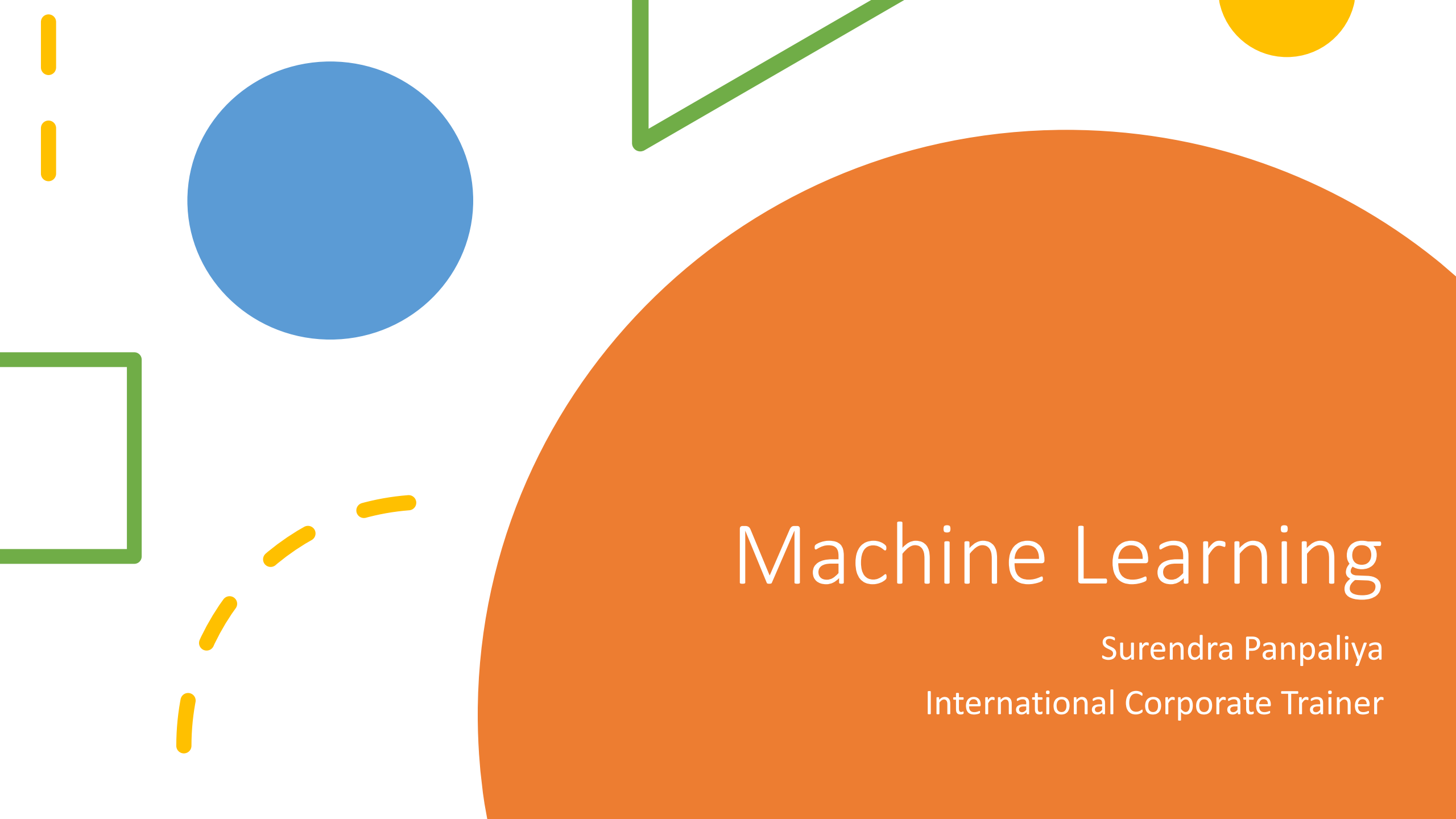


Machine Learning

Surendra Panpaliya

International Corporate Trainer

Agenda

Definition and Overview of Machine Learning

Types of Machine Learning

Applications of Machine Learning

Machine Learning Algorithms with Scikit-Learn

Agenda

Linear Regression

Logistic Regression

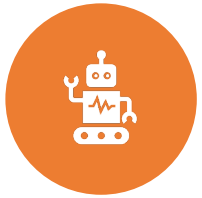
Support Vector Machines (SVM)

Decision Trees

Random Forests

Summary and Conclusion

Definition of Machine Learning



A subfield of artificial intelligence (AI)

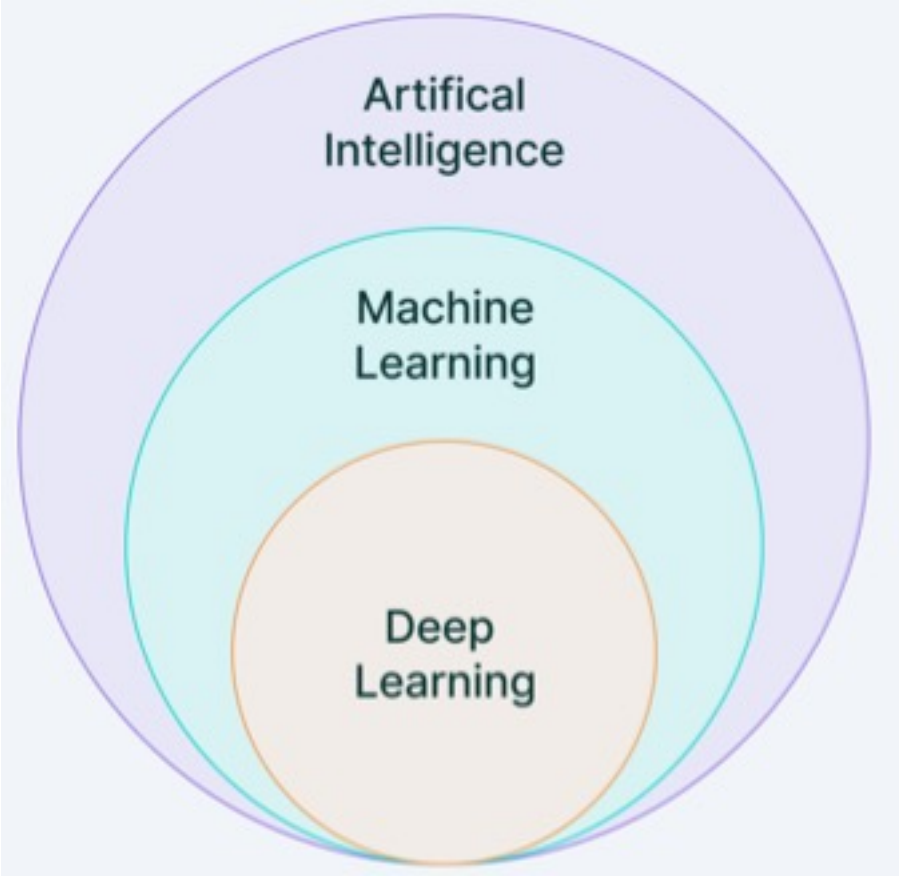
Focuses on the Development of

Algorithms and Statistical models

Enable computers to perform tasks

Without explicit programming.

