Wall Magazine – CS Dept. 2024

Time Complexity of 10 Most Popular ML Algorithms

-AMIT SHAW

SQL CHART

The Digital Symphony

In the heart of SILICON, where bits reside,
A realm of logic where bytes abide,
Tiny ants so small, yet grand,
Form the language of this land.

RAM, the keeper of dreams in flight,
Swift as lightning, out of sight,
ROM, the guardian of the past,
Holds the secrets, memories cast.

The CPU, the brain so keen,
Processing tasks, unseen, serene,
KEYBOARD click with rhythmic sound,
Letters, words, in rows abound.

In this digital realm, where all things meet,
Harmony of code, where worlds compete,
Together they dance, in binary cheer,
Creating magic, for us to hear.

Debasmita Dey, Sem-I

What are Soft Skills?

- **Soft Skills:** Personality traits and interpersonal skills.
- **Examples:**
  - Effective Communication
  - Time Management
  - Problem-Solving
  - Active Listening
- **Categories:** Hard skills (technical) vs. soft skills (non-technical).
- **Importance:** Employers prefer candidates with both soft and hard skills.

Most valued soft skills

- **Soft Skills:**
- **Acceptance of Criticism:** Receiving constructive feedback with an open mind.
- **Accountability:** Fulfilling responsibilities and accepting responsibility.
- **Active Listening:** Paying close attention to discussions.
- **Adaptability:** Being flexible and open to change.
- **Collaboration:** Effectively contributing to a team.
- **Communication:** Conveying and receiving information effectively.
- **Conflict Management:** Mediating disagreements to achieve positive outcomes.
- **Creativity:** Generating new and original ideas.
- **Critical Thinking:** Using reason and resourcefulness to problem-solving.
- **Decision-Making:** Weighing pros and cons swiftly and taking decisive action.
- **Dependability:** Being trustworthy and reliable.
- **Emotional Awareness:** Demonstrating empathy and resolving conflicts.
- **Leadership:** Leading, managing, and guiding team members.
- **Persuasion:** Influencing others' behaviour and beliefs.
- **Positive Attitude:** Approaching challenges with optimism.
- **Problem-Solving:** Overcoming obstacles to achieve goals.
- **Time Management:** Planning and allocating time effectively.

How IOT Works

Ritesh Saha, Sem-III, CS

The Internet of Things (IoT) refers to the network of physical devices that are embedded with sensors, software, and other technologies to connect and exchange data with each other over the internet. Here's a breakdown of how IoT works:

1. Devices/Sensors:

IoT devices can be everyday objects like thermostats, smart watches, refrigerators, cars, or even industrial machines. These devices are embedded with sensors that can monitor things like temperature, humidity, motion, pressure, or location. They can also interact with other devices or people.

- **Sensors:** These measure physical conditions, such as temperature, light, sound, motion, etc.
- **Actuators:** These trigger actions based on sensor data, such as turning on a fan or adjusting the thermostat.

2. Connectivity:

After data is collected by IoT devices, it must be transmitted to other devices or cloud services for analysis and processing. This communication is achieved through various network technologies, such as:

- **Wi-Fi:** For devices within range of a wireless network.
- **Bluetooth:** For short-range communication between devices.
- **Zigbee, Z-Wave:** Low-power, short-range wireless protocols used for home automation.
- **Cellular Networks (3G, LTE):** For long-range communication, especially for mobile IoT devices.
- **LoRa, Long Range:** A low-power, long-range network for IoT devices, used in agriculture, smart cities, etc.

- **Ethernet:** Wired connection in industrial or stationary setups.

3. Data Processing:

Once data is collected and transmitted, it needs to be processed. This can happen in one of two places:

- **Edge Computing:** The data is processed near the device itself (at the "edge" of the network). This is beneficial for reducing latency and conserving bandwidth, as only relevant data is sent to the cloud or other centralized systems.
- **Cloud Computing:** The data is sent to a remote cloud-based platform, where it can be stored, processed, and analyzed. Cloud platforms offer scalable storage and powerful analytics.

4. Data Analysis:

After processing, data is often analyzed to extract meaningful insights. This can involve:

- **Real-Time Analytics:** For applications where immediate action is needed (e.g., in industrial settings or vehicle tracking).
- **Predictive Analytics:** For forecasting future behavior, such as predicting equipment failure in manufacturing or energy consumption patterns.
- **Machine Learning:** IoT systems can use machine learning algorithms to continuously improve and make smarter decisions over time based on data patterns.

5. Action/Automation:

Based on the analysis, IoT systems can trigger actions or automations. For instance:

- **Smart Home:** If a smart thermostat detects that the temperature is too low, it can automatically adjust the temperature.
- **Industrial IoT (IIoT):** If machinery detects wear or damage, it can send maintenance alerts or even shut down for repairs.
- **Healthcare:** Wearable devices can monitor heart rate and alert emergency services if it detects an abnormal condition.

6. User Interaction:

Finally, users can interact with IoT systems via applications or dashboards. They can monitor and control devices remotely, review analytics, and configure settings. Examples include smartphone apps, web-based dashboards to monitor industrial machinery or energy consumption, etc.

