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V-Tech

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Department

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Issue-1

Preface

I am delighted to introduce V-Tech Issue-1, the technical magazine by the Department of Information Technology and Data Science of VSIT for the academic year 2023-24. In this issue, we bring you a diverse array of articles that showcase the cutting-edge developments and innovations in the tech industry.

Welcome to this edition, where we explore the Kotlin vs. Java debate, dissecting the nuances and use cases of these two prominent languages to guide your coding decisions. Beyond the coding dialectics, we delve into the concept of "Datafication," shedding light on the transformation of data into actionable insights. Our magazine also introduces the programmer's camaraderie code, "Bhailang," and explores the future of healthcare with "Smart Bandages."

For the tech enthusiasts, "Raspberry Breadstick" offers a unique Raspberry Pi project, while "Learning Accelerators in MS Teams" explores collaborative tools. On the analytics front, "Leveraging Google Analytics for Comprehensive Social Media Analytics" provides insights into bolstering online presence.

Navigating the networking landscape, we discuss "Enhancing Network Efficiency with Supervised Learning Algorithms." Lastly, we bring you insights into corporate strategy with "Performance-Based Salary Appraisal," aligning compensation with employee excellence.

We trust this condensed edition will captivate and inform, offering a snapshot of the ever-evolving world of technology. Dive into the articles, explore new concepts, and glean insights that resonate with the pulse of the tech industry. Happy reading!

Dr Sarika Chouhan

Chief Academic Officer

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Kotlin vs. Java: Exploring the Differences and Use Cases

Java and Kotlin are two programming languages that have gained significant popularity in the world of software development. While Java has been a stalwart in the industry for decades, Kotlin emerged more recently as a modern alternative with a focus on conciseness and interoperability. In this article, we will explore the key differences between Kotlin and Java and examine the use cases where each language shine.

Syntax and Conciseness:
One of the standout features of Kotlin is its concise syntax. Kotlin code tends to be more expressive and requires fewer lines than equivalent Java code. For example, Kotlin's type inference system allows developers to omit explicit type declarations in many cases, reducing boilerplate code. This can lead to improved readability and faster development cycles.

```
CODE:
//Kotlin
fun sum(a: Int, b: Int) = a + b
// Java
int sum(int a, int b) {
   return a + b;
}
```

Null Safety:
One of the common pitfalls in Java development is the notorious NullPointerException. Kotlin addresses this issue with built-in null safety features. In Kotlin, variables are non-nullable by default, and if you want to assign null, you must explicitly declare a variable as nullable. This reduces the chances of null pointer exceptions, a frequent source of bugs in Java code.

```
CODE:
// Kotlin
var name: String? = "John"
name = null // This is allowed
// Java
String name = "John";
name = null; // This would cause a compilation error
```

Interoperability:
Kotlin was designed with seamless interoperability with Java in mind. This means that Kotlin code can coexist with existing Java codebases, and developers can gradually migrate from Java to Kotlin. Both languages can be used together in the same project, allowing teams to leverage existing Java libraries while gradually adopting Kotlin for new features.

Extension Functions:
Kotlin introduces extension functions, a powerful feature that enables developers to add new functions to existing classes without modifying their code. This promotes a more modular and clean code structure. Java, on the other hand, lacks this feature, and developers often resort to utility classes for similar functionality.

CODE:
```
// Kotlin
fun String.addExclamation() = "$this!"
// Usage
val greeting = "Hello"
val excitedGreeting = greeting.addExclamation() // Results in "Hello!"
```

Use Cases:

When to Choose Java:

Legacy Systems: If you are working on a project with a substantial existing codebase in Java, sticking with Java might be more practical for maintaining consistency and avoiding the overhead of migrating the entire project to Kotlin.

Android Development: While Kotlin is now the preferred language for Android development, many existing Android projects are written in Java. However, modern Android development strongly encourages the use of Kotlin.

Large Enterprise Applications: For large-scale enterprise applications where stability and a mature ecosystem are paramount, Java remains a solid choice.

When to Choose Kotlin:

Concise and Readable Code: If you value concise and expressive code that enhances readability and reduces boilerplate, Kotlin is a strong contender.

Android Development: Kotlin has become the official language for Android development, offering features that make Android app development more streamlined and less error-prone.

Modern Language Features: If you want to leverage modern language features like extension functions, coroutines, and improved null safety, Kotlin provides a more modern and feature-rich programming experience.

In conclusion, both Kotlin and Java have their strengths, and the choice between them depends on factors such as project requirements, existing codebase, and developer preferences. Kotlin's emergence has brought valuable improvements to the world of Java development, offering a

modern alternative without abandoning the robustness and versatility of Java. Whether you are a Java veteran or considering a new language for your next project, understanding the differences and use cases of Kotlin and Java is crucial for making informed decisions in the ever-evolving landscape of software development.

Ketaki Ghawali
Assistant Professor

Datafication

Datafication is a current technology trend that aims to transform the most aspects of business into quantifiable data that can be tracked, monitored and analyzed. It refers to the use of tools and processes to transform an organization into a data-driven enterprise. The term "datafication" was coined by Kenneth Cukier and Victor Mayer-Schöenberger in 2013 to describe the transformation of invisible processes into data that companies can use to optimize their business.