Definition of Machine Learning



Goal of Machine Learning

To allow computers

To learn from data

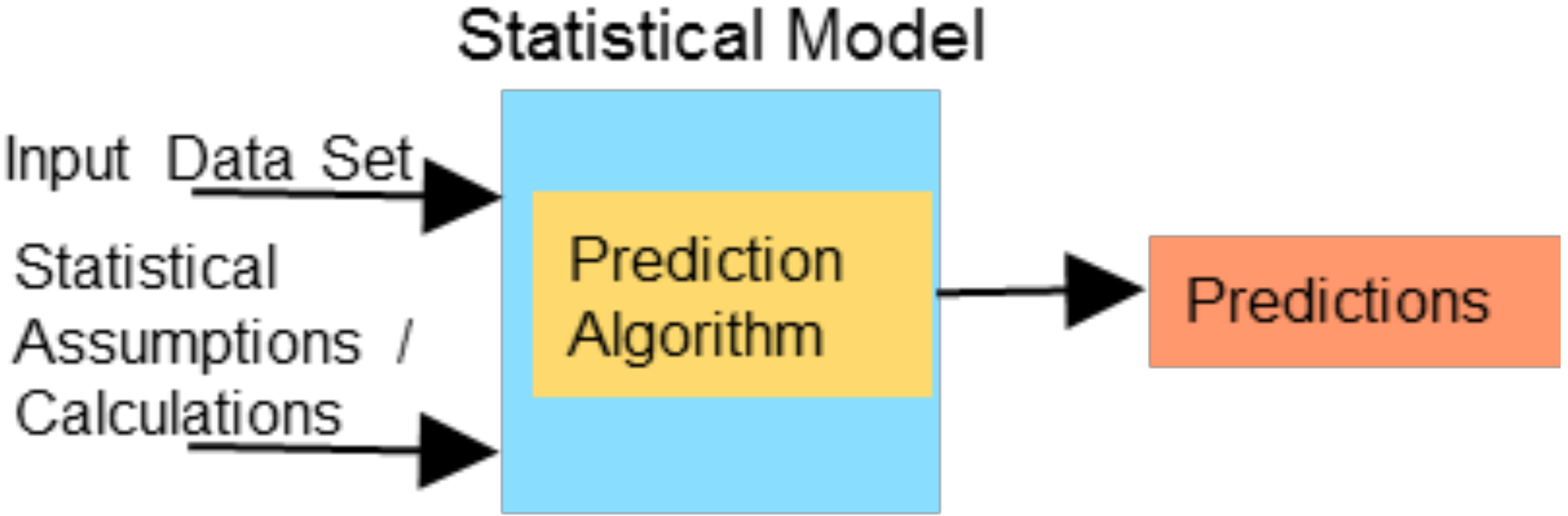
Improve their performance over time,

Making them more capable

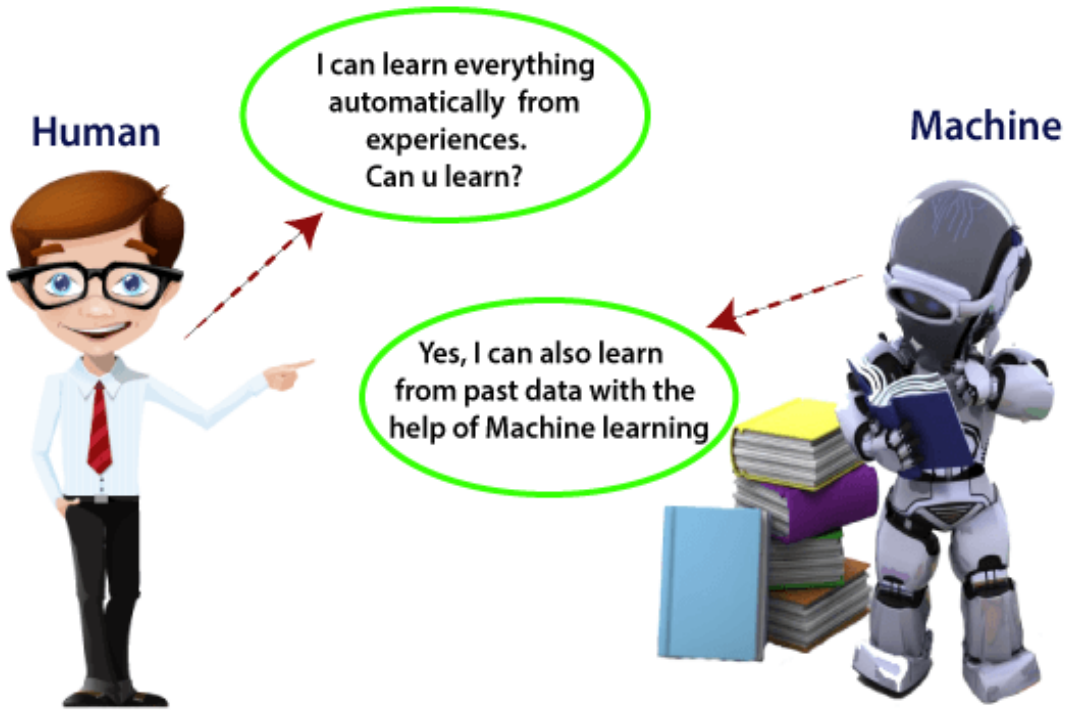
Making Predictions, Decisions

Solving complex problems

Goal of Machine Learning



Goal of Machine Learning



Overview of Machine Learning

DATA IS THE FOUNDATION OF ML

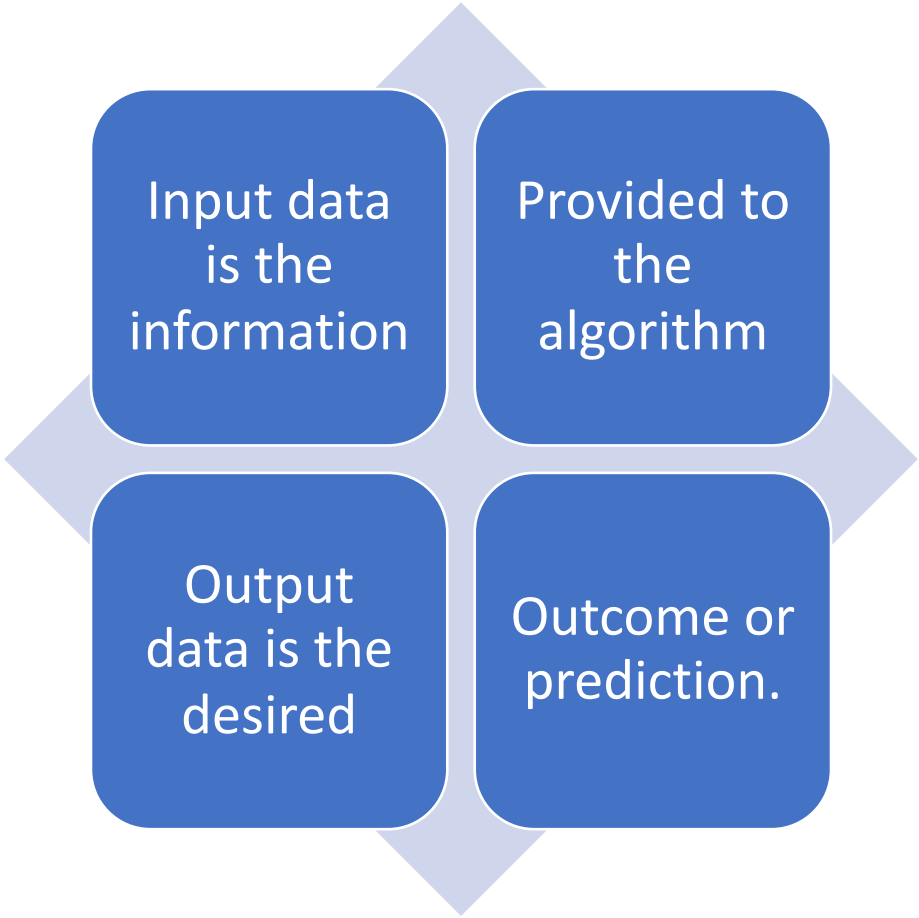
ALGORITHMS ARE TRAINED

ON LARGE DATASETS,

CONSIST OF

INPUT-OUTPUT PAIRS.

Overview of Machine Learning



Overview of Machine Learning

Input data is divided into

Features (Attributes or variables)

Labels (Target variable to be predicted).

Overview of Machine Learning

Algorithm learns

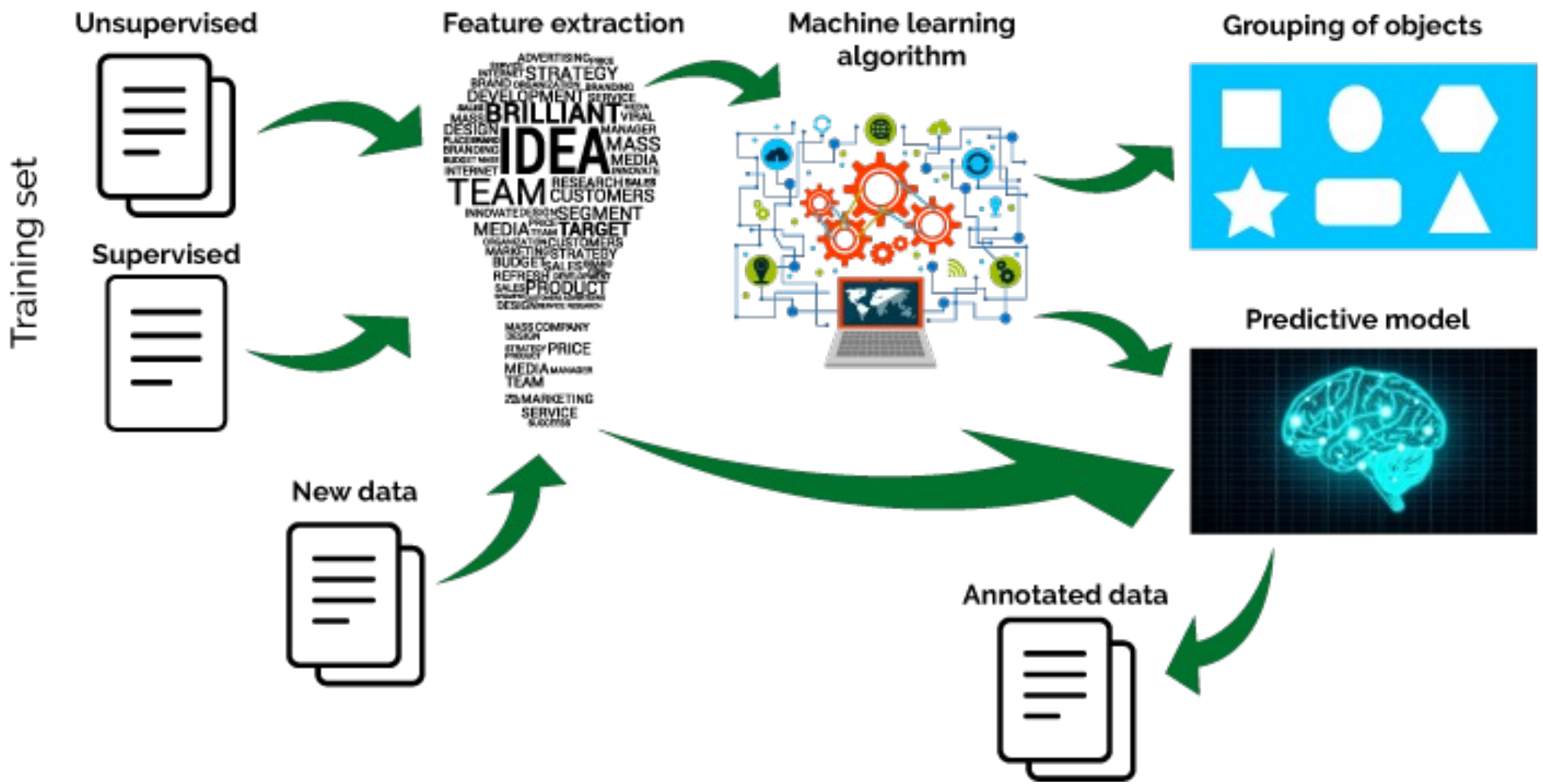
Relationship between

Features and Labels

To make predictions on

new, unseen data.

Machine Learning



Google: Machine Learning Example

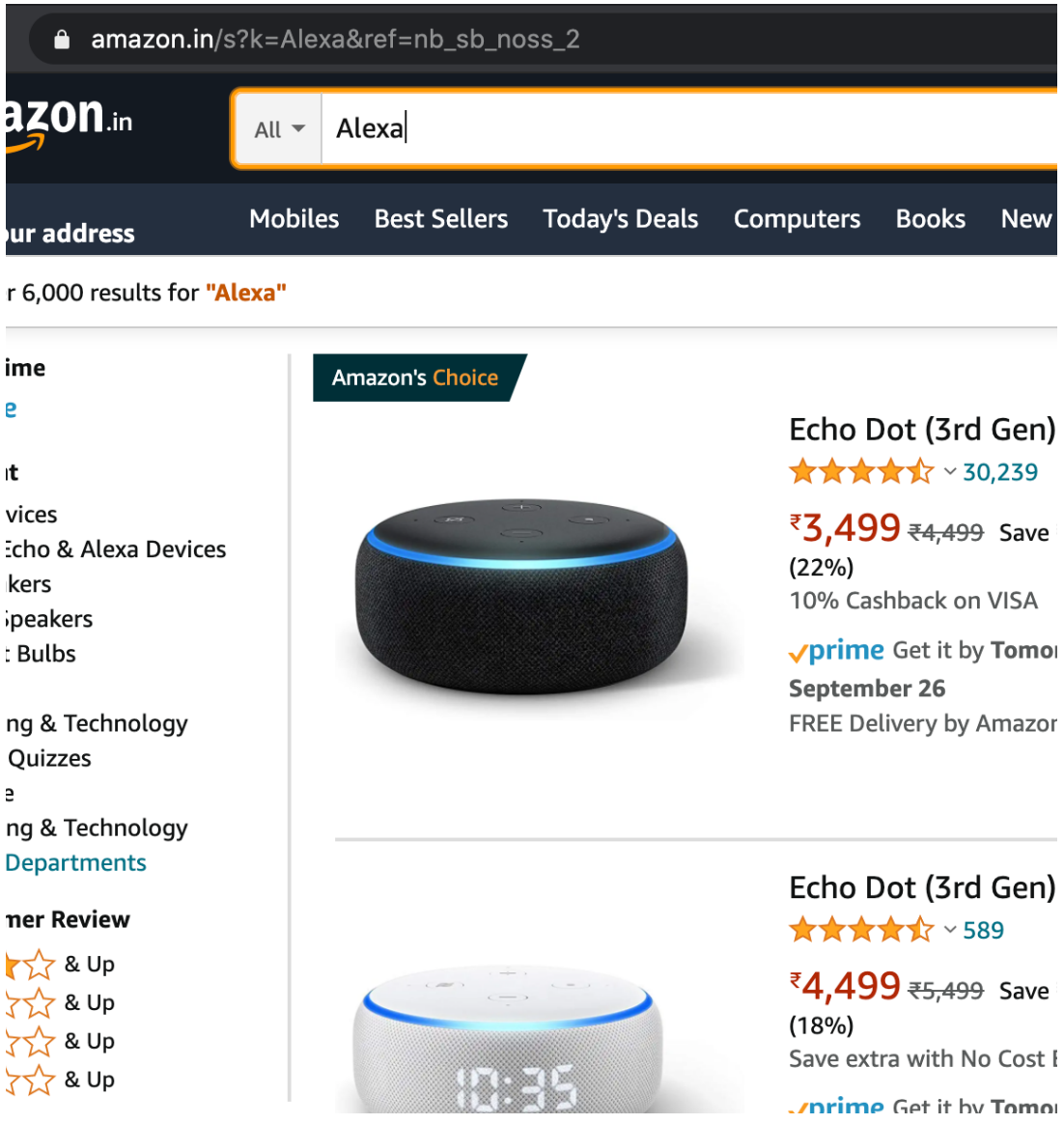
Google: Machine Learning Example

- Google Photos: Recognize the Faces, Location and Emotions
- Gmail: Analyses the Content in Email and provide the Smart Replies.
- Google Now: Learn from the different sample data and provide Best Search Result.

