# DAILY ASSESSMENT

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| Date: | 8/07/2020 | Name: | GAURAV N R |
| Course: | **Matlab from mathworld** | USN: | 4AL15EC025 |
| Topic: | **Logical arrays, programming, final project, conclusion.**  **CERTIFICATE** | Semester & Section: | 8TH SEM & A Section |
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| **FORENOON SESSION DETAILS**  **MATLAB CERTIFICATE**       Report: MATLAB offers two types of logical operators and functions −   * Element-wise − these operators operate on corresponding elements of logical arrays. * Short-circuit − these operators operate on scalar, logical expressions.   Element-wise logical operators operate element-by-element on logical arrays. The symbols &, |, and ~ are the logical array operators AND, OR, and NOT.  Short-circuit logical operators allow short-circuiting on logical operations. The symbols && and || are the logical short-circuit operators AND and OR. Example Create a script file and type the following code −  a = 5;  b = 20;  if ( a && b )  disp('Line 1 - Condition is true');  end  if ( a || b )  disp('Line 2 - Condition is true');  end    % lets change the value of a and b  a = 0;  b = 10;    if ( a && b )  disp('Line 3 - Condition is true');  else  disp('Line 3 - Condition is not true');  end    if (~(a && b))    disp('Line 4 - Condition is true');  end  When you run the file, it produces following result −  Line 1 - Condition is true  Line 2 - Condition is true  Line 3 - Condition is not true  Line 4 - Condition is true Functions for Logical Operations Apart from the above-mentioned logical operators, MATLAB provides the following commands or functions used for the same purpose −   |  |  | | --- | --- | | **Sr.No.** | **Function & Description** | | 1 | **and(A, B)**  Finds logical AND of array or scalar inputs; performs a logical AND of all input arrays A, B, etc. and returns an array containing elements set to either logical 1 (true) or logical 0 (false). An element of the output array is set to 1 if all input arrays contain a nonzero element at that same array location. Otherwise, that element is set to 0. | | 2 | **not(A)**  Finds logical NOT of array or scalar input; performs a logical NOT of input array A and returns an array containing elements set to either logical 1 (true) or logical 0 (false). An element of the output array is set to 1 if the input array contains a zero value element at that same array location. Otherwise, that element is set to 0. | | 3 | **or(A, B)**  Finds logical OR of array or scalar inputs; performs a logical OR of all input arrays A, B, etc. and returns an array containing elements set to either logical 1 (true) or logical 0 (false). An element of the output array is set to 1 if any input arrays contain a nonzero element at that same array location. Otherwise, that element is set to 0. | | 4 | **xor(A, B)**  Logical exclusive-OR; performs an exclusive OR operation on the corresponding elements of arrays A and B. The resulting element C(i,j,...) is logical true (1) if A(i,j,...) or B(i,j,...), but not both, is nonzero. | | 5 | **all(A)**  Determine if all array elements of array A are nonzero or true.   * If A is a vector, all(A) returns logical 1 (true) if all the elements are nonzero and returns logical 0 (false) if one or more elements are zero. * If A is a nonempty matrix, all(A) treats the columns of A as vectors, returning a row vector of logical 1's and 0's. * If A is an empty 0-by-0 matrix, all(A) returns logical 1 (true). * If A is a multidimensional array, all(A) acts along the first non-singleton dimension and returns an array of logical values. The size of this dimension reduces to 1 while the sizes of all other dimensions remain the same. | | 6 | **all(A, dim)**  Tests along the dimension of A specified by scalar *dim*. | | 7 | **any(A)**  Determine if any array elements are nonzero; tests whether any of the elements along various dimensions of an array is a nonzero number or is logical 1 (true). The any function ignores entries that are NaN (Not a Number).   * If A is a vector, any(A) returns logical 1 (true) if any of the elements of A is a nonzero number or is logical 1 (true), and returns logical 0 (false) if all the elements are zero. * If A is a nonempty matrix, any(A) treats the columns of A as vectors, returning a row vector of logical 1's and 0's. * If A is an empty 0-by-0 matrix, any(A) returns logical 0 (false). * If A is a multidimensional array, any(A) acts along the first non-singleton dimension and returns an array of logical values. The size of this dimension reduces to 1 while the sizes of all other dimensions remain the same. | | 8 | **any(A,dim)**  Tests along the dimension of A specified by scalar *dim*. | | 9 | **false**  Logical 0 (false) | | 10 | **false(n)**  is an n-by-n matrix of logical zeros | | 11 | **false(m, n)**  is an m-by-n matrix of logical zeros. | | 12 | **false(m, n, p, ...)