Organizations can only keep up with the latest technological advancements if they turn to datafication. Companies across industries can use databases to improve many of their critical processes. Once these processes become measurable, optimization is achievable in no time. Datafication enables businesses to improve operations, increase productivity and increase revenue. At the micro level, it can help organizations accomplish day-to-day tasks while maximizing resources. On a macro level, it can streamline current processes and enable users to remain competitive.

How to Datafy Your Business

- **Use the right technology**

You can start your business with data by integrating into the Internet of Things (IoT). That means having the right technology in place, such as mobile devices, wearables, Bluetooth beacons and voice assistants.

- **Use an appropriate platform**

Once you have the infrastructure in place, choose the right platform that will allow you to extract data efficiently. This platform should generate the data you need for research. It should also be able to convert huge amounts of online data into structured and machinereadable information. The right platform will give you the right tools to track and analyze trends to strengthen your decision-making processes.

- **Build a centralized repository**

Working with all available data is the only way to make datafication work. That's why you need a single repository that everyone in your organization can access.

What are the current applications of datafication?

Datafication is no longer just a buzzword as it has many applications in various industries including:

- **Human Resource Management**

Companies can collect data from mobile phones, social media and apps to identify potential talent and analyze their characteristics, including their personalities and risk profiles. Instead of having candidates take personality tests, datafication can measure analytical thinking and see if candidates fit the company culture and roles they're applying for. Datafication can lead to the development of new personality measures that recruiters can use.

- **Customer relationship management**

Businesses that use customer data also benefit from using data mining tools and strategies to understand their clients. They can create appropriate triggers relevant to the buying behaviour and personas of their target audience. Datafication allows companies to collect data based on the tone and language that potential customers use in phone calls, emails and social media.

- **Commercial real estate**

Datafication can also prove useful for those in the real estate industry, especially in commercial real estate. Real estate companies can use data mining tools and strategies to gain deep insights into different locations. This way, they will know if the property they are looking at is ideal for a client looking to set up a profitable business.

- **Provision of financial services**

Perhaps of all industries, the financial services sector stands to benefit the most from dating.

Spruha More
Assistant Professor

Bhailang: A New Bro-code for Programmers

Coding involves a wide array of programming languages. A beginner might find the syntax intimidating. What about if there was a Hindi linguistic version of coding? After all these programming languages such as C, C++, and Python, here we have Bhailang, created by our own Indian engineers spawned out of inside jokes. Bhailang is a toy language written in Typescript. The term 'toy language' refers to any computer programming language that does not meet the standards for general purpose applications.

Key Terminologies

- **Entry & Exit point:** A program must begin with a hi bhai and end with a bye bhai.
- **Variables:** Variables are declared with bhai ye hai.
- **Datatype:** Numbers and strings are just like any other language. Null values are indicated with nalla. Sahi and Galat represent boolean values.
- **Output:** Any console output can be printed with bol Bhai.
- **Conditionals:** If the condition is Sahi (True), then the agar bhai (if) block will be executed, and if the condition is galat (false), then the warna bhai (else) block will be executed.
- **Loops:** 'Jab tak bhai' blocks execute statements as long as a specified condition evaluates to sahi (true). Upon reaching galat, the statement within the loop stops executing, and control passes to the statement following the loop.
- **Control Statements:** Break the loop with bas kar bhai (break) and continue within it with agla dekh (continue) bhai.
- **Errors:** It throws a syntax error with Kya kar rha hai tu statement.

Steps to try Bhailang:

- **Step 1: Environment Setup**
- Install Visual Studio code on your local machine.
  Download Link: https://code.visualstudio.com/download

- Make sure you have Node.js installed. Download it using the link below if you haven't already.
- Download Link: https://nodejs.org/en/
- Install Bhailang globally by using the command 'npm i -g bhailang'

Note: In Visual Studio code go to Extensions or press Ctrl + shift + x to open extensions. Search Bhailang – syntax highlight, autocomplete extension and install it.

- **Step 2: Create a file named gfg.bhai (or any other name) in a new project directory.**
- Bhailang files have the extension .bhai

Example (Copy the following code in gfg.bhai):

```
// Entry point
Hi bhai
// bol bhai- prints the statements in console
 Bol bhai "Welcome to V-Tech!";
 Bol bhai "Let's code in our Hindi Lingo using Bhailang";
// Declaring the Variables
  Bhai ye hai a = 5;
  Bhai ye hai b = 3;
// Sahi represents a boolean value True
  Bhai ye hai c = sahi;
  Bhai ye hai d = galat;
// loop
  Jab tak bhai (b < 8) {
      Bol bhai b;
      // if else construct
      Agar bhai (b == a){
     Bol bhai "b is equal to a";
      Bol bhai c;
}
    Warna bhai
    Bol bhai d ;
    B += 1;
}
 // exit point
Bye bhai
```

Prabal Deep Das
Assistant Professor

Remote Sensing Overview: Decoding Satellite Images

Introduction-

Remote sensing images are captured remotely from the earth's surface using special sensors typically mounted on satellite or aeroplane or aircraft. A carrier, in the form of electromagnetic radiation, is used in remote sensing to carry information about the various observations on earth's surface and towards the sensor placed in a space far away. The main source of radiation used by remote sensing sensors is solar radiation. Different materials and different surfaces absorb and reflect radiation differently at different wavelengths. The sensors detect all the forms of reflected or emitted electromagnetic radiation from the objects/scene on earth's surface and the output is represented in the form of image.