YouTube: Machine Learning

Product Recommendation

Amazon: Machine Learning

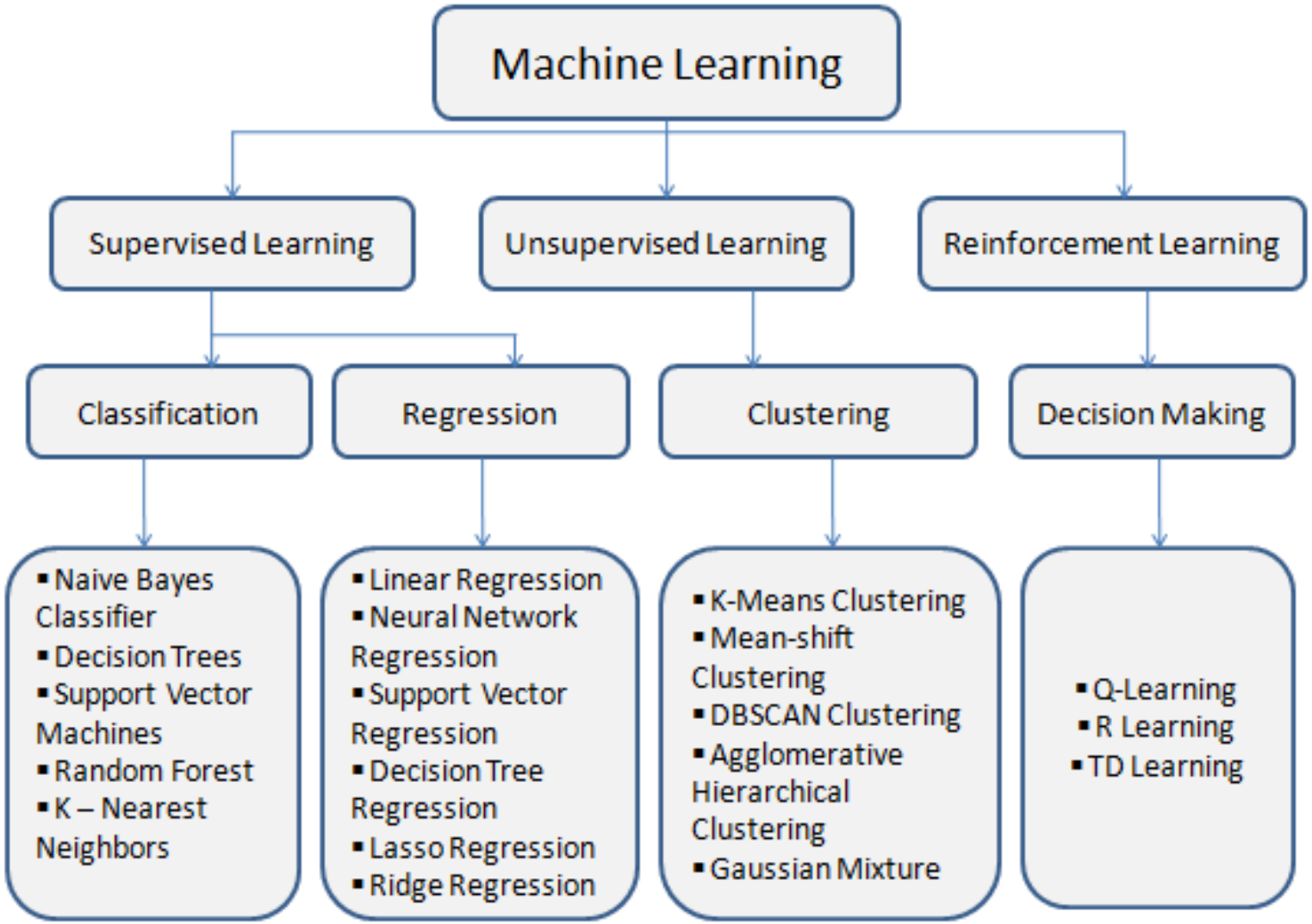


Types of Machine Learning

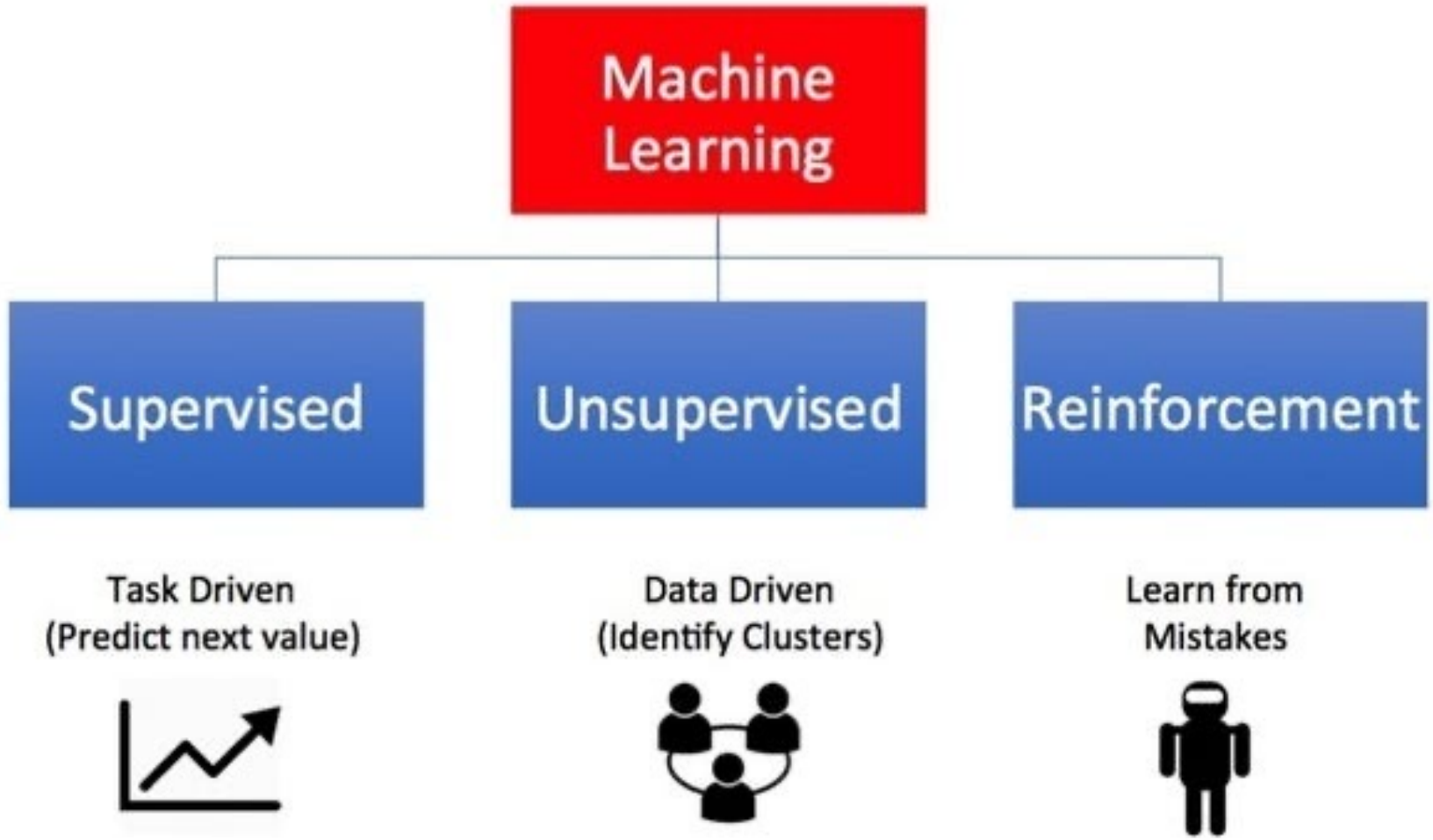
Supervised Learning

Unsupervised Learning

Reinforcement Learning


Machine Learning
Supervised Learning
Unsupervised Learning
Reinforcement Learning
Classification
Regression
Clustering
Decision Making
▪ Naive Bayes Classifier
▪ Decision Trees
▪ Support Vector Machines
▪ Random Forest
▪ K – Nearest Neighbors
▪ Linear Regression
▪ Neural Network Regression
▪ Support Vector Regression
▪ Decision Tree Regression
▪ Lasso Regression
▪ Ridge Regression
▪ K-Means Clustering
▪ Mean-shift Clustering
▪ DBSCAN Clustering
▪ Agglomerative Hierarchical Clustering
▪ Gaussian Mixture
▪ Q-Learning
▪ R Learning
▪ TD Learning

Types of Machine Learning



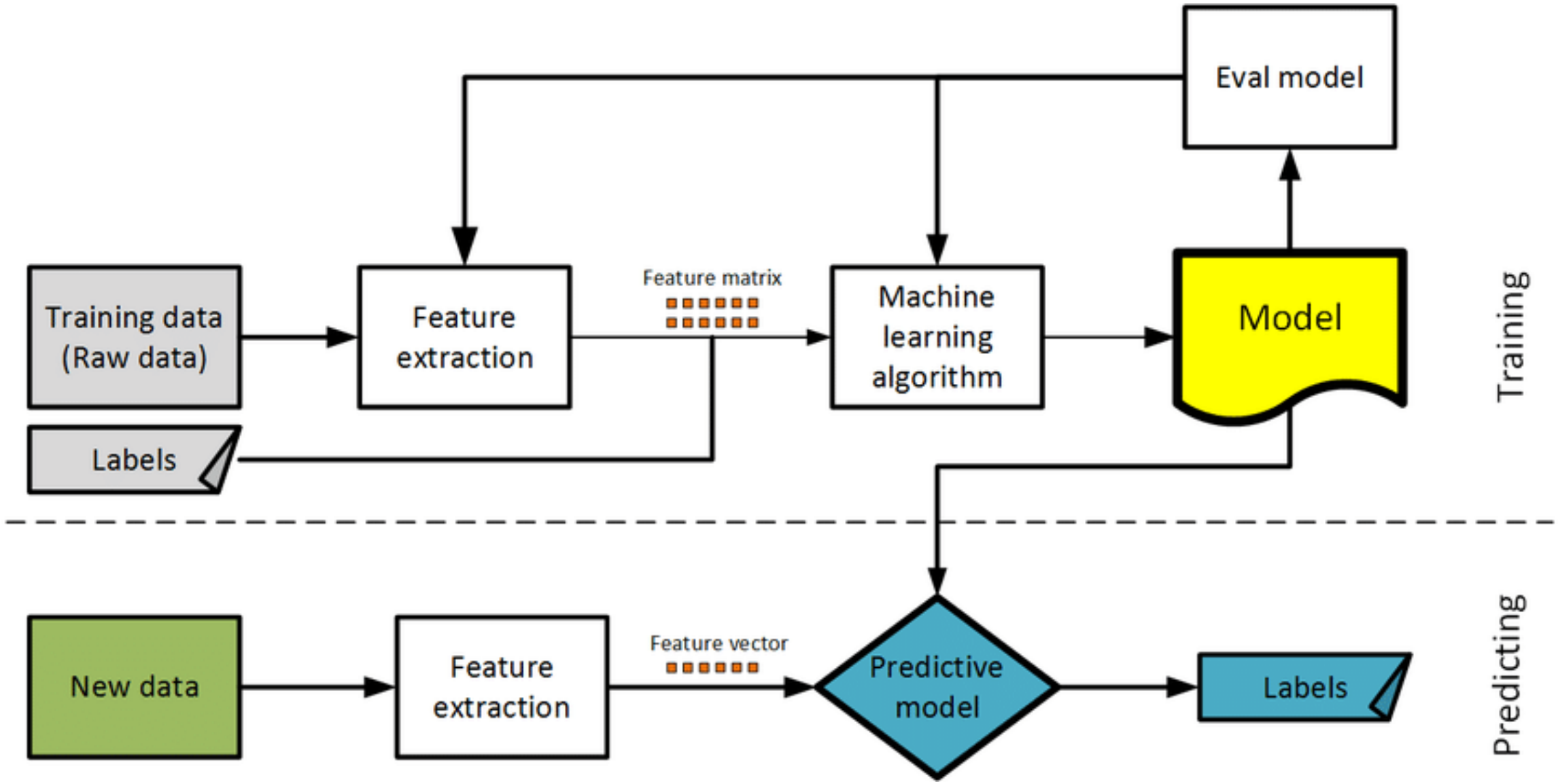
Supervised Learning

Algorithm is trained on a **labelled dataset**

Meaning that the input data includes

Both Input **features** and

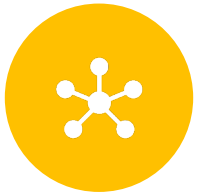
Corresponding Output **labels**.