**  is an m-by-n-by-p-by-... array of logical zeros. | | 13 | **false(size(A))**  is an array of logical zeros that is the same size as array A. | | 14 | **false(...,'like',p)**  is an array of logical zeros of the same data type and sparsity as the logical array p. | | 15 | **ind = find(X)**  Find indices and values of nonzero elements; locates all nonzero elements of array X, and returns the linear indices of those elements in a vector. If X is a row vector, then the returned vector is a row vector; otherwise, it returns a column vector. If X contains no nonzero elements or is an empty array, then an empty array is returned. | | 16 | **ind = find(X, k)**  **ind = find(X, k, 'first')**  Returns at most the first k indices corresponding to the nonzero entries of X. k must be a positive integer, but it can be of any numeric data type. | | 17 | **ind = find(X, k, 'last')**  returns at most the last k indices corresponding to the nonzero entries of X. | | 18 | **[row,col] = find(X, ...)**  Returns the row and column indices of the nonzero entries in the matrix X. This syntax is especially useful when working with sparse matrices. If X is an N-dimensional array with N > 2, col contains linear indices for the columns. | | 19 | **[row,col,v] = find(X, ...)**  Returns a column or row vector v of the nonzero entries in X, as well as row and column indices. If X is a logical expression, then v is a logical array. Output v contains the non-zero elements of the logical array obtained by evaluating the expression X. | | 20 | **islogical(A)**  Determine if input is logical array; returns true if A is a logical array and false otherwise. It also returns true if A is an instance of a class that is derived from the logical class. | | 21 | **logical(A)**  Convert numeric values to logical; returns an array that can be used for logical indexing or logical tests. | | 22 | **true**  Logical 1 (true) | | 23 | **true(n)**  is an n-by-n matrix of logical ones. | | 24 | **true(m, n)**  is an m-by-n matrix of logical ones. | | 25 | **true(m, n, p, ...)**  is an m-by-n-by-p-by-... array of logical ones. | | 26 | **true(size(A))**  is an array of logical ones that is the same size as array A. | | 27 | **true(...,'like', p)**  is an array of logical ones of the same data type and sparsity as the logical array p. | |

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| **Date:** | **8/07/2020** | **Name:** | **GAURAV N R** |
| **Course:** | **Cisco certification:IOT** | **USN:** | **4AL15EC025** |
| **Topic:** | **Chapter 4** | **Semester & Section:** | **8TH SEM & A Section** |
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| **AFTERNOON SESSION DETAILS** |
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| **Report**- Real-Time Processing of Data for IoT Applications The [internet of things (IoT)](https://www.tiempodev.com/blog/the-industrial-internet-of-things-iiot/) is driving value across nearly every sector. Sectors span from manufacturing and logistics to retail and resource management, and the IoT is capturing data from a network of connected “things,” including drones, delivery trucks, medical devices, security cameras, and construction equipment.  While IoT sensors and devices collect tons of valuable insights, they also generate massive, high-speed data streams that are difficult to process, analyze, store, and secure. IoT data is also highly perishable, and without the right tools, organizations miss opportunities to act on time-sensitive insights with the most potential.  Here, we’ll discuss how real-time data analytics and IoT applications come together to create new opportunities across a wide range of sectors. What Does Real-Time Data Processing Mean for IoT Applications? As IoT adoption continues to rise, organizations from every sector struggle to keep up with these massive datasets expanding at exponential rates. As a point of reference, IoT devices and sensors can capture gigabytes of data within a few hours–and that’s before you consider the data coming from your CRM, social media channels, financial reports, and so on.  At the same time, big data analytics, and AI & machine learning are evolving at a break-neck pace. By applying AI to IoT data management and analytics, organizations can quickly pull valuable information from these massive, heterogeneous data sets and respond to real-time conditions. Together, these technologies are driving game-changing innovations. For example, big data’s inherent characteristics (aka the 4Vs) are perfect for “training” AI and ML applications fast.  Those intelligent applications can then be used to automate processes, predict equipment failures, detect security threats–in real-time. In the case of fully-autonomous solutions, AI takes the wheel, relying on a connected network of IoT devices to guide the way.  With [significant gains in autonomous driving](https://www.latentview.com/blog/all-you-need-to-know-about-real-time-analytics-and-iot/) at all levels, real-time analytics can support drivers with safety features like automatic braking, parking, and collision avoidance by transmitting data.  While there are endless examples of what AI, advanced analytics, and the IoT can accomplish, they can’t deliver on those promises without the right tools. Real-Time Insights Depend on Powerful Computing Most of the IoT platforms in use today were designed to connect the various devices within a network and merge and process data streams from several heterogeneous sources.  These platforms often address many of the challenges IoT presents like storage, security, and interoperability and can integrate with data analytics solutions to provide valuable business insights. But because most data analytics solutions use a cloud computing architecture called Platform as a Service (PaaS), real-time data processing isn’t possible.  