The images that are captured using remote sensing sensors are digital images. They are classified as panchromatic, multispectral, and hyperspectral images. These images need to be interpreted in order to extract information from them. Remote sensing data is used in the domains like agriculture, weather, forestry, land use and land cover, biodiversity mapping, meteorology, surface changes, resource mapping, military applications, etc.

Multispectral Images-

Multispectral image is a layered image that contains images of the same scene captured at different wavelength bands mostly between 3 to 15. Multispectral images capture additional information that human eye cannot see. These satellite images are multi-dimensional, multi-resolution, and multi-temporal observations.

The information from these wavelength ranges is stored in independent bands. Each band is viewed as a matrix structure where their pixels contain a digital number (DN) which is related with the electromagnetic energy reflected or emitted from a target. For example, Landsat 8 images have 65535 number of pixels in each of the 11 wavelength bands with 4096 intensity levels. Analysing multispectral image is challenging as every image has a huge set of information in each band and few bands located very close in electromagnetic spectrum are correlated with each other.

Hyperspectral Images-

Hyperspectral images, as the name suggest, capture the spectral data across the electromagnetic spectrum instead of just what human eye can see. Multispectral image is a layered image that contains images of the same scene captured at different wavelength bands mostly between 3 to 15 forming discrete spectrum of intensities for each pixel of the scene. While Hyperspectral

image contains few hundreds of layered images of the same scene captured at different wavelength bands, forming a continuous spectrum of intensities for every pixel in an image. This spectrum of every pixel known as 'spectral signature' is useful in identifying characteristics and properties of the material in remote sensing. These satellite images are multi-dimensional, multi-resolution, and multi-temporal observations. Basic difference in multispectral and hyperspectral images are number of bands are more and every band is narrower in hyperspectral images.
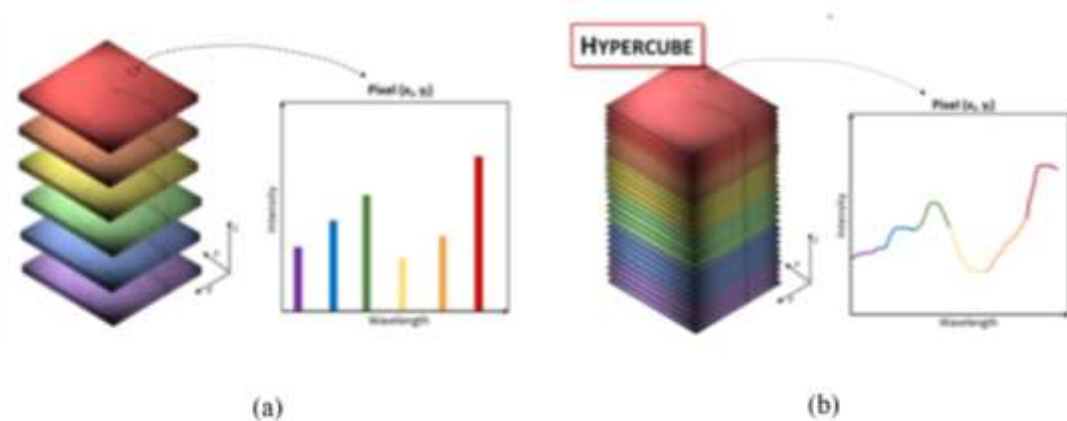

Figure 1: (a) Multispectral Imagery (MSI) (b) Hyperspectral Imagery (HSI)

Hyperspectral image is represented or visualized as Hypercube of data. The dataset of this hypercube is a three dimensional data with two spatial dimensions (X,Y) and one spectral dimension λ, i.e a hypercube D can be represented using three dimensional structure (X, Y, λ). The information from these wavelength ranges is stored in independent bands[7]. Each band is viewed as a matrix structure where their pixels contain a digital number (DN) which is related with the electromagnetic energy reflected or emitted from a target. Fig (2) shows representation of every pixel in the hypercube.