Eval model
Training data
(Raw data)
Feature
extraction
Feature matrix
Machine
learning
algorithm
Model
Training
Labels
New data
Feature
extraction
Feature vector
Predictive
model
Labels
Predicting

Unsupervised Learning

Algorithm is trained on **unlabelled data**

Must **find patterns**



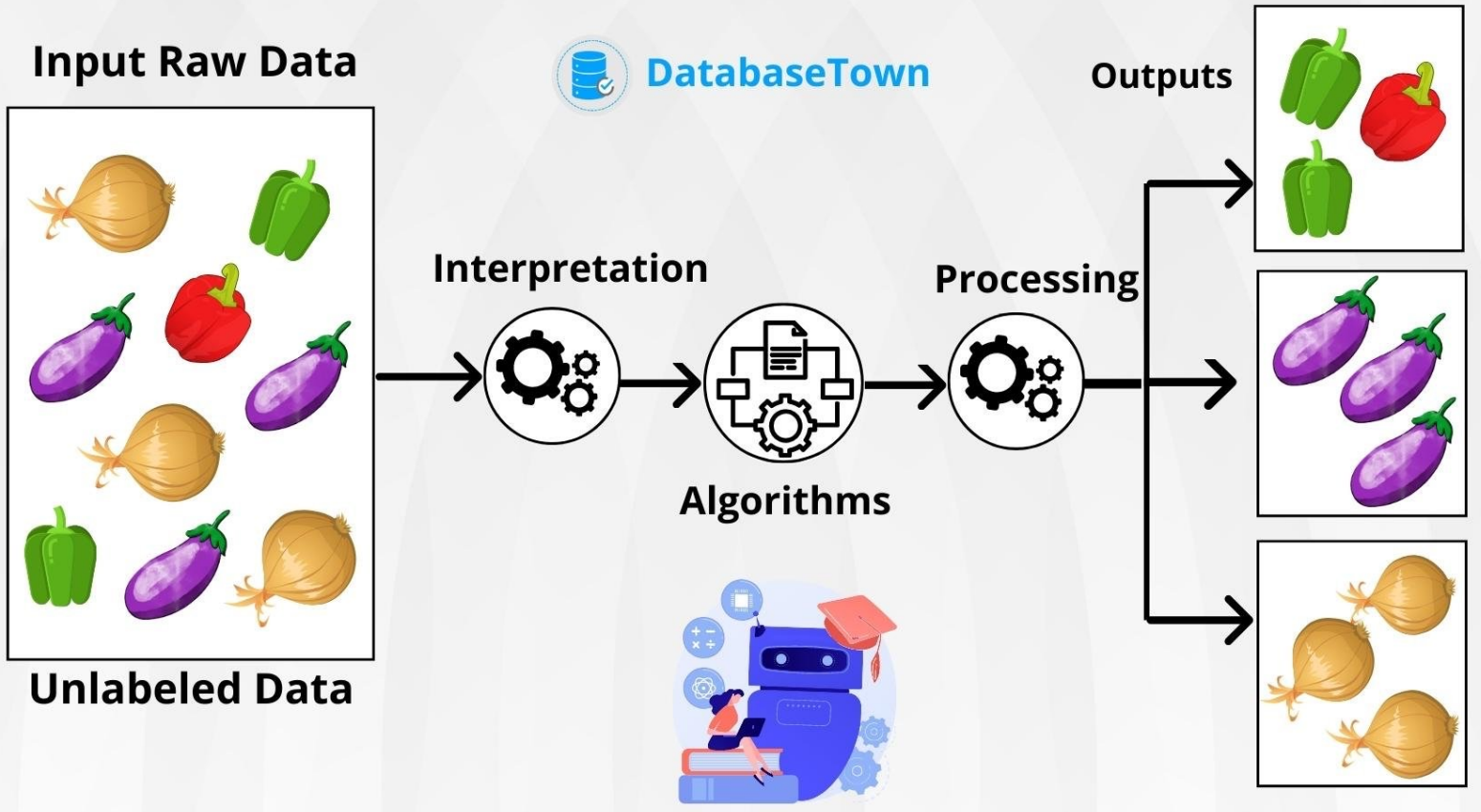
Relationships within the data

without explicit guidance

on the output.

UNSUPERVISED LEARNING

Unsupervised learning is a type of machine learning where the algorithm learns from unlabeled data without any predefined outputs or target variables.



Reinforcement Learning

THE ALGORITHM LEARNS BY

INTERACTING WITH AN ENVIRONMENT

RECEIVING FEEDBACK IN THE FORM OF

REWARDS OR PENALTIES.

environment

agent

actions

rewards

observations

Reinforcement Learning

Trial and error learning

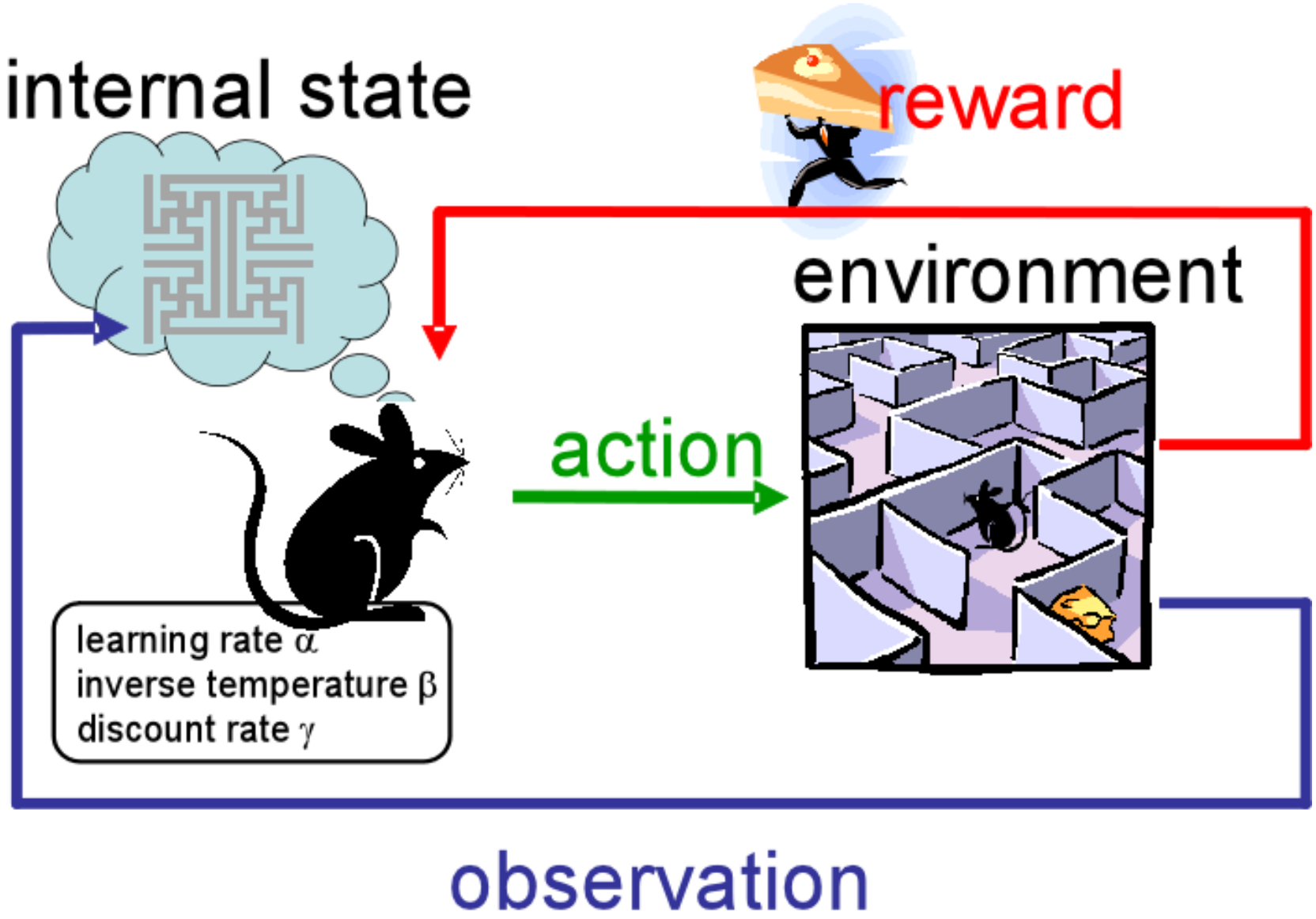
through interactions

with the environment.

The agent receives

rewards or punishments

based on its actions.


internal state
reward
environment
action
learning rate α
inverse temperature β
discount rate γ
observation

Reinforcement Learning

Rewards serve as **positive reinforcements**

the agent seeks to maximize

Punishments represent **negative consequences**

to be minimized.