According to a [recent Dell report](https://www.dellemc.com/en-me/collaterals/unauth/white-papers/products/gateways-embedded-computing/forrester-iot-driving-analytics-to-edge.pdf), using cloud-based systems to process IoT data has several limitations, including security risks, latency, and missed opportunities to act on powerful, real-time insights.  While IoT data streams themselves capture what’s happening in-the-moment, processing those data streams means sending them to the cloud for off-line analysis and processing, which can then be reviewed at a later time.  You’re also working within a system where you’re sending information to a remote location at a volume that may exceed network bandwidth and waste storage space and computing power on unusable insights.  The report found that while just 29% of participating firms have incorporated edge computing into their analytics strategies, 69% of respondents agreed that prioritizing edge for processing IoT data would help them achieve their primary business goals.  However, it’s worth noting that edge computing alone won’t unlock the door to real-time data analytics.  Technologies like 5G and WiFi6, IoT platforms like Kaa and AWS, [event-driven architectures](https://www.tiempodev.com/blog/event-driven-architecture/), and analytics tools like Kafka, Kinesis, Spark, Storm, Cassandra, and BigTable, designed for processing continuous streams are converging to enable real-time big data analytics. The Convergence of IoT and Big Data Analytics The convergence of IoT, big data, and AI-driven analytics presents a number of new opportunities for companies to create more competitive business models.  According to Forrester’s[2020 Predictions](https://go.forrester.com/wp-content/uploads/2019/10/Forrester_Predictions-2020.pdf?utm_source=forrester_web&utm_medium=web&utm_campaign=predictions&utm_content=link), enterprise strategy is becoming a critical initiative for driving digital transformation. While the report mentions that interest in big data has waned over the past few years, innovations in AI and machine learning are driving renewed interest in big data—as they present new opportunities to process data and put it to good use.  At the same time, we’re seeing more affordable hardware, software, and sensors, as well as emerging standards and best practices driving IoT adoption. As such, there’s a rapidly growing number of connected “things” capturing continuous data streams (which includes audio, video, and images) and metrics that measure machine functions, environmental conditions, and more.  Here’s a look at some of the ways leading companies are bringing these technologies together to drive value:   * **Disney.** Disney is [applying advanced analytics](https://digital.hbs.edu/platform-digit/submission/big-data-behind-disney-magic/) to big IoT data and Machine Learning techniques to create personalized in-park experiences with a wearable, RFID-enabled MagicBand that collects customer traffic patterns provides access to hotel rooms, and enables guests to charge purchases back to their room. Disney’s teams can apply these insights to several use cases, including optimized park logistics that reduce long wait times for rides by redirecting guests to less-crowded parts of the park. Additionally, Disney might also use these insights to predict a guest’s favorite character and arrange surprise meet-and-greets. * **CPS Energy.** In an interview with SAS, San Antonio-based [CPS Energ](https://www.sas.com/en_us/insights/articles/big-data/smart-cities-smart-energy-iot.html)y discussed how they leverage data analytics to address multiple use cases—from leak detection to helping customers save money. The utility’s approach is all about gathering as much data as possible from smart meters, consumer usage habits, street lights, and more. This combination of event stream data, usage, and real-time anomaly-detection, supports consumers in several ways. For one, the utility can use real-time analytics to detect leaks or outages and address those issues as they emerge.Long-term, CPS can use this massive amount of data to pull the psychological triggers that get customers to embrace energy efficiency initiatives or provide products that help consumers. * **Primex.** This example looks at how a company might look toward big data analytics solutions to solve a problem. According to a 2016 [SQLStream case study](https://sqlstream.com/wp-content/uploads/2018/03/CASE-STUDY-Primex.pdf), IoT company, Primex decided to replace its legacy architecture with a more efficient, cloud-based solution. They settled on a serverless architecture that included Amazon Web Services’ (AWS) Lambda, Kinesis Streams, and Cloud-Watch. Initially, this was a practical choice, as they couldn’t maintain an open-source platform like Apache Spark.At the time, Primex had over 150k connected devices deployed in the field, which meant they were processing over 67k AWS Lambda requests every five minutes. This system came with several challenges, as it wasn’t built to handle data on a massive scale.The report mentions one incident following a four-hour outage where it took 20+ hours for the system to process a massive backlog of sensor data. The organization also incurred high costs (around $565 a day), latency, and instability.   