

# APPLICATION OF DIGITAL DESIGN IN DATA ANALYTICS

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## ABSTRACT

The digital logic is based on binary logic and it is the mother of computer science. Basically, the transfer from analog to digital helps in easy transmission and storage of data and it is the rising sun for different hardware as well as software. The digital transformation empowers new business models as well as improves business processes by deploying available data for analytics, prediction, and decision making. An overview of data analytics using digital design is discussed here below. Now-a-days Data Analytics is one of the most upcoming trend. By applying digital design data analytics can be implemented Thus enhance better result in all fields of business, health etc.

**Key words: Electronics, digital electronics, Digital Logic Design, Data Analytics ,Quantum computing**

## I. INTRODUCTION

The DIGITAL ELECTRONICS or DIGITAL LOGIC DESIGN is the main cruxes and soul of the new technologies. Main component of it is logic gate which is the basic structure of the computer. It carries out logic operation on one or more logic inputs and engenders a single logic output. It is mainly based on 2 states which is also known as binary logic deputed by "0" which is logic low and "1" which is logic high elucidated by fixed voltages. Generally ground potential is taken as "0" and Vcc or +5v is taken to be the logic high. A benefit of digital circuits is easy transmission without degradation made by unwanted sound. In a digital system, a more representation to the core and specific of a signal can be founded by Implementing more binary digits to represent it. Storage of information can be simplified in digital Systems. Now-a-days, new systems and functions can be added through revision of software by the help of computer-controlled digital systems.[1][2]

While digital logic design and digital electronics actually implicates the conversion of analog into digital information, the term are also used combined and permuted refer to different concept affecting business, and social affairs. The digital transformation actually permits new business models that reckon on automated decision making based on machine learning artificial intelligence and data analytics.[3][4] Data analytics (DA) is the procedure of examining sets of data to make a decision about the information they have, with the assistance of specialized systems and software[1], Data analytics methodologies consists of exploratory data analysis (EDA) , also known as qualitative data analysis, which designs to find pattern matching and relationships in data, whereas confirmatory data analysis (CDA) also known as quantitative data analysis , which implies statistical techniques to determine whether conjecture about a data set are true or false.[1].

## II. DETAILED STUDY

Data Analytics is one of the upcoming trends actually, the digital renaissance is actually is nothing but "digital maturity" and strategy hinge on survey of 2014.[5].A German ministry( BMWi) funded Smart Data technology program with an aim of develop Big Data solutions as well as business models related to legal, security, economic and societal nature.

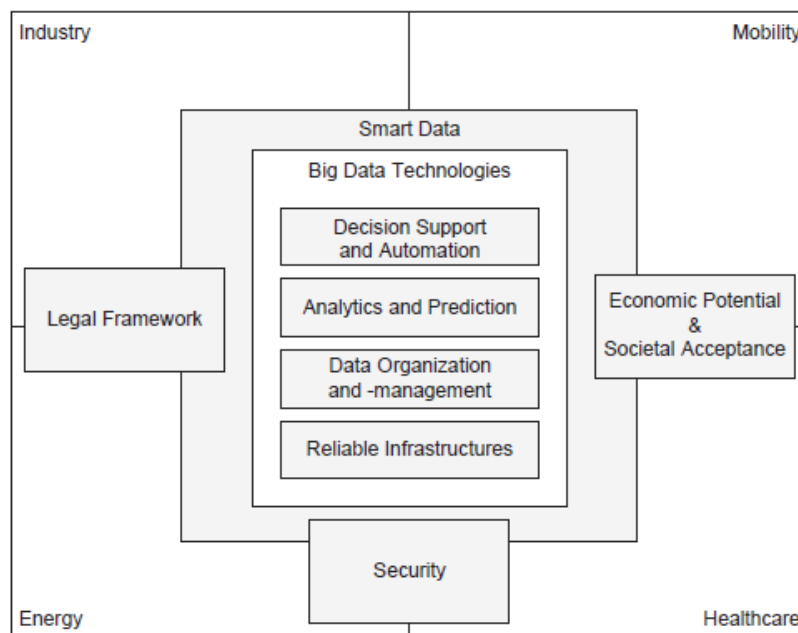


Fig: chart to understand the development of smart data program clearly [3]

There are many application fields:

#### A. IOT

The Internet of things (IoT) is the network of physical devices, vehicles, other domestic items **embedded with electronics mainly digital signal, software, sensors, actuators**, and connectivity which empower these objects to connect and exchange data having purely digital control. This required AI and data analytics as because data analytics helps to take the data and analysis [1]. IoT is acting as a main resource for the data which is going to be analyzed.