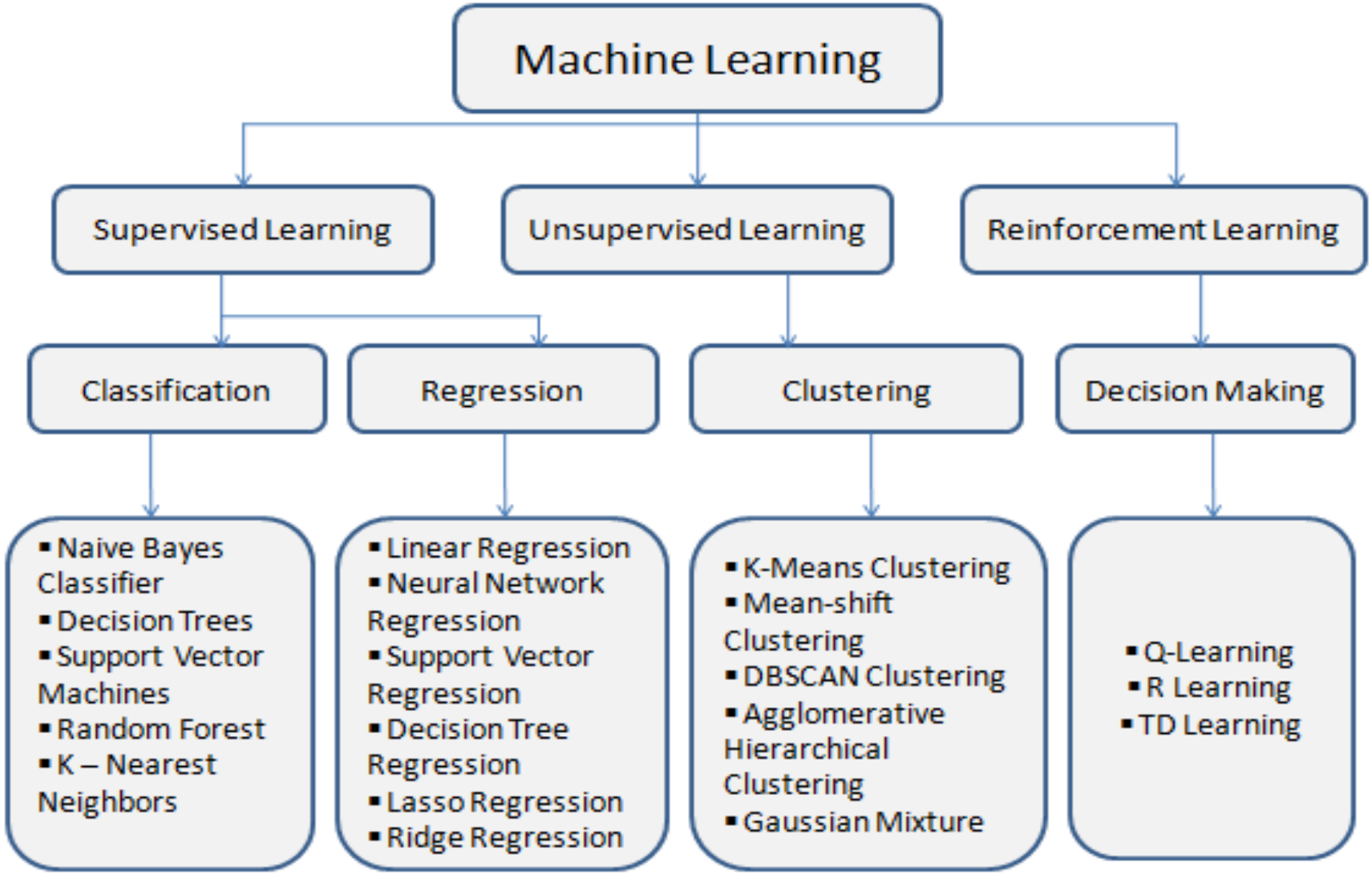
Reinforcement Learning

Through Rewards and Punishments,

The agent learns

to optimize its behavior

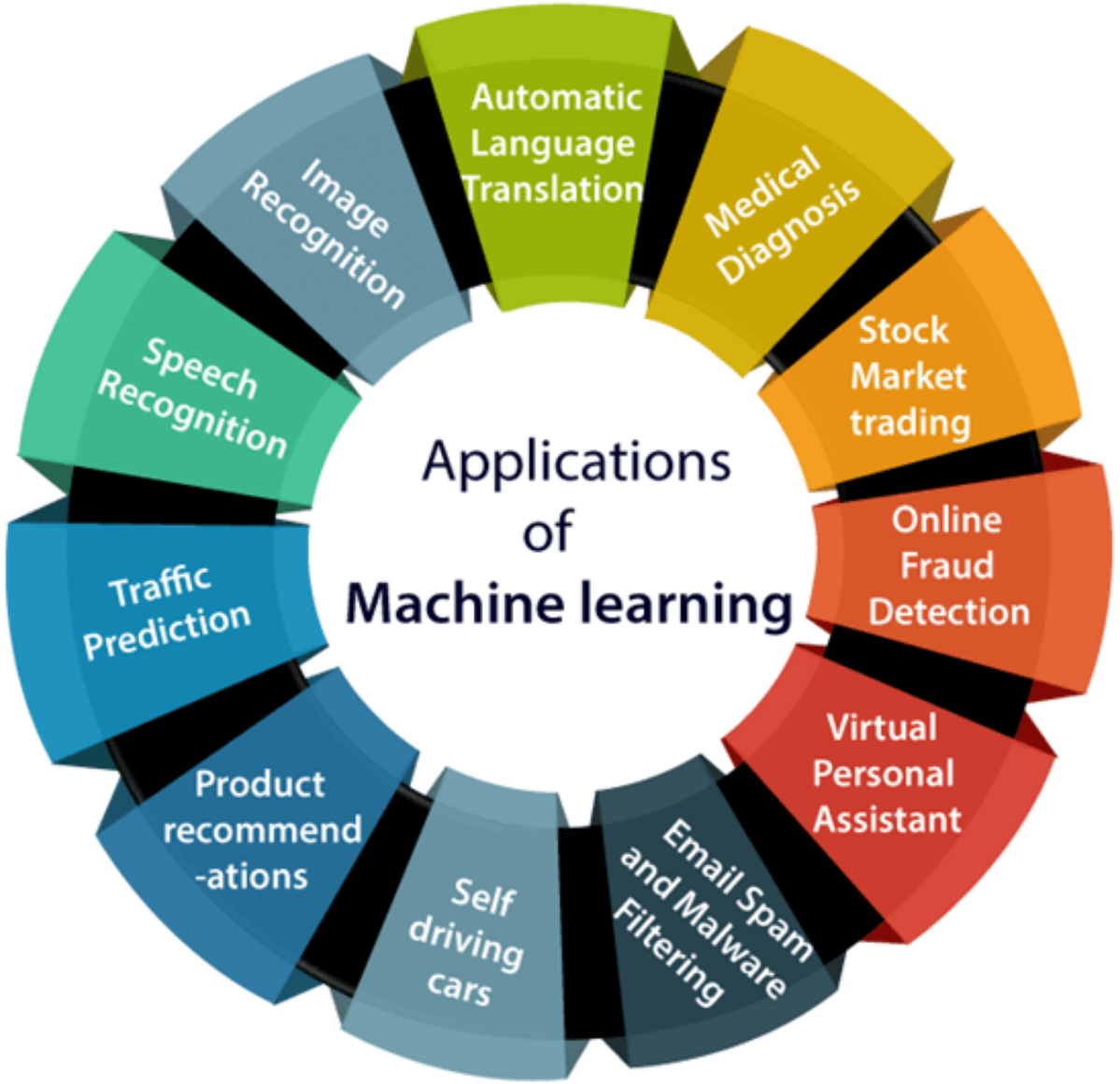
to achieve desired outcomes.


Machine Learning
Supervised Learning
Unsupervised Learning
Reinforcement Learning
Classification
Regression
Clustering
Decision Making
▪ Naive Bayes Classifier
▪ Decision Trees
▪ Support Vector Machines
▪ Random Forest
▪ K – Nearest Neighbors
▪ Linear Regression
▪ Neural Network Regression
▪ Support Vector Regression
▪ Decision Tree Regression
▪ Lasso Regression
▪ Ridge Regression
▪ K-Means Clustering
▪ Mean-shift Clustering
▪ DBSCAN Clustering
▪ Agglomerative Hierarchical Clustering
▪ Gaussian Mixture
▪ Q-Learning
▪ R Learning
▪ TD Learning

Applications of Machine Learning

Surendra Panpaliya

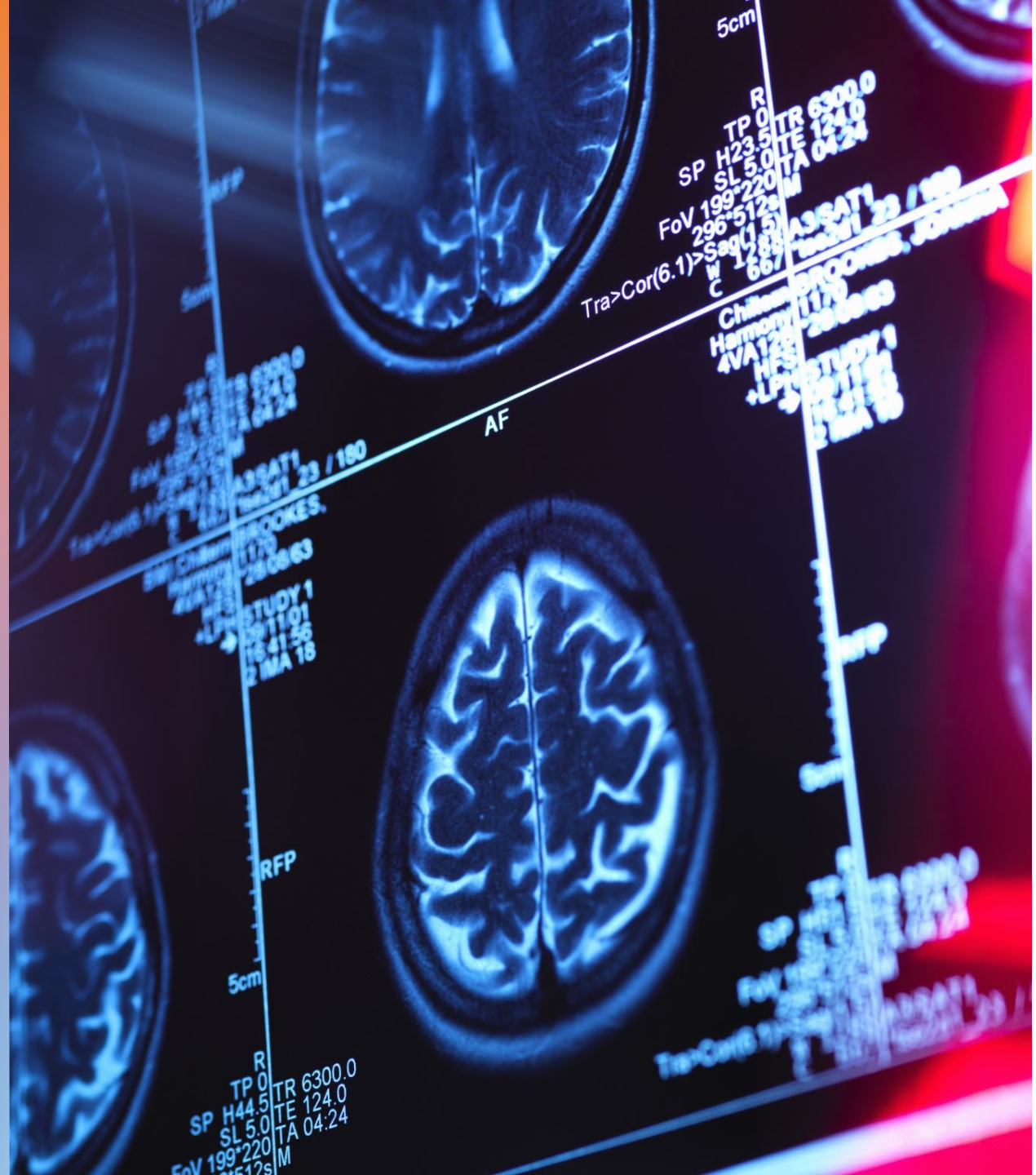
International Corporate Trainer


Applications
of
Machine learning
Automatic Language Translation
Medical Diagnosis
Stock Market trading
Online Fraud Detection
Virtual Personal Assistant
Email Spam and Malware Filtering
Self driving cars
Product recommend-ations
Traffic Prediction
Speech Recognition
Image Recognition

Healthcare

Disease Prediction:

- Machine learning models can analyse
- Patient data to predict the likelihood of diseases,
- such as diabetes or cancer.



Healthcare

Medical Image Analysis

- ML algorithms assist in interpreting
- Medical images like
- X-rays and MRIs,
- aiding in diagnosis.

Healthcare

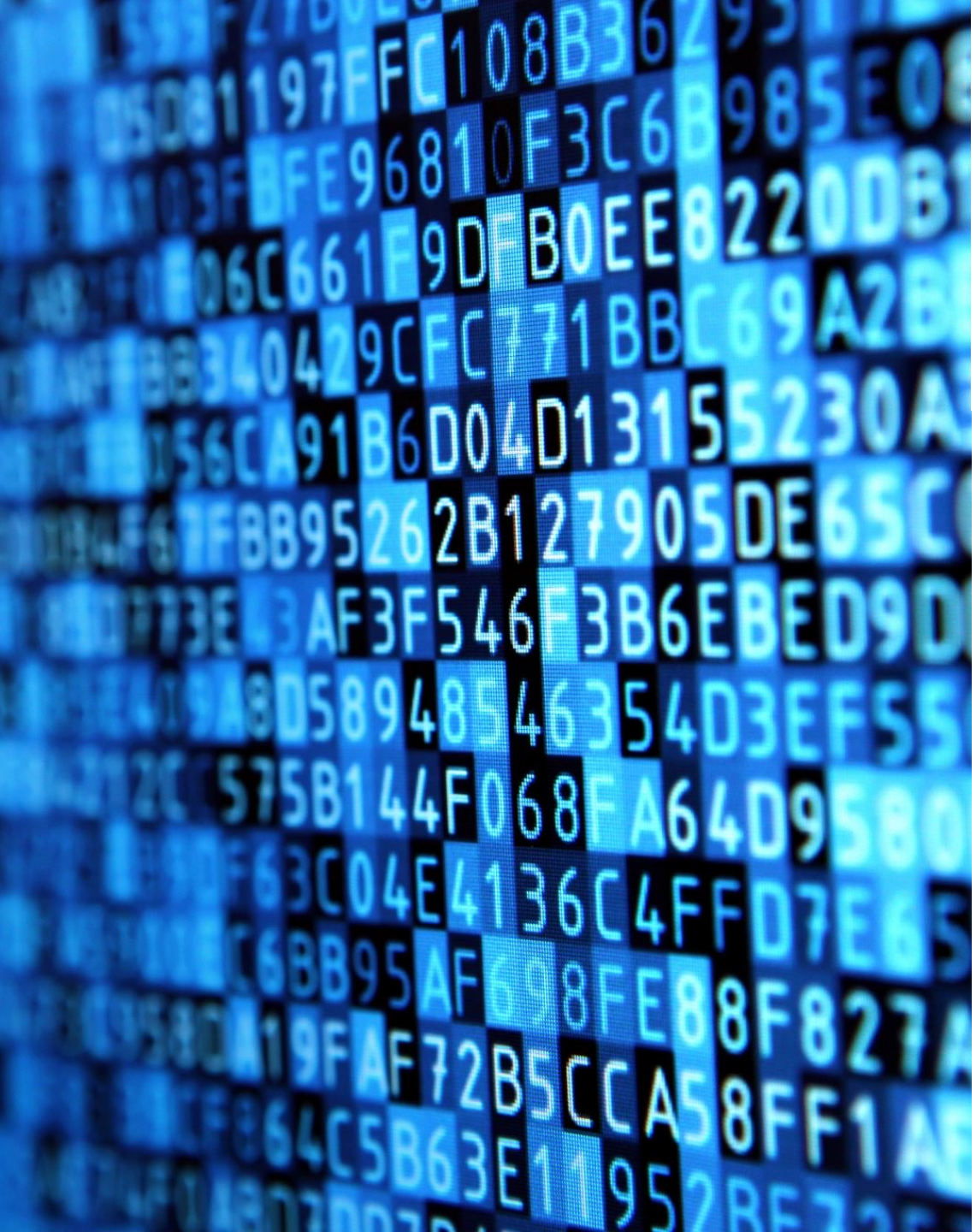
Drug Discovery

- ML accelerates drug discovery
- By analyzing biological data
- Predicting potential drug candidates.