Applications of Remote Sensing-

By studying spectrum of every pixel in multispectral and hyperspectral images, it is possible to study chemical and physical properties of the materials. The data captured can be utilized for land-cover classification, natural calamity detection, anomaly mapping, study of physical and chemical properties, etc.
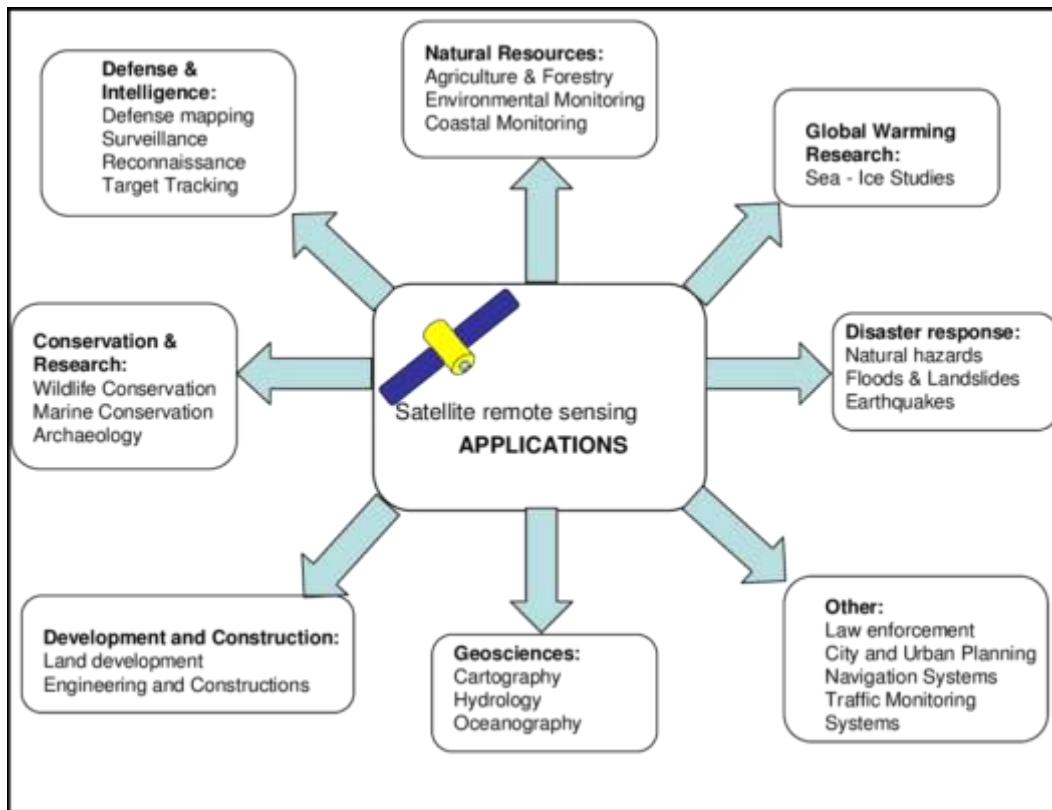
Remote sensing finds diverse applications across agriculture, weather forecasting, forestry, land use mapping, biodiversity assessment, meteorology, surface change monitoring, resource mapping, military surveillance, environmental impact assessment, infrastructure planning, and disaster management. From optimizing crop yields and tracking weather patterns to assessing environmental changes and supporting defence operations, remote sensing provides critical data for informed decision-making and sustainable resource management across various domains.

Maitreyi Joglekar
Assistant Professor

Smart Bandages: The Future of Wound Care

Introduction

Smart bandages are advanced wound care solutions that incorporate technology to monitor and facilitate the process of wound healing. These bandages go beyond traditional wound dressings by integrating sensors, electronics, and sometimes even drug delivery systems. Smart bandages aim to enhance patient outcomes by offering more personalized and efficient wound care solutions.
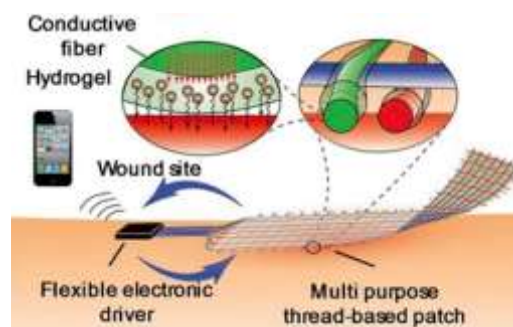
Here are some features and technologies commonly associated with smart bandages:

Wound Monitoring Sensors:
- **Temperature Sensors:** Detecting changes in temperature can provide insights into the inflammation level of a wound.
- **Pressure Sensors:** Monitoring pressure on the wound can help in understanding the healing progress and avoiding complications.
- **pH Sensors:** Measuring the acidity or alkalinity of the wound can indicate infection or other issues.

Biosensors:
- **Bacterial Sensors:** These can detect the presence of bacteria in the wound and help in early identification of infections.
- **Glucose Sensors:** Useful for diabetic patients to monitor glucose levels in the wound and adjust treatment accordingly.

Wireless Connectivity:
- **Bluetooth or Wi-Fi:** Allows data collected by the sensors to be transmitted wirelessly to a smartphone, tablet, or healthcare provider's system for real-time monitoring.

Drug Delivery Systems:
- **Micro-pumps:** Some smart bandages are designed to release medications or growth factors to promote healing or prevent infections.

- **Nanoparticles:** Drug-loaded nanoparticles embedded in the bandage material can slowly release therapeutic agents over time.

Flexible Electronics:
- **Printed Electronics:** The use of flexible and printed electronic components allows the bandage to conform to the contours of the body while maintaining its functionality.