Sir Gurudas Mahaviyalaya

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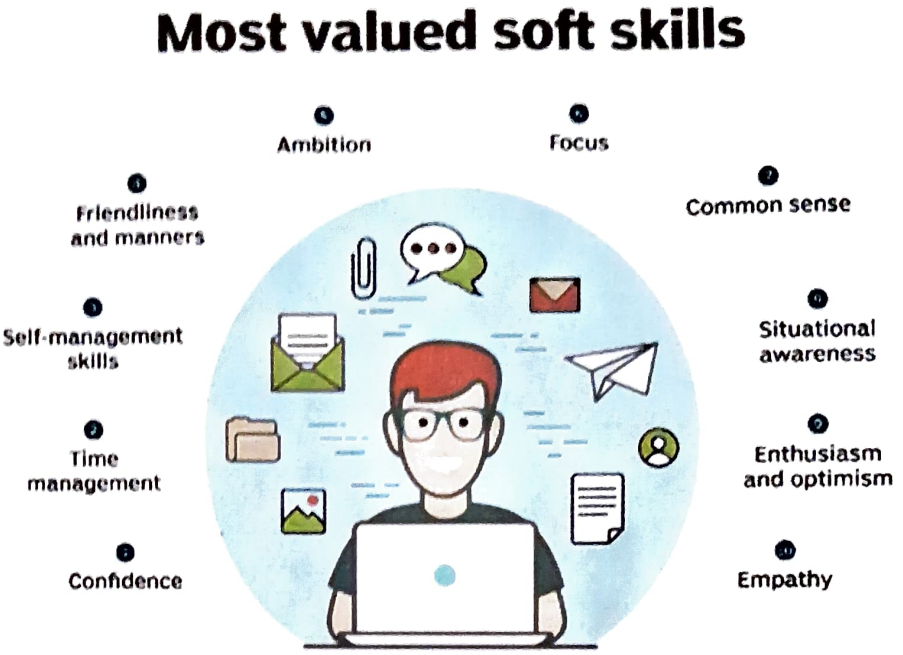

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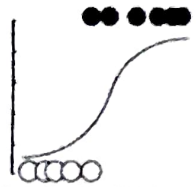
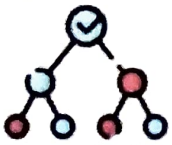
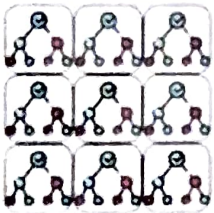
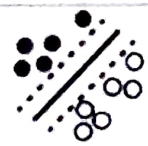
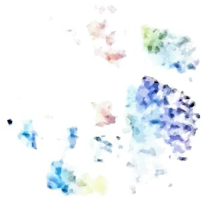
- ✓ **Problem-Solving**: Overcoming obstacles to achieve goals.
- ✓ **Time Management**: Planning and allocating time effectively.
- ✓ **Work Ethic**: Showing determination to achieve goals.

Time Complexity of 10 Most Popular ML Algorithms

	Linear Regression (OLS)	$O(nm^2 + m^3)$	$O(m)$
	Linear Regression (SGD)	$O(n_{epoch}nm)$	$O(m)$
	Logistic Regression (Binary)	$O(n_{epoch}nm)$	$O(m)$
	Logistic Regression (Multiclass OvR)	$O(n_{epoch}nmc)$	$O(mc)$
	Decision Tree	$O(n \cdot \log(n) \cdot m)$ $O(n^2 \cdot m)$	$O(d_{tree})$
	Random Forest Classifier	$O(n_{trees} \cdot n \cdot \log(n) \cdot m)$	$O(d_{tree} * d_{tree})$
	Support Vector Machines (SVMs)	$O(nm^2 + m^3)$	$O(m * n_{sv})$
	k-Nearest Neighbors	—	$O(nm)$
$P(A\|B) = \frac{P(B\|A) \cdot P(A)}{P(B)}$	Naive Bayes	$O(nm)$	$O(mc)$
	Principal Component Analysis (PCA)	$O(nm^2 + m^3)$	—
	t-SNE	$O(n^2m)$	—
	KMeans Clustering	$O(iknm)$	??