Finance

Credit Scoring:

- ML models assess creditworthiness
- by analyzing an individual’s
- financial history and behavior.



Finance

Fraud Detection

- Machine learning algorithms
- identify unusual patterns or anomalies
- to detect fraudulent transactions.

Finance

Algorithmic Trading:

- ML is used to develop trading algorithms that
- Analyze market data
- Make automated trading decisions.

Retail

Recommendation Systems:

- ML algorithms analyze customer preferences
- To provide personalized
- Product recommendations.

Retail

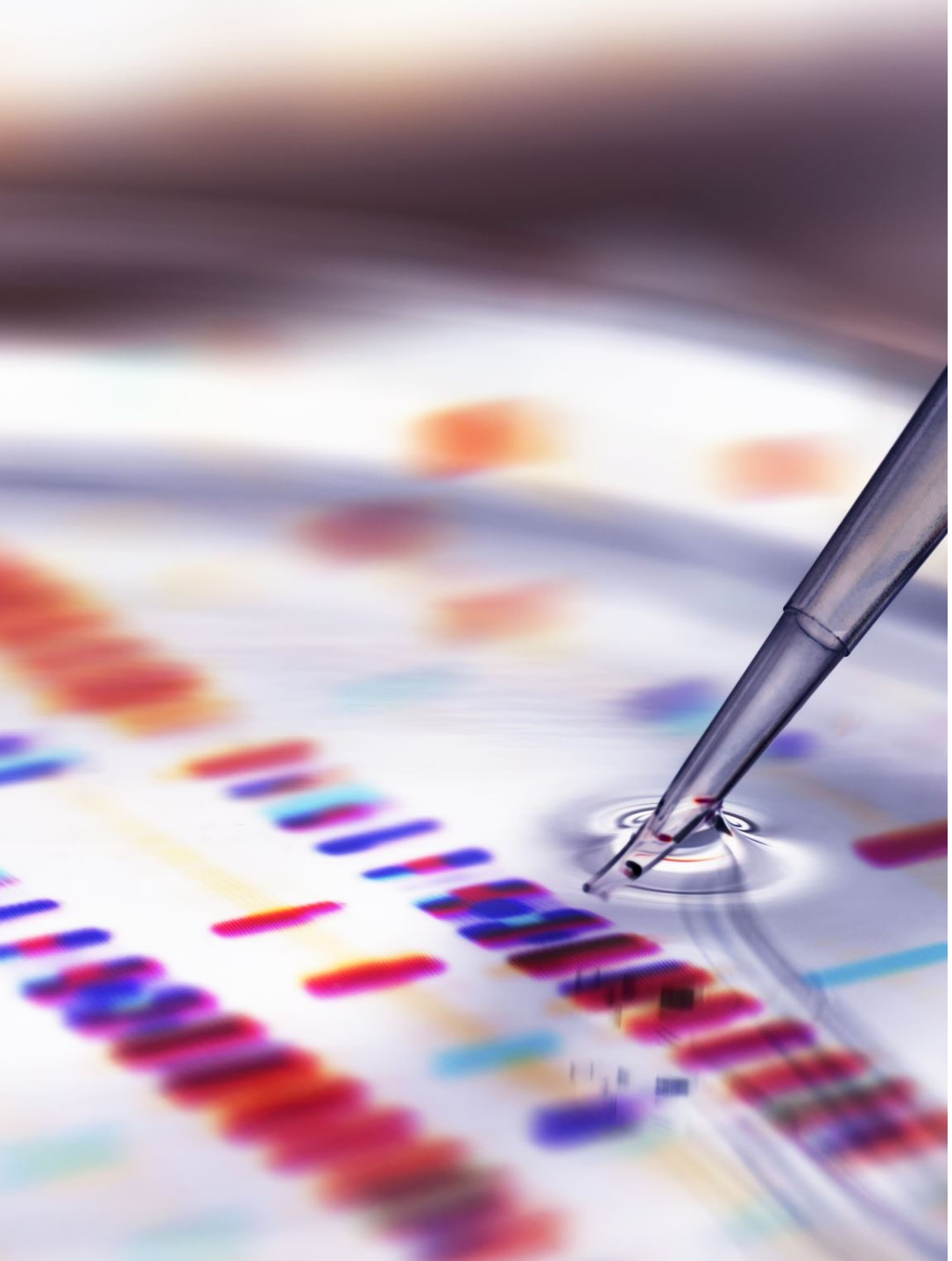
Demand Forecasting:

- Predictive models help
- optimize inventory management
- by forecasting demand for products.

Retail

Dynamic Pricing:

- ML algorithms adjust pricing in real-time
- based on factors like demand,
- competition, and customer behavior.



Manufacturing

Predictive Maintenance:

- ML predicts equipment failures
- by analyzing sensor data,
- enabling proactive maintenance.

Manufacturing

Quality Control:

- Machine learning models inspect and
- classify products based on visual or
- sensor data, ensuring quality.

Manufacturing

Supply Chain Optimization:

- ML optimizes supply chain processes
- by predicting demand,
- managing inventory, and
- Improving logistics.

Automotive

Autonomous Vehicles:

- ML is fundamental to self-driving cars,
- enabling them to perceive the environment,
- make decisions and navigate safely.

Automotive

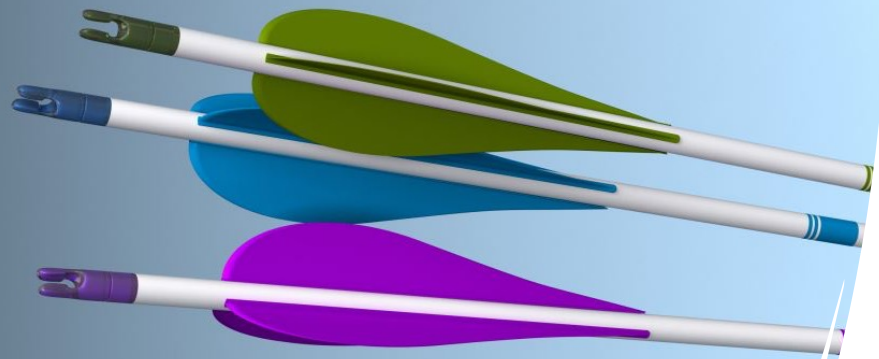
Predictive Maintenance:

- ML predicts potential issues with
- vehicle components,
- optimizing maintenance schedules.

Automotive

Traffic Management:

- ML algorithms analyze traffic patterns
- to optimize traffic flow and
- reduce congestion.



Marketing

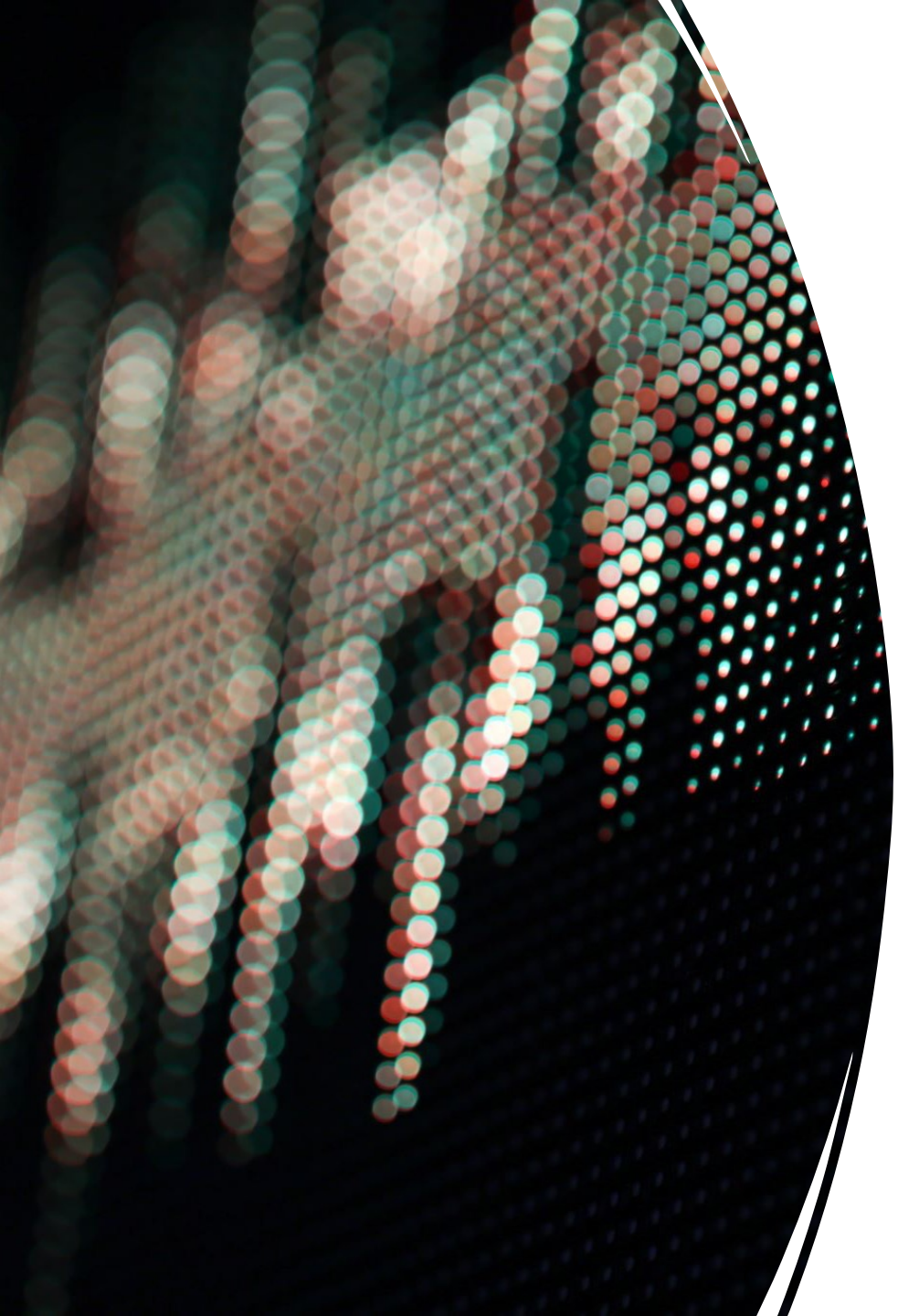
Customer Segmentation:

- ML helps identify and target specific
- customer segments based on
- behavior and preferences.

Marketing

Churn Prediction:

- Predictive models identify
- customers at risk of leaving,
- allowing proactive retention strategies.