Responsive Materials:
- **Shape Memory Polymers:** These materials can change shape in response to specific stimuli, providing dynamic support to the wound.

Smart Fabrics:
- **Conductive Fabrics:** Embedded conductive materials enable the bandage to measure various parameters while maintaining flexibility.

Power Sources:
- **Thin, Flexible Batteries:** Provide power to the electronic components without compromising the flexibility and comfort of the bandage.

Augmented Reality (AR):
- **AR Interfaces:** Some advanced smart bandages may have AR capabilities for visualization of the wound and treatment guidance.

The benefits of smart bandages include early detection of complications, personalized treatment plans, and improved patient outcomes. They are particularly useful for chronic wounds, such as diabetic ulcers, where continuous monitoring and precise treatment are essential for successful healing. However, smart bandages are still an evolving technology, and ongoing research aims to enhance their capabilities and accessibility in healthcare settings.

Amraja Shivkar
Assistant Professor

Raspberry Breadstick

The Raspberry Breadstick is a breadstick-shaped development board that is designed for ease of use. Unlike other development boards, the Breadstick is built to fit directly on your breadboard and interface with the other electronic components in your project without the need for lengthy jumper wires. It serves to deliver a prototype that is neat, straightforward, and easy to troubleshoot.


It is based on Raspberry Pi's debut microcontroller, the RP2040, which is the same MCU chip that powers the Raspberry Pi Pico and several other boards. We recently covered the Waveshare RP2040-PiZero that comes in the Pi Zero's form factor. The RP2040 is cheap and supports C/C++, MicroPython, and CircuitPython.

The Breadstick has other interesting features such as a lineup of 24 addressable RGB LEDs with fast refresh rates, a 6-axis inertial measurement unit for collecting acceleration and rotation data, as well as 16MB of external flash storage for your code and data.

Raspberry Breadstick Specifications:

- MCU – Raspberry Pi RP2040 dual-core Cortex M0+ microcontroller @ 133 MHz with 264 kB of embedded SRAM
- Storage – 16MB SPI flash
- USB – 1x USB Type-C port for data and power delivery
- Expansion – 4x 12-bit ADCs, 18x GPIO with hardware serial, I2C, and SPI support
- Misc – 24x addressable LEDs, 6-axis inertial measurement unit (3-axis accelerometer + 3-axis gyroscope)
- Power Supply – 5V @ 3A via USB Type-C port, 3A resettable fuse for overcurrent protection
- Dimensions – 10 mm x 164 mm x 5 mm (without headers)
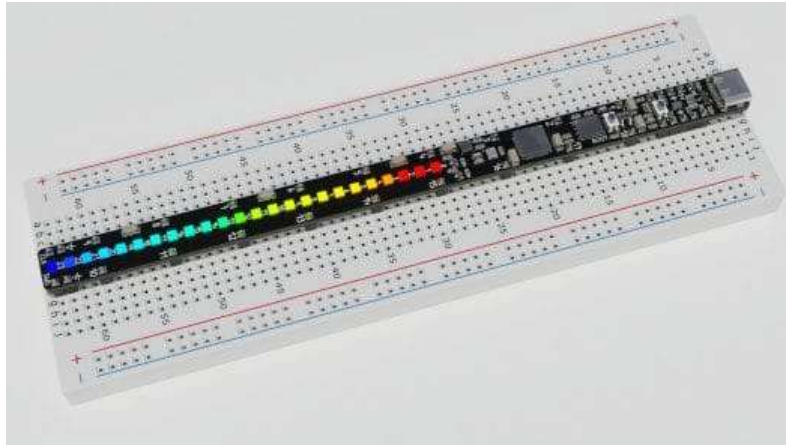
The Raspberry Breadstick looks like an essential ingredient in the recipe for a clean prototype. It is long, and slim and covers the entire length of the breadboard while leaving 4 bread-board holes clearance on both sides. Schematics, code, guides, and documentation can be found in the product's GitHub repository.

Comparisons

	Raspberry Breadstick	Raspberry Pi PICO	Arduino Uno
Processor	32-Bit Dual-Core Arm Cortex-M0+	32-Bit Dual-Core Arm Cortex-M0+	8-Bit AVR
Clock Speed	133 MHz	133 MHz	16 MHz
On-Chip SRAM	264 kB	264 kB	2 kB
Flash Memory	16 MB	2 MB	32 kB
User I/O Pins	18	26	20
3-Axis Accelerometer + 3-Axis Gyroscope	LSM6DSMTR	None	None
DotStar Compatible LEDs (Clk + Data)	24 x SK9822 Addressable RGB LEDs	None	None
ADC Channels	4	3	6
PWM Channels	16	16	6
USB Connector	USB Type-C	USB Micro-B	USB Type-B
Supports Arduino (C/C++)	Yes	Yes	Yes
Supports CircuitPython	Yes	Yes	No
Supports MicroPython	Yes	Yes	No
Clearly Labeled Pins	Yes	No	Yes
Prevents Jumper Wire Mess	Yes	No	No
Tidy Breadboard Integration	Yes	No	No

It is currently in the crowdfunding stage on CrowdSupply and still a way off from its goal of $7000. Funding ends on January 18, 2024. The Breadstick is priced at $55 with free shipping in the United States and $18 shipping to the rest of the world.