n: samples | m: dimensions | n_epochs: epochs | c: classes

d: depth | n_sv: Support vectors | k: clusters | i: iterations

~AMIT SHAW

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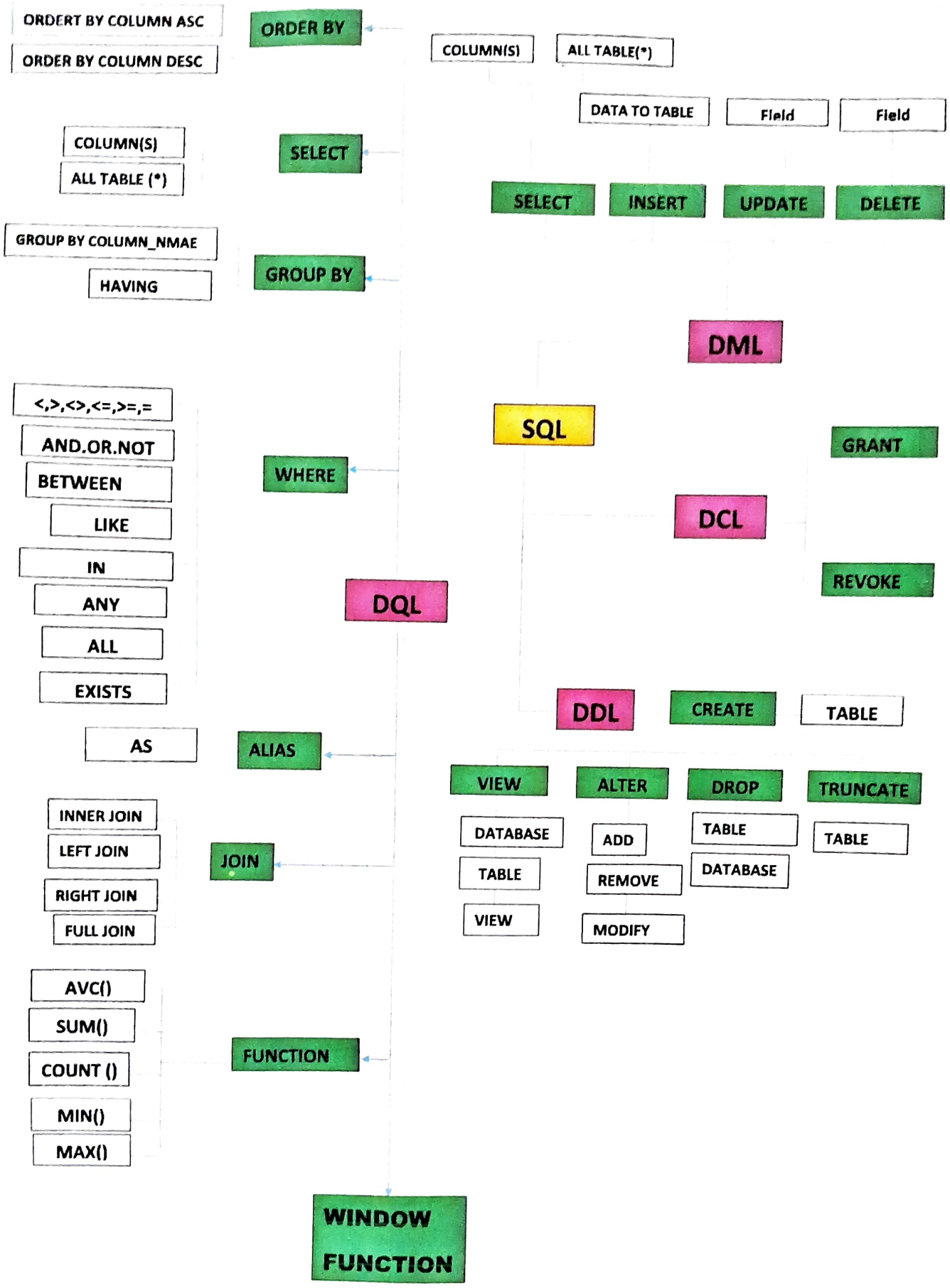
ORDERT BY COLUMN ASC
ORDER BY COLUMN DESC
ORDER BY
COLUMN(S)
ALL TABLE(*)
DATA TO TABLE
Field
Field
COLUMN(S)
ALL TABLE (*)
SELECT
SELECT
INSERT
UPDATE
DELETE
GROUP BY COLUMN_NMAE
HAVING
GROUP BY
DML
<,>,<>,<=,>=,=
AND.OR.NOT
BETWEEN
LIKE
IN
ANY
ALL
EXISTS
WHERE
SQL
GRANT
DCL
REVOKE
DQL
DDL
CREATE
TABLE
AS
ALIAS
VIEW
ALTER
DROP
TRUNCATE
INNER JOIN
LEFT JOIN
RIGHT JOIN
FULL JOIN
JOIN
DATABASE
TABLE
VIEW
ADD
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MODIFY
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AVC()
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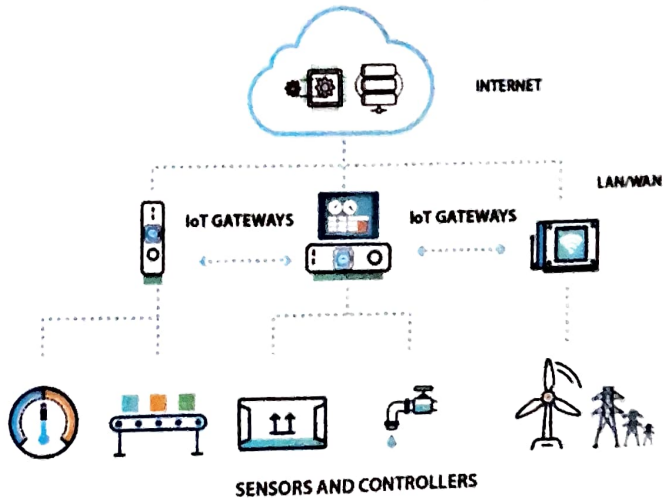

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