Marketing

Social Media Sentiment Analysis:

- ML analyzes social media data
- to understand public sentiment and
- monitor brand perception.

Energy

Predictive Analytics for Equipment Maintenance:

- ML models predict equipment failures,
- improving the reliability of energy infrastructure.

Energy

Energy Consumption Forecasting:

- ML helps forecast energy demand,
- optimizing resource allocation and
- reducing costs.

Energy

Grid Management:

- Machine learning optimizes
- the distribution of energy in smart grids,
- improving efficiency.

Energy

Predictive Analytics for Equipment Maintenance:

- ML models predict equipment failures,
- improving the reliability of energy infrastructure.

Energy

Energy Consumption Forecasting:

- ML helps forecast energy demand,
- optimizing resource allocation and
- reducing costs.

Energy

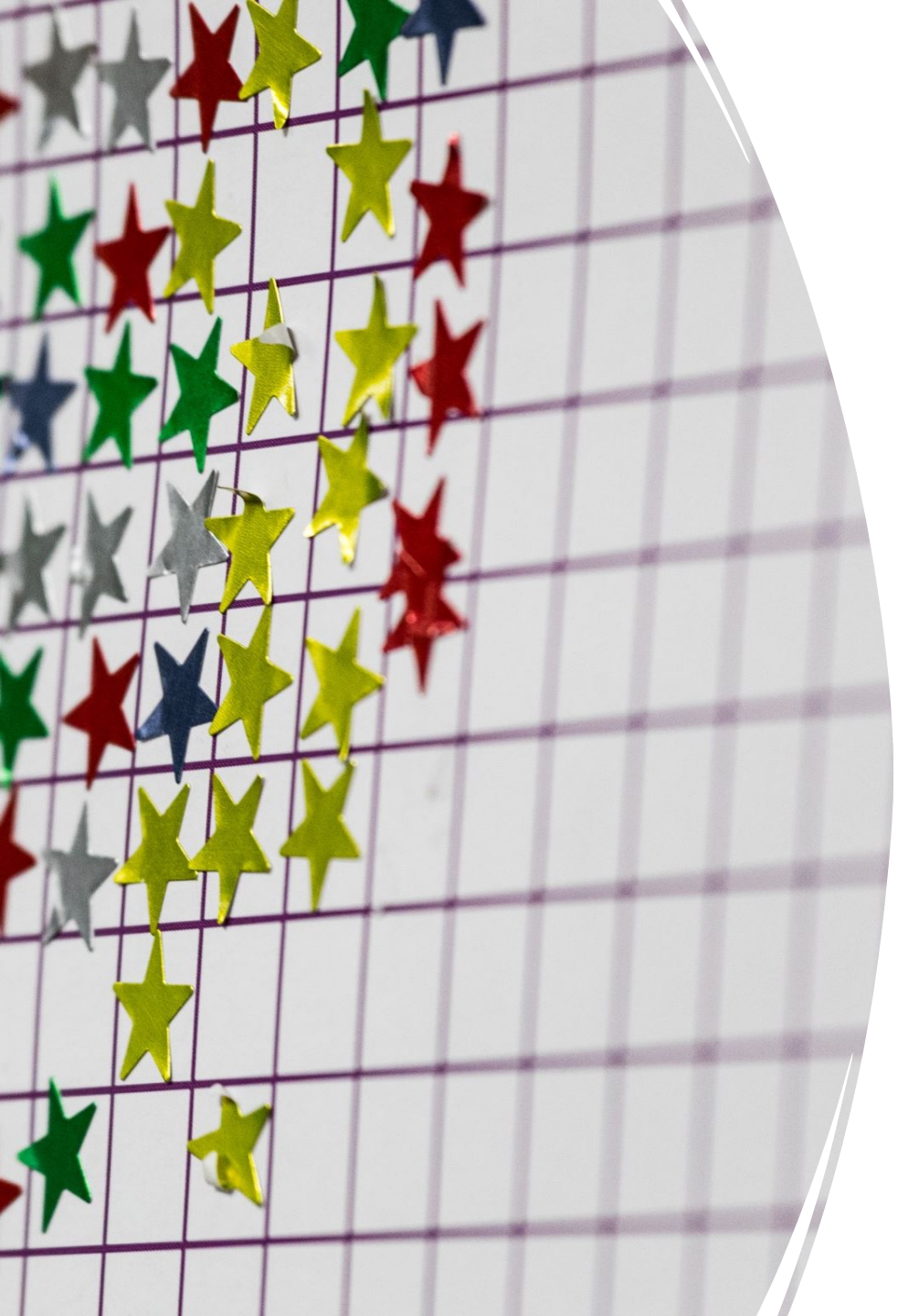
Grid Management:

- Machine learning optimizes
- the distribution of energy in smart grids,
- improving efficiency.

Education

Personalized Learning:

- ML algorithms tailor educational content
- to individual student needs,
- adapting to different learning styles.



Education

Predictive Analytics for Student Performance:

- Models predict student performance and
- identify areas needing intervention.

Education

Automated Grading:

- ML automates the grading process,
- saving time for educators.

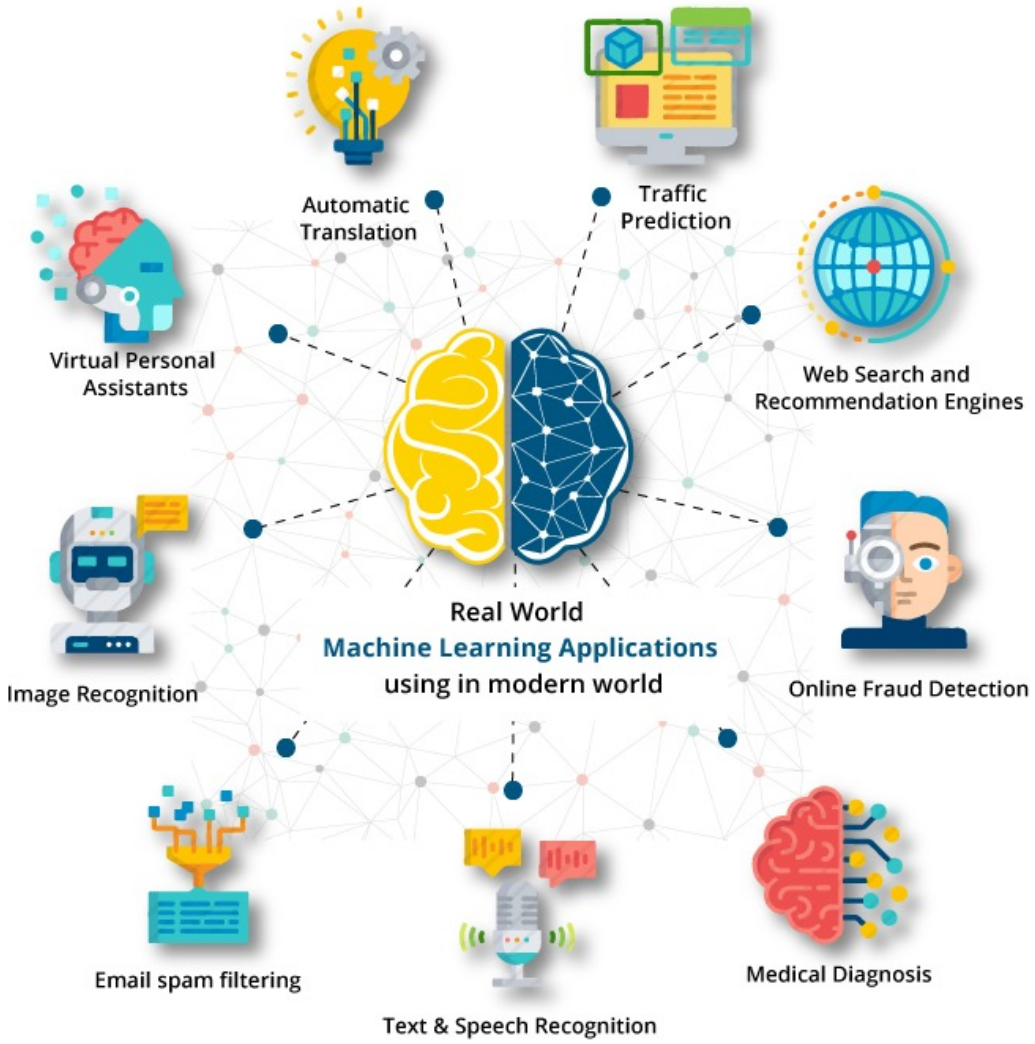

Automatic Translation
Traffic Prediction
Virtual Personal Assistants
Web Search and Recommendation Engines
Real World
Machine Learning Applications
using in modern world
Image Recognition
Online Fraud Detection
Email spam filtering
Text & Speech Recognition
Medical Diagnosis

Image Recognition

- Ranking
- Personalizing News Feed Stories
- Filtering out Offensive Content
- Highlighting Trending Topics
- Ranking Search Results
- Recognizing Image and Video content

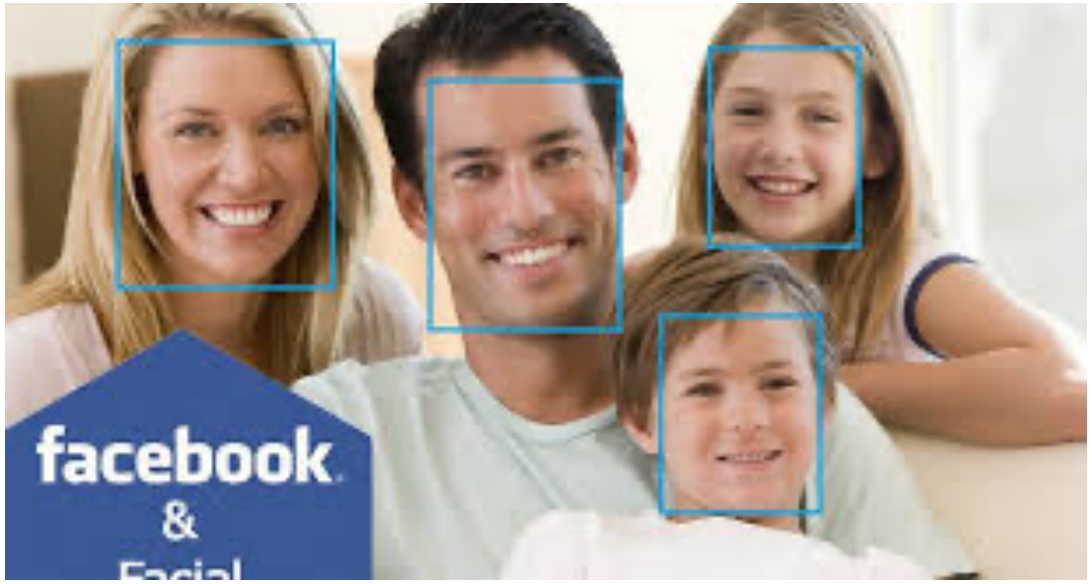


Image Recognition

- Used to identify Objects,
- Persons, Places, Digital images
- Upload a photo with our Facebook Friends
- Automatically get a Tagging Suggestion
- with Name and Face Detection

Speech Recognition

- Google: Search by Voice
- Process of converting voice instructions into text
- Speech to Text /Computer Speech Recognition
- Google Assistant
- Siri
- Cortana
- Alexa

Traffic Prediction

- Google Maps
- Correct Path
- Shortest Route
- Predicts the Traffic conditions
- Traffic is cleared
- Slow-moving
- Heavily congested

Traffic Prediction

- Real Time Location of the Vehicle
- Average time has taken on past days
- Takes information from the user
- Sends back to its database
- Improve the performance.

Product Recommendations

E-Commerce and Entertainment Companies	**Amazon, Netflix**
Product recommendation to the user	Search for some product on Amazon
Getting an advertisement for the same product	Internet surfing on the same browser

Product Recommendations

- Google understands the user interest
- Suggests the product as per customer interest
- Netflix: Recommendations for entertainment series, movies

Self-Driving Cars

Tesla

Unsupervised Learning

Train the Car models

Detect People and Objects while Driving.