Main technology driving IOT and digital design which helps in digital transformation are:

**Sensors:** Sensor technology leads to collection of data necessary for evidence based decision making. Sensors become ubiquitous in smartphones, smart watches etc. This entitles for distributed as well as widespread sensor networks. Secondly for cheap prices smart meters have become popular leads to rising distribution [8]. It also makes production environments affordable. Collection and storing of sensed data is a part of digital logic design helps to store and collect data which later becomes data set for data analytics.[3] [4][8]

**a>Crowd sensing:** Modern smartphones comprise a numbers of sensors like ambient light, GPS, proximity, camera, microphones, accelerometer etc.[3]

**b>Smart metering:** Smart meters for industrial purposes leads to important part of future smart grids measure, storage, as well as communicate consumption data in high resolution time intervals. By using analysis we can analysis it and there by a give an average and a result of usage of it and give a better output

**c>** It is also used for maintaining and continuous monitoring of different equipment which is product based.[3] .

The other technologies are on-demand computing, blockchain, mobile computing etc

3 steps of IoT big data processing are as follows:

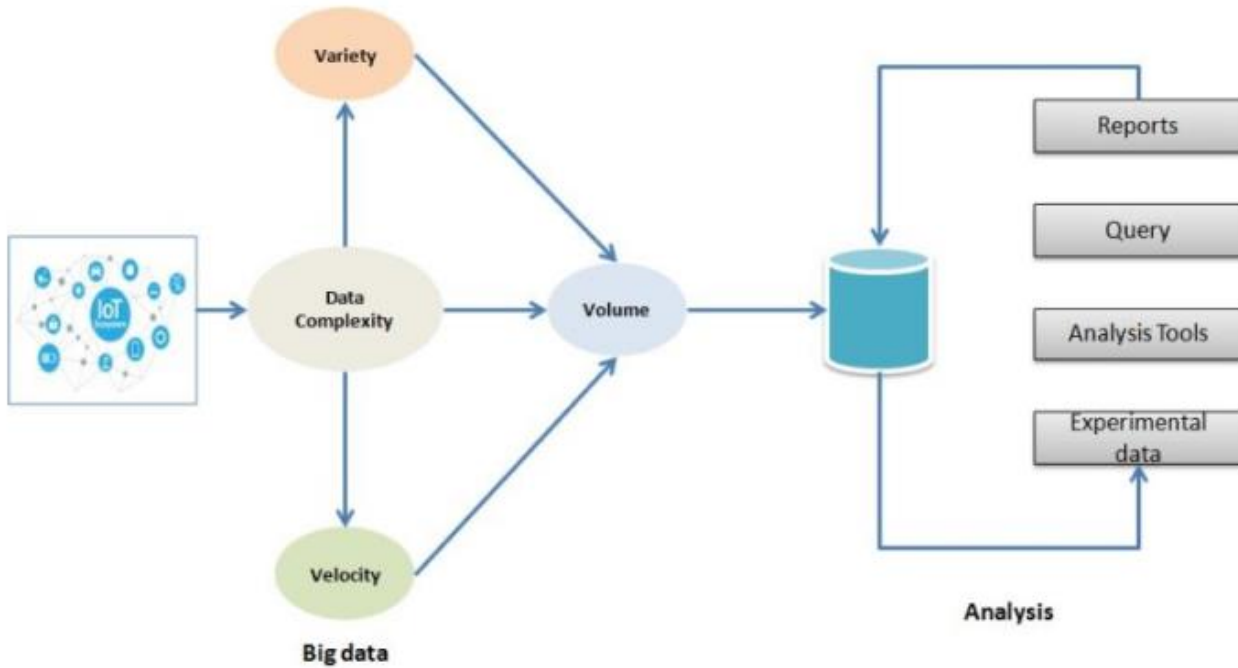
1. A massive amount of unstructured data is produced by IoT devices. This are collected in the data system.
2. In the big data system, the storage of data takes place in big data files.
3. Analyzing by the different solutions like **Hadoop, MapReduce and Spark** the reports are generated. [1]

Now-a-days it is very useful and beneficial for company as well as different fields.