By moving to SQLStream (a SQL-based platform designed for real-time stream processing), Primex was able to reduce Lambda costs by shifting calculations to SQLStream Blaze; it charges clients a fixed rate as opposed to AWS, which charges by the transaction.  Additionally, the low-latency response times and the ability to ingest and process big data sets underscores the importance of selecting the right architecture to power your solution.   * **Alibaba.** Alibaba’s financial services arm, Ant Financial, uses real-time analytics and data sourced from prior online transactions (think bill-paying history) to evaluate potential borrowers. The Chinese tech giant’s real-time credit scoring system allowed small to midsize merchants to apply for microloans and access funds quickly and without collateral.   According to an [IFC report](https://www.ifc.org/wps/wcm/connect/b0b99f74-2ee9-48e6-9c78-e2e1c1bedbbd/Ant+Financial+Case+Study.pdf?MOD=AJPERES&CVID=mDGMocy), these online solutions allow more small business owners to participate in the economy. Researchers found that 70% of female entrepreneurs have trouble securing loans within the traditional banking system, making it difficult to scale up or weather economic hardship. The Role of Big Data Analytics in IoT While the Internet of Things and Big Data are two distinct concepts, they’re becoming increasingly interconnected.  In the IoT, you’ve got a massive network of sensors that collect an unprecedented amount of data from a variety of sources feeding into the broader big data landscape. Here is an example to help you get a better idea of how much data, even one of these devices could collect.  The [Oura Ring](https://ouraring.com/) is a device that is worn on a user’s finger and tracks the user’s sleep, temperature, and physical activity. The device captures data at a rate of 250 times per second.  To put this in context, if we were to pour water at a rate of a cubic foot per minute into Madison Square Garden, we would fill it in less than 7 hours. That’s a lot of data! This data can include things like customer usage insights, sentiment analysis, sales metrics, and behavioral patterns—among countless other data sources. Together, Big Data and IoT create contextual insights that can be applied to improve products, services, and processes—and in turn, generate more revenue.  Big data analytics platforms hold the key to unlocking this information by taking unstructured IoT data—about say, foot traffic at a theme park, weather patterns, or patient health—and analyzing that information alongside other data sources to provide a holistic view of the situation. From there, platforms organize that information into digestible insights that companies can use to optimize their processes.  This means that environmental data from sensors, surveillance footage, log files, and geo-location data can join forces with social media and consumer behavior insights, to create a better understanding of your audience–bringing them to life in a way that marketing metrics can’t provide on their own. How Do IoT and Big Data Impact Each Other? According to [IDC Group Vice President of IoT, 5G, & Mobility](https://futureiot.tech/idc-forecasts-connected-iot-devices-to-generate-79-4zb-of-data-in-2025/), Carrie MacGillivray, IoT is increasingly driving value creation across both the public and private sectors by enabling the exchange of information between people, processes, and the system of connected “things.”  IoT applications generate raw data from sensors and devices, which is then collected in a centralized repository known as a “data lake.” These data lakes house IoT data alongside structured data such as transaction records and customer profiles and unstructured data from sources like social media, emails, and logs.  Big Data analytics platforms can then be used to generate reports and visualizations from insights sourced from all data sets that feed into that data lake. In turn, it provides a big-picture view of how external factors like market fluctuations, trends, and environmental conditions impact what’s happening inside your business.  Additionally, AI-based analytics tools benefit from IoT data, too. By feeding high volume, high variety IoT data into AI applications, you’re effectively training those systems to understand and make predictions from real-time data without human intervention–which, over time, can improve business outcomes. Deriving Value from IoT Data IoT and Big Data analytics are no longer stand-ins representing the promising use cases of tomorrow; they’re quickly emerging as essential tools for staying competitive right now.  Big IoT data analytics gives organizations the ability to extract value from IoT sensors and systems by analyzing IoT data with existing business tools and third-party data sets to bring more contextual information into the fold. Then, the information can be applied to create better products, services, and experiences. However, organizations need to make sure that they have the infrastructure in place to support real-time data processing–at scale to get the full value from their investments.  Whether you need to hire a team of data scientists or an expert consultant to help you design and implement a data strategy around specific use cases, Tiempo can help |