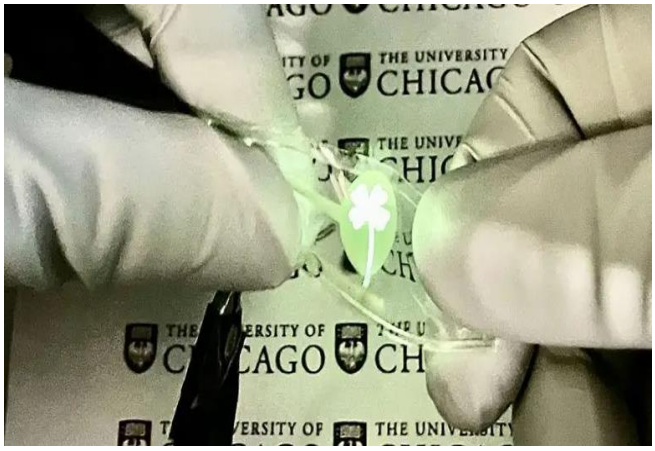
STRETCHABLE OLED DISPLAY BENDS AND EXPANDS – AN ENTIRELY NEW DISPLAY TECHNOLOGY

Researchers have developed a highly flexible and stretchable digital display material that emits a fluorescent pattern. The material, which can bend in half and stretch to more than twice its original length, has potential applications in wearable electronics, health sensors, and foldable computer screens. This new class of material was created by combining knowledge from various fields such as atomic models of new polymers and thermally activated delayed fluorescence, allowing for highly efficient light emission. The researchers are working on further developments including additional colors and improved efficiency and performance.



Imagine a thin, digital display so flexible that you can wrap it around your wrist, fold it in any direction, or curve it over your car's steering wheel. Researchers at the Pritzker School of Molecular Engineering (PME) at the University of Chicago have designed just such a material which can bend in half or stretch to more than twice its original length while still emitting a fluorescent pattern.

Flexible, light-up polymers

The displays on most high-end smart phones as well as a growing number of televisions, use OLED (organic light-emitting diode) technology, which sandwiches small organic molecules between conductors. When an electrical current is switched on, the small molecules emit a bright light. The technology is more energy-efficient than older LED and LCD displays and praised for its sharp pictures. However, the molecular building blocks of OLEDs have tight chemical bonds and stiff structures.

"The materials currently used in these state-of-the-art OLED displays are very brittle; they don't have any stretchability," said Wang. "Our goal was to create something that maintained the electroluminescence of OLED but with stretchable polymers."

Wang and De Pablo knew what it takes to imbue stretchability into materials long polymers with bendable molecular chains and also knew what molecular structures were required for an organic material to emit light very efficiently. They set out to create new polymers that integrated both properties.

A key feature in their design was the use of "thermally activated delayed fluorescence" which let the materials convert electrical energy into light, in a highly efficient way. This third-generation mechanism for organic emitters can provide materials with performance on par with commercial OLED technologies.

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RECENT PROGRESS IN ORGANIC LIGHT-EMITTING DIODES

The unprecedented growth in Organic optoelectronic materials is due to their potential applications in thin-film-transistors, light-emitting diodes, solar cells, sensors, photorefractive devices and many others. The technological promises include low cost of these materials and the possibility of their room-temperature deposition from solution on large-area and/or flexible substrates. Organic LEDs are light emitting diodes (LEDs) that use polymers or small organic molecules as their optically active element. Development of organic LEDs is driven in particular by its potential as a display technology.

Organic LEDs can be fabricated on flexible substrates unlike their rigid inorganic counterparts. OLEDs appear to be ideal for displays and lighting due to their intrinsic features such as wide-angle viewing, high contrast, fast response, low power consumption, no UV emission, large colour gamut, thinness and low weight, etc. White organic light-emitting diodes (WOLEDs) hold great promise for the fabrication of highly efficient, large-area, and flexible lighting sources. Achieving both high luminous efficiency and long operational lifetime simultaneously to meet the requirements of solid state lighting is a considerable challenge. We provide a review of recent advances on small-molecule OLEDs, Multilayer OLEDs and high performance WOLEDs covering their construction, operation and applications.

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PROGRAMMING LANGUAGE DICTIONARY

A- Arithmetic language developed by Grace Hopper in 1951.

B– Bell labs is a programming language developed at Bell labs circa 1969.

C- General purpose computer programming language developed by Dennis Ritchie in 1969.