Sabir Moin Shaikh
Assistant Professor

Learning Accelerators in MS Teams: A new feature added for Assignments in MS Teams

Learning accelerators in Microsoft Teams refer to a set of features and tools designed to enhance the educational experience within the Teams platform. These accelerators are specifically tailored to facilitate remote and hybrid learning, providing educators and students with a comprehensive set of tools to streamline communication, collaboration, and content delivery. In this article, we will explore some key learning accelerators in Microsoft Teams and their impact on modern education.

One of the fundamental components of learning accelerators in Microsoft Teams is the integration of various collaboration tools. Teams allows educators to create virtual classrooms where students can engage in real-time discussions, share files, and collaborate on projects. The platform's chat, file-sharing, and video conferencing capabilities enable seamless communication, fostering a sense of connectedness among students and teachers, even in remote settings.

Another notable feature is the integration of Microsoft 365 apps and services. Educators can leverage familiar tools like Word, Excel, and PowerPoint directly within Teams, providing a unified environment for content creation and collaboration. This integration simplifies workflows for both teachers and students, as they can access and edit documents without switching between different applications.

Learning accelerators also address the need for organized and accessible content. With Teams, educators can create channels for different subjects or topics, making it easy to categorize and locate materials. The platform supports the sharing of class notes, assignments, and multimedia content, ensuring that resources are readily available to students. Additionally, the OneNote Class Notebook integration allows for the creation of digital notebooks, providing a centralized space for assignments, feedback, and collaboration.

Inclusive and interactive learning experiences are further enhanced using features like breakout rooms and polls. Breakout rooms allow educators to divide larger virtual classes into smaller groups for focused discussions or collaborative activities. Polls enable real-time feedback and engagement, allowing teachers to gauge student understanding and adapt their teaching accordingly. These features contribute to a dynamic and participatory learning environment, even in online settings.

Learning accelerators also address the importance of analytics in education. Teams provides insights into student engagement and participation, allowing educators to track attendance, view assignment completion rates, and identify areas that may require additional attention. These analytics empower teachers to make data-driven decisions and personalize their approach to better meet the needs of individual students.

In conclusion, learning accelerators in Microsoft Teams offer a comprehensive suite of features and tools that contribute to a modern and effective educational experience. From collaboration and content creation to assessment and analytics, Teams provides a unified platform that supports educators and students in navigating the challenges of remote and hybrid learning. By leveraging these accelerators, educational institutions can create engaging, inclusive, and efficient learning environments that prepare students for success in the digital age.

Madhavi Amondkar

Assistant Professor

Leveraging Google Analytics for Comprehensive Social Media Analytics: A Step-by-Step Guide

In an era dominated by digital interactions, the online presence of businesses and individuals has become synonymous with success. However, the sheer volume of data generated by websites and social media platforms can be overwhelming. To navigate this digital landscape effectively, understanding how your website performs on social media is paramount.

Social media analytics provides a window into the behaviors and preferences of your audience, offering invaluable insights that can shape your digital strategy. One of the most robust tools for this purpose is Google Analytics. Renowned for its ability to dissect user interactions and website performance, Google Analytics empowers users to make data-driven decisions. In this comprehensive guide, we will delve into the step-by-step process of leveraging Google Analytics for social media analytics. Whether you're a business owner aiming to boost brand visibility or a content creator seeking to enhance engagement, mastering this tool will elevate your understanding of how social media impacts your online presence.

Step 1: Set Up Google Analytics:
Begin by creating a Google Analytics account and adding your website as a property. Once the property is set up, obtain the tracking code and embed it into the header section of your website. This code allows Google Analytics to collect data on user interactions.

Step 2: Set Up Social Media Goals:
Define your social media objectives, whether it's increasing traffic, engagement, or conversions. In the Google Analytics Admin tab, under the View column, set up goals aligned with your social media goals. These goals will serve as benchmarks to measure the success of your social media efforts.

Step 3: Track Social Media Traffic:
Access the Social reports in Google Analytics under the Acquisition Tab. Analyse data to identify which social media channels are driving traffic to your website. Explore metrics such as sessions, page views, and conversion rates to understand the impact of each channel.

Step 4: Use UTM Parameters:
Enhance your tracking capabilities by creating UTM parameters for your social media links using Google's Campaign URL Builder. Google Analytics will then track these parameters, providing detailed insights into the effectiveness of specific social media campaigns and posts.

Step 5: Monitor Social Conversions:
Navigate to the Conversions tab in Google Analytics and review goal reports to understand how social media contributes to goal completions. Analyse conversion data to evaluate the impact of your social media efforts on key objectives.

Step 6: Set Up Social Media Events:
Identify specific events related to social media engagement on your website, such as social shares or clicks on social icons. Implement event tracking using Google Tag Manager or by adding event tracking code. Analyse event data in the Behaviour tab to gain insights into user interactions with social elements.