Email Spam and Malware Filtering

New email : Filtered automatically

Important

Normal

Spam.

Important Mail in Inbox

Spam emails in Spam Box

Email Spam and Malware Filtering

Some spam Filters used by Gmail	Content Filter	Header filter
General blacklists filter	Rules-based filters	Permission filters

Email Spam and Malware Filtering

Used Machine Learning Algorithms

Multi-Layer Perceptron

Decision Tree

Naïve Bayes Classifier

Virtual Personal Assistant / Secretory

- Help finding the Information using our Voice Instruction
- Google assistant
- Alexa
- Cortana
- Siri

Virtual Personal Assistant

Voice Instructions :

Play Music

Call Someone

Open an Email

Scheduling an Appointment

Virtual Personal Assistant

Virtual Assistant

Record our Voice instructions

Send it over the server on a cloud

Decode it using ML Algorithms

Act Accordingly

Online Fraud Detection

- Machine learning is making our Online transaction safe and secure by detecting fraud transaction
- Whenever we perform some online transaction
- fraudulent transaction can take place
- **Fake Accounts**
- **Fake Ids**
- **Steal Money** in the middle of a transaction

Online Fraud Detection

To detect this

Feed Forward Neural network

helps us by checking

Whether it is a genuine transaction

fraud transaction

Online Fraud Detection

Genuine Transaction

The output is converted into some Hash values

These Values become the Input for the next round

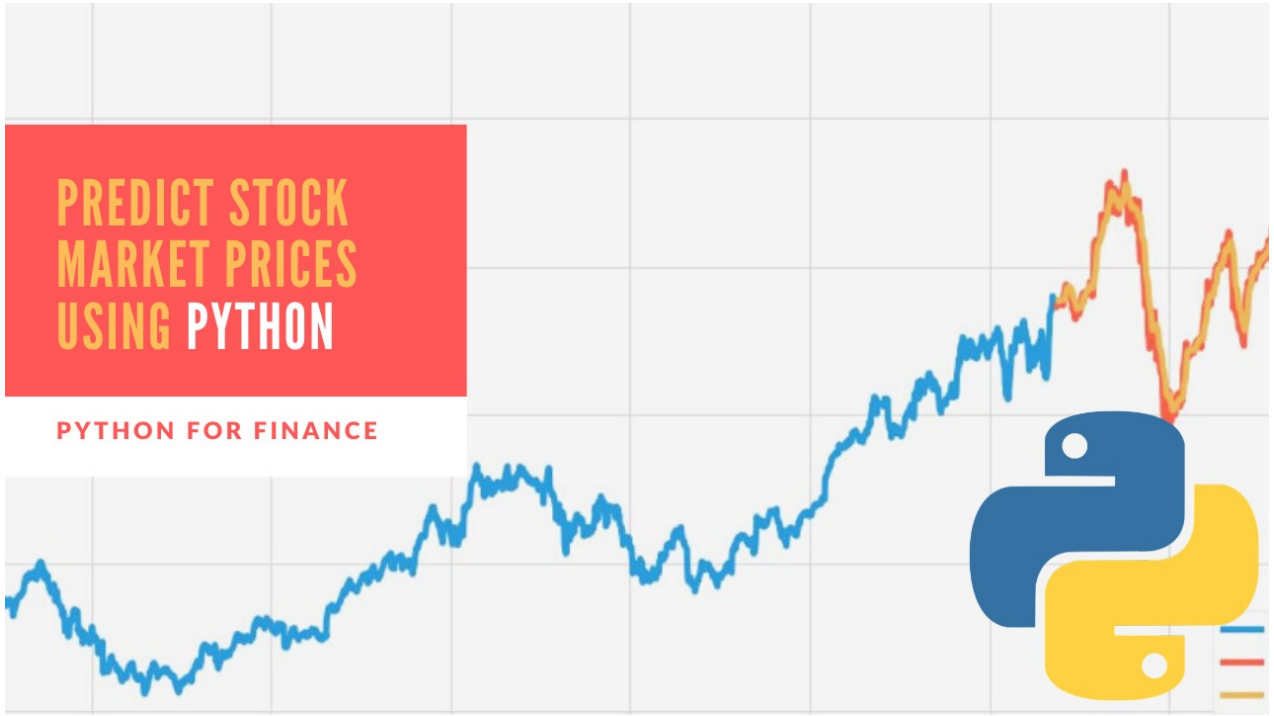
Fraud transaction

There is a Specific Pattern which gets change

it detects it

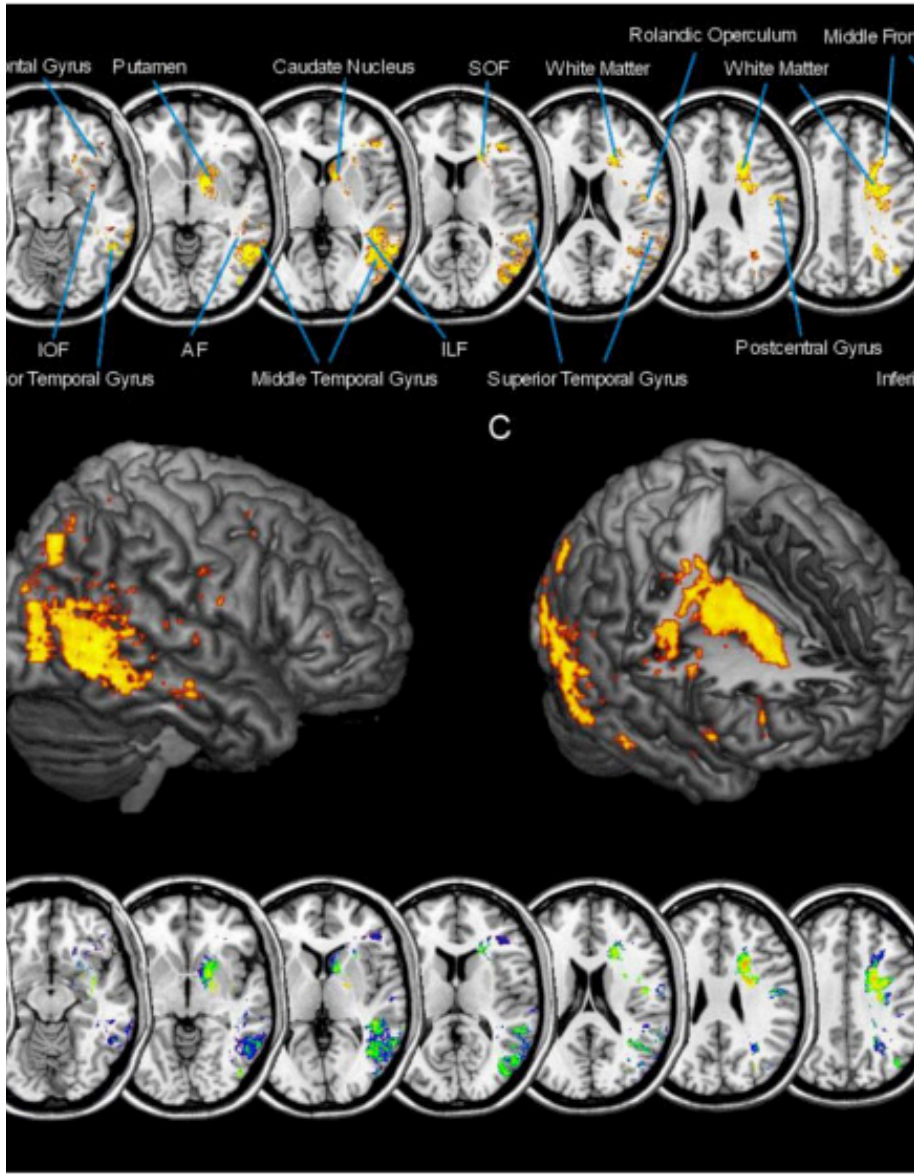
Stock Market Trading

- Risk of Up and Downs in shares
- **Long Short-Term Memory Neural Network**
- Used for the prediction of stock market trends

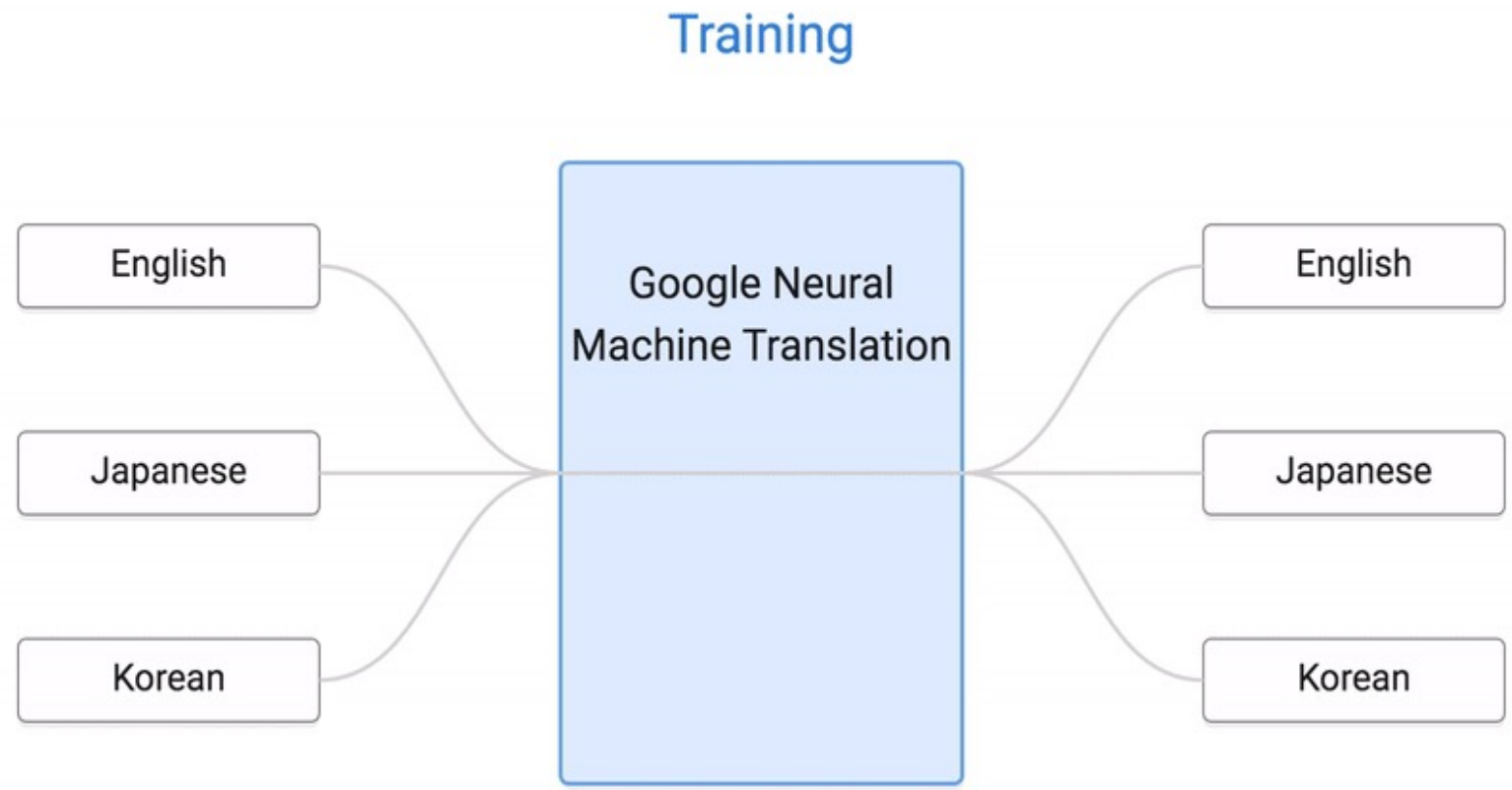


Medical Diagnosis

- Able to build 3D Models
- Predict the exact position of lesions in the Brain
- Finding Brain tumors
- Brain-related Diseases



Automatic Language Translation



Happy Learning !!

Thank You for your patience ☺

Happy to Connect !!☺

Email: Surendra@gktcs.com
Mobile: 9975072320