D - Object-oriented multi-paradim system programming language.

E - Object-oriented programming language for secure distributed computing, developed by Mark S Miller, Dan Bornsen, in 1997.

F- Module-oriented, compiled and numeric computer programming developed for scientific programming and scientific computation.

G-Numerical Control (NC)programming language. It is used mainly in computer-aided manufacturing for controlling automated machine tools.

H- Hack is a programming language for the Hip Hop Virtual Machine (HHVM) created by Facebook as a dialect of PHP.

I- Interactive Data Language (IDL) is a programming language used for data analysis. It is popular in particular areas of science such as astronomy, atmospheric and medical imaging.

J- Java is a general-purpose computer programming language that is concurrent, class-based, object-oriented, platform independent language.

K-Is a proprietary array processing language developed by Arthur Whitney and commercialized by Kx Systems.

L- Larry McAvoy with extensive help from Jeffrey Hobbs, Oscar Bonilla.

M-MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment and 4th generation programming language.

N– Net Logo is an agent-based programming language designed foe logo programming.

O-Oak is a programming language created by James Gosling in 1991 Sun Microsystems set-top box project.

P- Perl (Practical Extraction and Reporting Language) is a family of high-level, general purpose, interpreted, dynamic programming language.

Q- Proprietary array processing language developed by Arthur Whitney and commercialized by Kx systems .

R- Programming language and software environment for stastical computing and graphics.

S- Stastical programming language developed primarily by John Chambers Rick Becker and Allan Wilks of Bell laboratories.

T- Programming language is a dialect of the Scheme programming language developed in the early 1980s by Jonathan A. Rees, Kent M. Pitman and Norman I.

U- Ubercode is a high level programming language developed by Ubercode Software and in 2005 for Microsoft Windows.

V- VHDL (VHSIC Hardware Description Language) is a hardware description language used in electronic design automation to describe digital and mixed-signals systems.

W- WATFIV developed at the University of waterloo is an implementation of the FORTRAN programming language.

X- XBL (XML Binding Language) is an XML-based mark-up language used to declare the behaviour and look of XUL-widgets and XML elements.

Y- Yahoo Query Language (YQL) is an SQL like query language created by Yahoo as part of their Developer Network. YQL is designed to retrieve and manipulate data from single Web interface.

Z- Z notation is a formal specification language used for describing and modelling computing systems.

G.AAKASH

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BIG ADVANCES IN QUANTUM COMPUTING

Like the transistors in a classical computer, superconducting qubits are the building blocks of a quantum computer. While engineers have been able to shrink transistors to nanometer scales, however, superconducting qubits are still measured in millimeters. This is one reason a practical quantum computing

device couldn't be miniaturized to the size of a smartphone, for instance.

MIT researchers have now used ultrathin materials to build superconducting qubits that are at least one-hundredth the size of conventional designs and suffer from less interference between neighbouring qubits. This advance could improve the performance of quantum computers and enable the development of smaller quantum devices.

The researchers have demonstrated that hexagonal boron nitride, a material consisting of only a few monolayers of atoms which can be stacked to form the insulator in the capacitors on a superconducting qubit. This defect-free material enables capacitors that are much smaller than those typically used in a qubit, which shrinks its footprint without significantly sacrificing performance.

In addition, the researchers show that the structure of these smaller capacitors should greatly reduce cross-talk, which occurs when one qubit unintentionally affects surrounding qubits.

"Right now, we can have maybe 50 or 100 qubits in a device, but for practical use in the future, we will need thousands or millions of qubits in a device. So, it will be very important to miniaturize the size of each individual qubit and at the same time avoid the unwanted cross-talk between these hundreds of thousands of qubits. This is one of the very few materials we found that can be used in this kind of construction," says co-lead author Joel Wang, a research scientist in the Engineering Quantum Systems group of the MIT Research Laboratory for Electronics.

Wang's co-lead author is Megan Yamoah '20, a former student in the Engineering Quantum Systems group who is currently studying at Oxford University on a Rhodes Scholarship. Pablo Jarillo-Herrero, the Cecil and Ida Green Professor of Physics, is a corresponding author, and the senior author is William D. Oliver, a professor of electrical engineering and computer science and of physics, an MIT Lincoln Laboratory Fellow, director of the Center for Quantum Engineering, and associate director of the Research Laboratory of Electronics. The research is published today in Nature Materials.