Step 7: Create Custom Reports and Dashboards:
Tailor your analysis by creating custom reports that focus on social media metrics relevant to your goals. Additionally, set up custom dashboards in Google Analytics to consolidate key social media analytics data in one convenient location.

Step 8: Regularly Review and Adjust:
Consistently monitor your social media analytics in Google Analytics to identify trends, successes, and areas for improvement. Use these insights to adjust your social media strategies for optimal performance.

It can be concluded that Google Analytics serves as a powerful in understanding the impact of your social media efforts on website performance. By following this step-by-step guide, you can unlock a wealth of data to make informed decisions, refine your digital strategies, and ultimately enhance your online presence. Regularly reviewing and adjusting your approach based on these insights will contribute to sustained success in the ever-evolving landscape of social media marketing.

Pushpa Susant Mahapatro
Assistant Professor

Enhancing Network Efficiency of Multipath Routing by using Supervised Learning Algorithms

Multipath routing involves the simultaneous use of multiple paths between source and destination nodes in a network. Traditional routing algorithms often rely on a single path, which can lead to suboptimal resource utilization and vulnerability to network failures. Multipath routing addresses these issues by distributing traffic across multiple paths, thereby improving load balancing, fault tolerance, and overall network performance. Multi-path transmission can well solve the data transmission reliability problems and life cycle problems caused by single-path transmission. However, the accuracy of the routing scheme generated by the existing multi-path routing algorithms is difficult to guarantee. To improve the accuracy of the multi-path routing scheme we shall look at on semi supervised algorithms.

Semi Supervised Learning in Multipath Routing:

- **Fuzzy Synthetic Evaluation Mechanism (FSEM)**

Fuzzy synthetic evaluation (FSE) uses fuzzy set theory and is a suitable technique for assessing decision-making considering various criteria. The model is proposed to control paths to balance workload. Since there may be many available paths for the same source node and destination node, FSEM is divided into two phases to guarantee efficiency. First, the Top-K paths will be selected. Second, the best path will be dynamically chosen from the Top-K paths with the aid of fuzzy synthetic evaluation method when a new flow enters the network or network status changes. The experimental results show that the proposed solution of path load-balancing is effective and can dynamically change path with the traffic information of network nodes and links.

- **Real-time evaluation algorithm based on semi-supervised learning (RESL)**

Real-time evaluation (RTE) is to provide immediate (real time) feedback to those planning and/or implementing a project or programme. Feedback is usually provided during the evaluation field work, rather than afterwards. The algorithm outperforms by having low packet loss rate, while selecting a correct path also minimizing end to end delay as compared to GPSR (Greedy Perimeter Stateless Routing), MOPR (Movement Prediction-Based Routing) and MM-GPSR (Maxduration - Minangle Greedy Perimeter Stateless Routing)

- **Context-Aware module and Optimal Path Configuration module**

Context Aware module can intelligently estimate the scalability of the path. It is the most stable path, which has the lowest possibility of interruption, can be effectively established based on the proposed routing metric. Furthermore, the proposed method can efficiently avoid physical unit influence; therefore, extra energy consumption caused by frequent retransmissions can also be efficiently avoided. The routing algorithm reduces the probability of route failure by learning and estimating the activity and channel utilization of physical units.

- **Application-Aware Multipath Flow Routing**

AMPS introduces the concept of machine learning algorithm to classify the traffic and assigns an appropriate path to each of the flow based on their QoS requirement. It works on the idea of providing constrained resources of a network, like bandwidth and low latency paths according to their priority and class. AMPS automatically classifies the input traffic and applies QoS policy to each of them. Each flow is routed through the most appropriate path to reach the destination to achieve low-latency or higher throughput. The algorithm exhibits a significant reduction of latency and improvement of throughput to deliver the service for the classified application.

Benefits of implementing semi-supervised Learning in Multipath Routing:

- **Traffic Prediction:**

Semi-supervised learning algorithms, such as regression models or neural networks, can be trained on historical network traffic data to predict future traffic patterns. These predictions help multipath routing algorithms proactively adapt to varying network loads.

- **Quality of Service (QoS) Optimization:**

By leveraging semi-supervised learning, multipath routing algorithms can predict the QoS requirements of different applications or services. This allows for intelligent routing decisions that prioritize paths based on the predicted QoS needs.

- **Adaptive Load Balancing:**

Semi-supervised learning models can continuously analyse network conditions, learning patterns of congestion and load distribution. Multipath routing algorithms can then dynamically adjust the distribution of traffic based on the insights gained from the trained models.

- **Anomaly Detection:**

Semi-supervised learning techniques contribute to anomaly detection in network behaviour. If the model identifies unusual patterns, the multipath routing algorithm can adapt by rerouting traffic to avoid potential network issues.

<div align="right">

Mithila Chavan
Assistant Professor

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Performance-Based Salary Appraisal

In the dynamic landscape of contemporary workplaces, the performance-based salary appraisal system has emerged as a pivotal tool for organizational success. It functions as a mechanism to align employee efforts with organizational goals, fostering a culture of meritocracy, motivation, and productivity. This article delves into the significance of performance-based salary appraisal, its benefits, challenges, and strategies for effective implementation.