It can be very useful to perform different tasks like

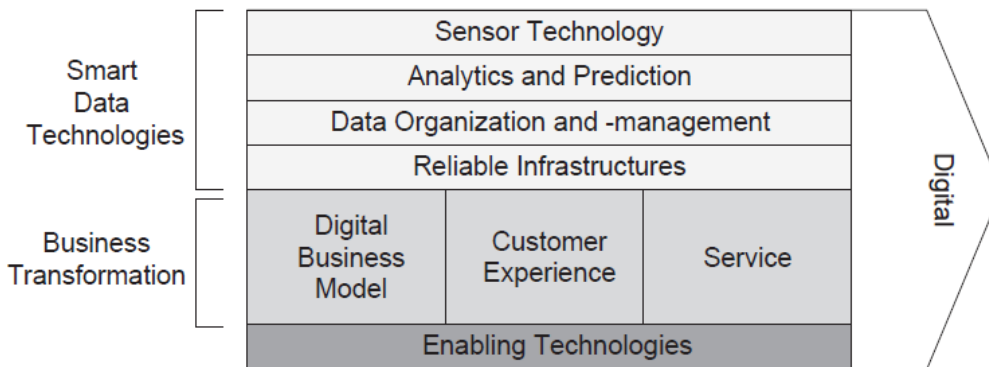
1. Examine
2. Reveal trends
3. Find unseen patterns

- 4. Find hidden correlations
- 5. Reveal new information



[1] [3]

There are different areas of application:



**a>MOBILITY:** Electric ,automated vehicles produce a massive amount of data collected from sensors as well as control systems which is designed with the help of digital logic used for driver protection and autonomous driving. Also by getting acquainted with the vehicle data like speed, location some problems like traffic management can be done. Also by utilizing data maintaince can also be done.

A big application is smart alarm. The logic design of smart car is stated below.

The circuit consists of 1 input Y that must be connected to the door of the car to determine door is open or not When the door is closed Y = 0, else Y = 1. It also consists of one output Z used to set off a relay that claxons the horn by shorting the wires which is connected to the horn switch in the steering When Z = 1, it is activated so the horn is blown. The circuit would be asynchronously reset. During ignition, the flip-flops are forced to go to the state 000 by the asynchronous reset. Also, when the ignition is off, the circuit stays in state 000 while door is closed (Y = 0) it will wait for the driver to leave the car. When the driver opens the door (Y = 1), the circuit goes to state 001. When door is not closed(Y = 1), the circuit moves to state 011. If there is a clock pulse and the clock having one pulse for every 20 seconds, there will be at least 20 second delay before the circuit goes to to state 100 and honks the horn. If the ignition is still off till 20 seconds, then it will go to state 100 checking door condition, and the horn is blown (Z = 1).[9]

Table : State Table for Car Alarm Circuit

Q2	Q1	Q0	Y=0			Y=1			Z
			q2*	q1*	q0*	q2*	q1*	q0*	
0	0	0	0	0	0	0	0	1	0
0	0	1	0	1	0	0	0	1	0
0	1	0	0	1	0	0	1	1	0
0	1	1	1	0	0	1	0	0	0
1	0	0	1	0	0	1	0	0	1
1	0	1	X	X	X	X	X	X	X
1	1	0	X	X	X	X	X	X	X
1	1	1	X	X	X	X	X	X	x

using K-maps equations are:

$$D_0 = q_1'q_0Y + q_2'q_0'Y$$

$$D_1 = q_1'q_0'Y' + q_1q_0'$$

$$D_2 = q_1q_0 + q_2$$

$$Z = q_2$$

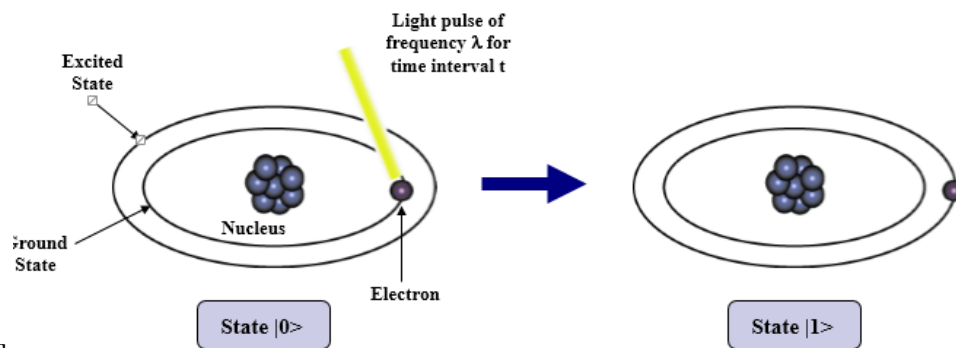
[9]

b>It also used in health-care ,industry and energy

**B> QUANTUM COMPUTING**

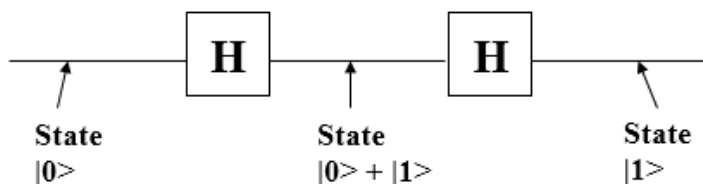
Quantum computing (Quantum Information Processing) (QIP) is a new computation technology having its roots in different interrelated fields. It is the implementation of quantum mechanics concepts in the domain of information processing. It is based on the laws of quantum mechanics, which is the behavior of particles at the sub-atomic level.

A bit of data is embodied by a single atom which is in one of two states denoted by  $|0\rangle$  and  $|1\rangle$ . A single bit of this form is known as a *qubit*

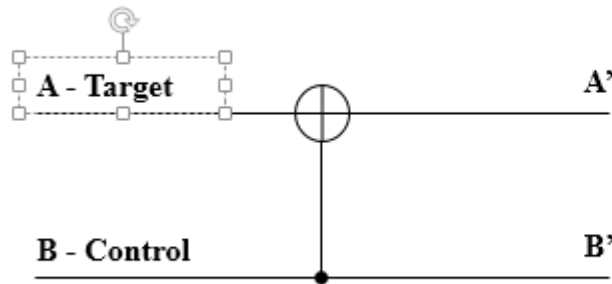


[1]

Quantum gates are the principal hardware components for making the Quantum computation tasks. The quantum NOT gate and Hadamard gate ( also called square-root of NOT gate.) are applied for serving the purpose. When a single qubit with state  $|\Psi\rangle = \alpha |0\rangle + \beta |1\rangle$  is operated by a quantum NOT gate, it produces an output like  $|\Psi\rangle = \alpha |1\rangle + \beta |0\rangle$ . Theoretically, qubit is stored in the quantum register. A quantum register  $|\chi\rangle$ , consisting of n qubits[6]



A gate which is managed on two qubits is known a Controlled-NOT (CN) Gate. The CN gate shows same behavior to the XOR gate but has capability of extra information to make it reversible



Input		Output	
A	B	A'	B'
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	1

[1]

The data Analytics deals with the data and applying different method it does the analysis part.