Qubit quandaries

Superconducting qubits, a particular kind of quantum computing platform that uses superconducting circuits, contain inductors and capacitors. Just like in a radio or other electronic device, these capacitors store the electric field energy. A capacitor is often built like a sandwich, with metal plates on either side of an insulating, or dielectric, material.

But unlike a radio, superconducting quantum computers operate at super-cold temperatures less than 0.02 degrees above absolute zero (-273.15 degrees Celsius) and

have very high-frequency electric fields, similar to today's cellphones. Most insulating materials that work in this regime have defects. While not detrimental to most classical applications, when quantum-coherent information passes through the dielectric layer, it may get lost or absorbed in some random way.

"Most common dielectrics used for integrated circuits, such as silicon oxides or silicon nitrides, have many defects, resulting in quality factors around 500 to 1,000. This is simply too lossy for quantum computing applications," Oliver says.

To get around this, conventional qubit capacitors are more like open-faced sandwiches, with no top plate and a vacuum sitting above the bottom plate to act as the insulating layer.

"The price one pays is that the plates are much bigger because you dilute the electric field and use a much larger layer for the vacuum," Wang says. "The size of each individual qubit will be much larger than if you can contain everything in a small device. And the other problem is, when you have two qubits next to each other, and each qubit has its own electric field open to the free space, there might be some unwanted talk between them, which can make it difficult to control just one qubit. One would love to go back to the very original idea of a capacitor, which is just two electric plates with a very clean insulator sandwiched in between."

They thought hexagonal boron nitride, which is from a family known as van der Waals materials (also called 2D materials), would be a good candidate to build a capacitor. This unique material can be thinned down to one layer of atoms that is crystalline in structure and does not contain defects. Researchers can then stack those thin layers in desired configurations.

To test hexagonal boron nitride, they ran experiments to characterize how clean the material is when interacting with a high-frequency electric field at ultracold temperatures and found that very little energy is lost when it passes through the material.

"Much of the previous work characterizing hBN (hexagonal boron nitride) was performed at or near zero frequency using DC transport measurements. However, qubits operate in the gigahertz regime. It's great to see that hBN capacitors have quality factors exceeding 100,000 at these frequencies, amongst the highest Qs I have seen for lithographically defined, integrated parallel-plate capacitors," Oliver says.

Capacitor construction

They used hexagonal boron nitride to build a parallel-plate capacitor for a qubit. To fabricate the capacitor, they sandwiched

hexagonal boron nitride between very thin layers of another van der Waals material, niobium dieseline.

The intricate fabrication process involved preparing one-atom-thick layers of the materials under a microscope and then using a sticky polymer to grab each layer and stack it on top of the other. They placed the sticky polymer, with the stack of 2D materials, onto the qubit circuit, then melted the polymer and washed it away.

Then they connected the capacitor to the existing structure and cooled the qubit to 20 millikelvins (-273.13 C). "One of the biggest challenges of the fabrication process is working with niobium diselenide which will oxidize in seconds if it is exposed to the air. To avoid that, the whole assembly of this structure has to be done in what we call the glove box, which is a big box filled with argon, which is an inert gas that contains a very low level of oxygen. We have to do everything inside this box," Wang says.

The resulting qubit is about 100 times smaller than what they made with traditional techniques on the same chip. The coherence time, or lifetime, of the qubit is only a few microseconds shorter with their new design. And capacitors built with hexagonal boron nitride contain more than 90 percent of the electric field between the upper and lower plates, which suggests they will significantly suppress cross-talk among neighboring qubits, Wang says. This work is complementary to recent research by a team at Columbia University and Raytheon.

In the future, the researchers want to use this method to build many qubits on a chip to verify that their technique reduces cross-talk. They also want to improve the performance of the qubit by fine tuning the fabrication process, or even building the entire qubit out of 2D materials.

"Now we have cleared a path to show that you can safely use as much hexagonal boron nitride as you want without worrying too much about defects. This opens up a lot of opportunity where you can make all kinds of different hetero structures and combine it with a microwave circuit, and there is a lot more room that you can explore. In a way, we are giving people the green light you can use this material in any way you want without worrying too much about the loss that is associated with the dielectric," Wang says.

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TECHNOLOGY ITSELF DOESN'T MAKE LEADERS. TECNNOLOGY ONLY AMPLIFIES TRUE LEADERSHIP.

-STEVE JOBS-