Importance of Performance-Based Salary Appraisal: Performance-based salary appraisal refers to a method where an employee's compensation is determined by their individual performance, contributions, and achievements within a specific timeframe. This approach serves multifaceted purposes:

1. Encouraging Excellence: Linking salary increments or bonuses directly to performance motivates employees to strive for excellence. It promotes a culture of continuous improvement and innovation.

2. Goal Alignment: It aligns individual objectives with organizational goals, ensuring that employees' efforts contribute to the broader mission and vision of the company.

3. Retention and Engagement: Fair and transparent performance evaluations coupled with rewards enhance employee satisfaction, engagement, and retention rates within the organization.

4. Cost-Effectiveness: It allows organizations to allocate financial resources judiciously by rewarding high performers, thereby optimizing the return on investment in human capital.

Benefits of Performance-Based Salary Appraisal: Implementing a performance-based salary appraisal system yields several advantages:

1. Merit-Based Recognition: It recognizes and rewards employees based on their actual contributions and performance, fostering a sense of fairness and meritocracy.

2. Enhanced Productivity: The prospect of financial rewards motivates employees to enhance their productivity and efficiency, resulting in increased output.

3. Talent Development: Regular performance evaluations facilitate constructive feedback and development opportunities, fostering skill enhancement and career growth.

4. Improved Organizational Culture: A culture of performance-based rewards cultivates a competitive yet collaborative environment, where employees are encouraged to excel while supporting their peers.

Challenges and Considerations: While performance-based salary appraisal offers numerous benefits, it comes with its own set of challenges:
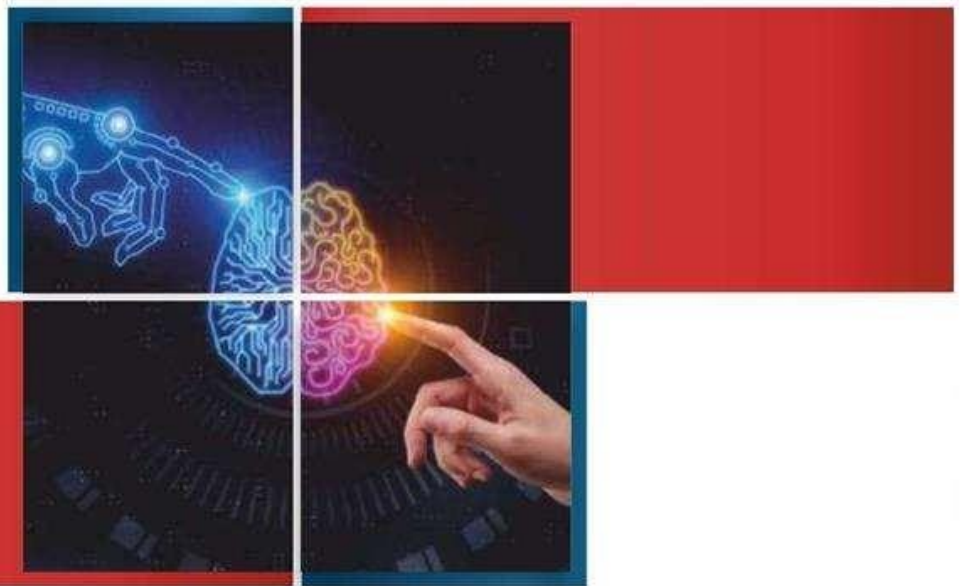
1. Subjectivity in Evaluation: Biases or subjective judgments in performance evaluations can lead to dissatisfaction and demotivation among employees.

2. Metrics and Measurement: Defining clear and measurable performance metrics that accurately reflect an employee's contributions can be challenging across diverse roles and functions.

3. Communication and Transparency: Transparent communication regarding the appraisal criteria and process is crucial to ensure fairness and avoid misunderstandings.

4. Managing Underperformance: Addressing underperformance becomes crucial; strategies for improvement and support mechanisms should be in place.

Strategies for Effective Implementation: To ensure the successful implementation of performance-based salary appraisal systems, organizations can adopt the following strategies:

1. Clear and Measurable Metrics: Define specific, measurable, achievable, relevant, and time-bound (SMART) performance metrics that align with organizational objectives.

2. Training and Development: Provide training to managers to conduct fair and unbiased evaluations and offer constructive feedback to employees.

3. Regular Feedback and Communication: Encourage ongoing feedback sessions throughout the year to keep employees informed about their performance.

4. Flexibility and Fairness: Allow flexibility in appraisal systems to accommodate diverse roles and job functions, ensuring fairness and equity.

Conclusion: A well-executed performance-based salary appraisal system can serve as a cornerstone for organizational success by aligning individual efforts with overarching goals. By promoting a culture of meritocracy, motivation, and continuous improvement, organizations can leverage this approach to enhance productivity, retain talent, and foster a high-performance work culture. However, it necessitates careful planning, transparent communication, and a commitment to fairness to reap its full benefits.

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