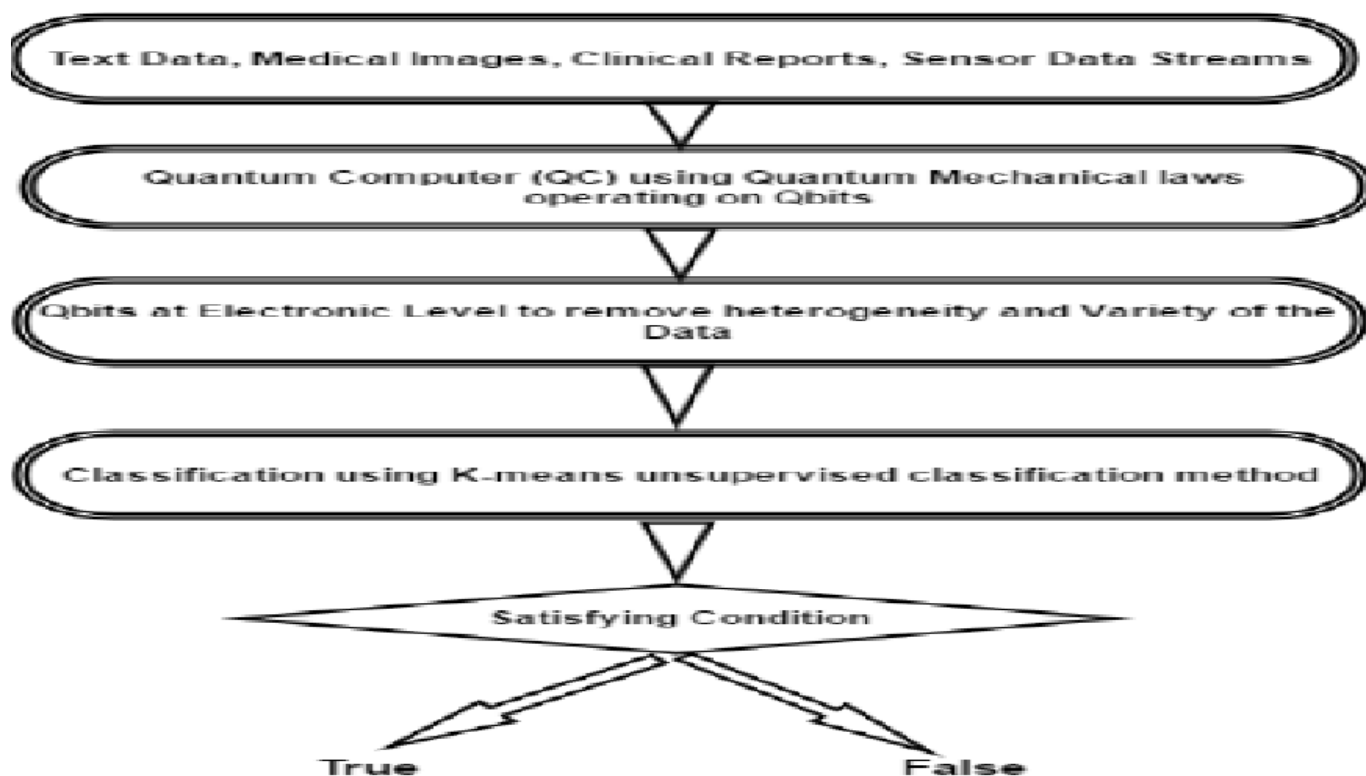
a> **BIG DATA CLASSIFICATION**

On the plane, a qubit is considered as a unit vector. vector machine is a strong method for performing classification, linear and non-linear, The machine realize two parallel hyper planes having normal vector  $\sim u$ , sunder by the max possible distance  $2/|\sim u|$  which spilts up the two classes of training data.[6]

Rebentrost et al [7], used support vector machine for executing an optimized linear and non-linear binary classifier on a quantum computer having exponential speedups in the magnitude of the vectors and the number of training examples. The non-sparse matrix simulation methodology to perfectly perform main component analysis and matrix inversion for the training of the data kernel matrix is at basic core of the algorithm[6]. Rebentrost et aldiscussed about the optimized binary classifier that can be applied on a quantum computer[7]

B> **ON HEALTH CARE**

Smart health is the application of artificial intelligent, networked technologies for constant betterment of health provision for all. Mainly radio frequency identification (RFID), wireless sensor network (WSN), and the Internet of Things and smart mobile technologies are keys to these. These technologies conducted with the moving of the health care industry to electronic patient records .The key features of big data and how medical and health informatics, sensor informatics, translational bioinformatics, and imaging informatics will get affected from an homogenized approach of integrating together different aspects of personalized information from a diverse range of data sources covering it all.[6]



[6]

In this way with the help of quantum computing data analytics can be made easy.

### III. Conclusion

In this paper explanation have been done regarding development and implementation of data analytics using digital logic design with several field of application with solid and perfect example. Data analytics is one of the most emerging and latest trend of technology. A digital and advanced business model of digital network is discussed here .Business process in different fields by different companies will be progressed by utilizing these predication analysis and decision.

#### Acknowledgement:

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