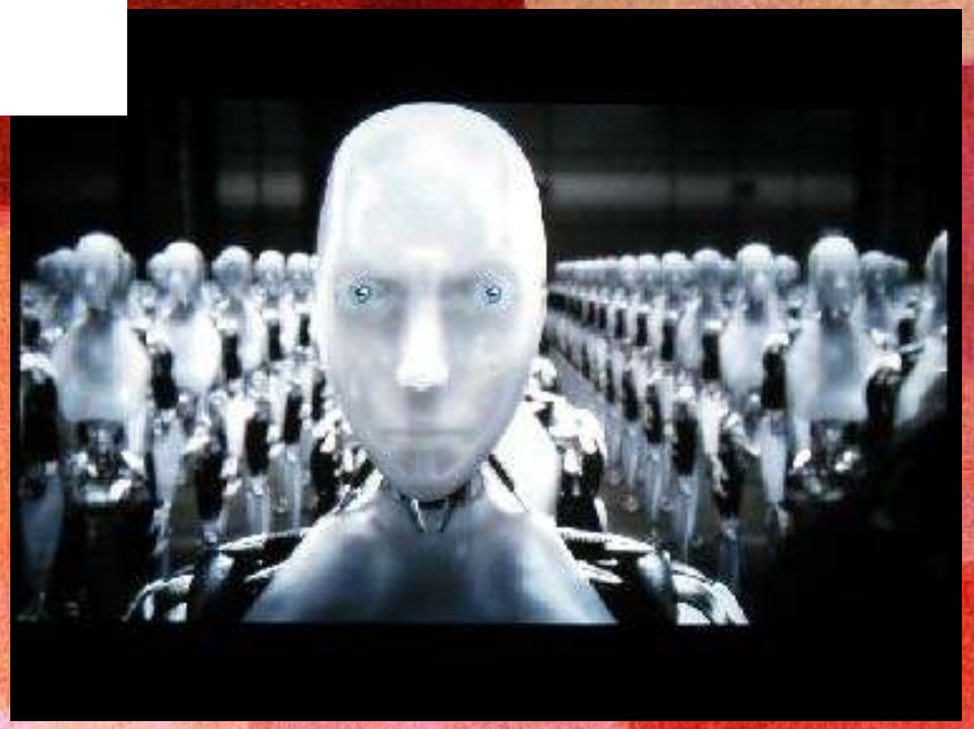
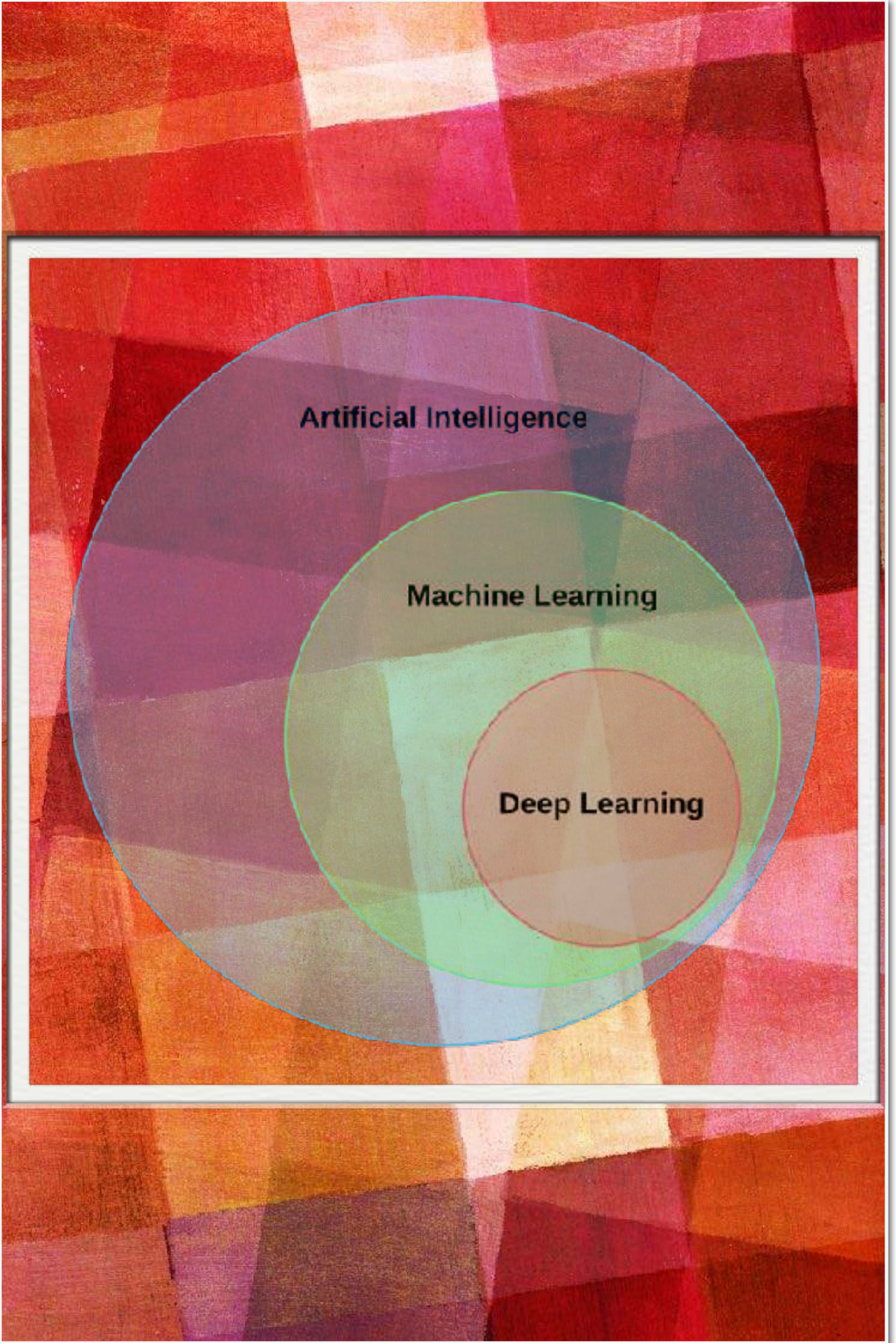
Introduction to

MACHINE LEARNING





WHAT IS MACHINE LEARNING?

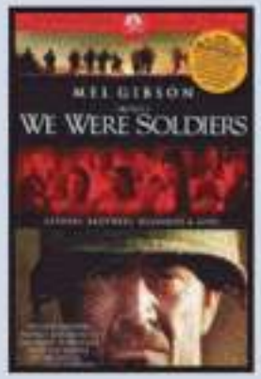
- The capability of a computer to learn from data and experience.
- A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E.

-Tom Mitchell,1997

Where is ML Used Today

- Internet search clustering
- Knowledge management systems
- Social network mapping
- Taxonomy transformations
- Marketing analytics
- Recommendation systems
- Log analysis & event filtering
- SPAM filtering, fraud detection

STAR WARS
EPISODE III


MEL GIBSON
WE WERE SOLDIERS

Joe

BLACK HAWK DOWN

SPIDER-MAN

#3

DUNE

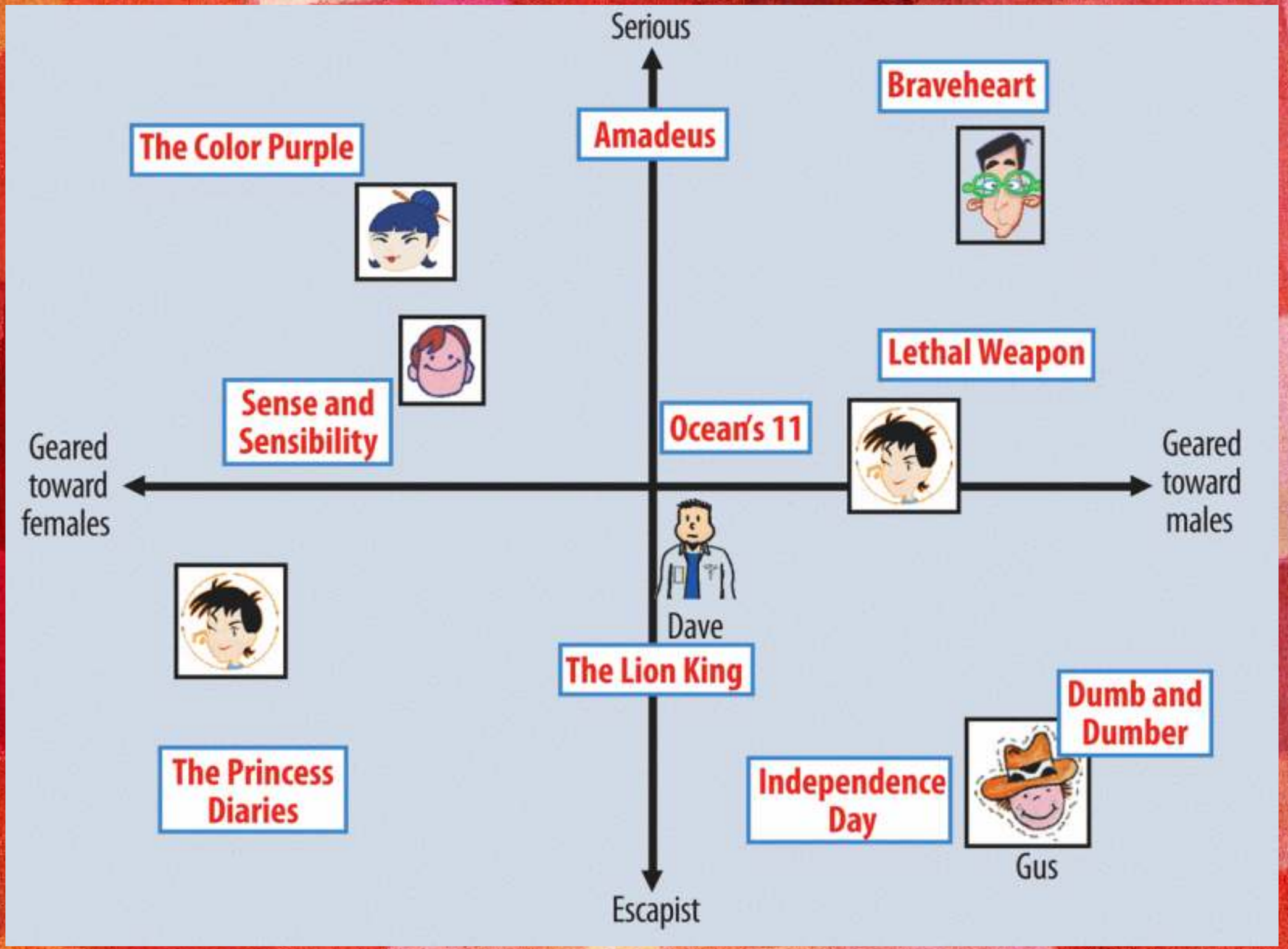
#2

tom hanks
saving private ryan

#1

MADAGASCAR

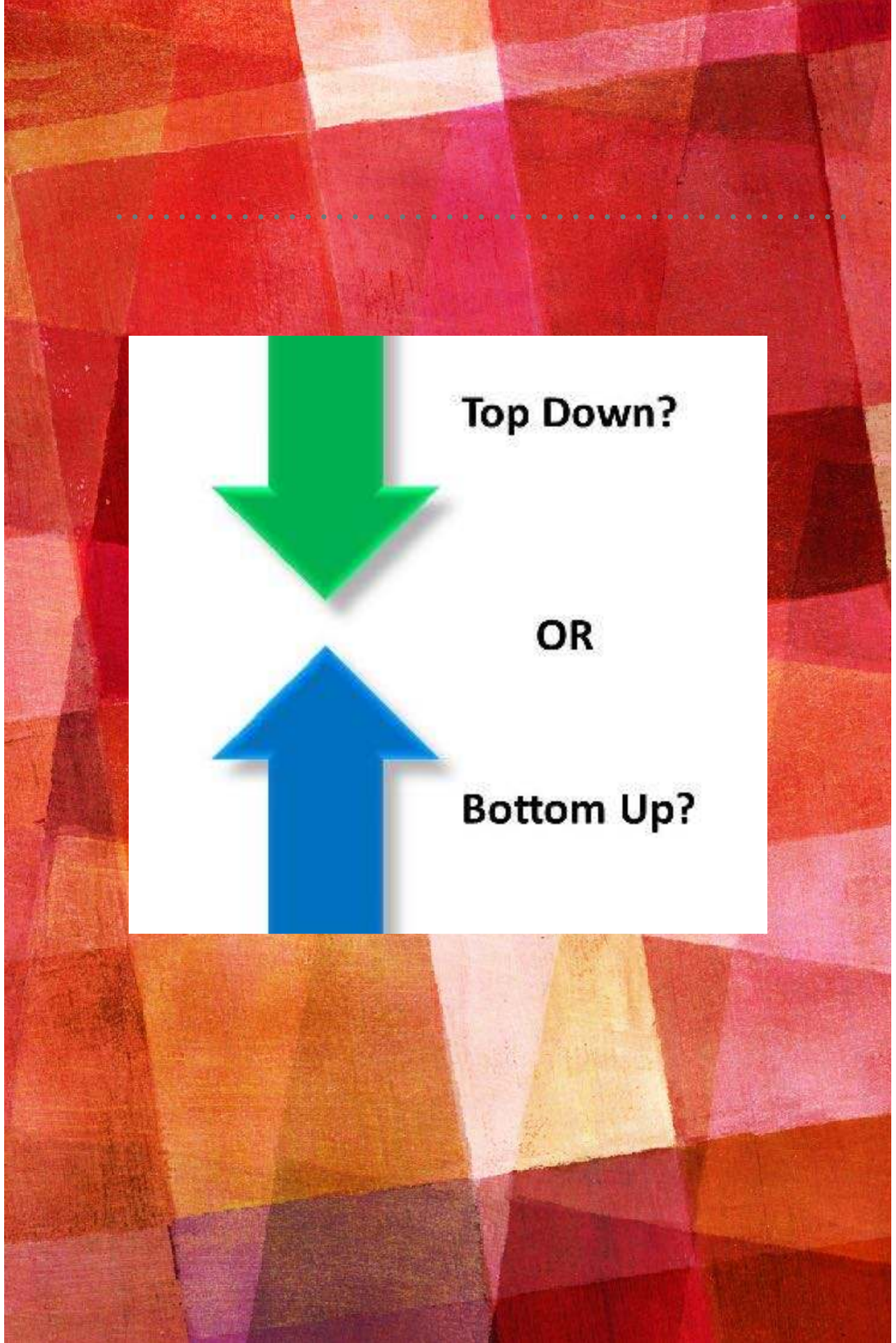
#4

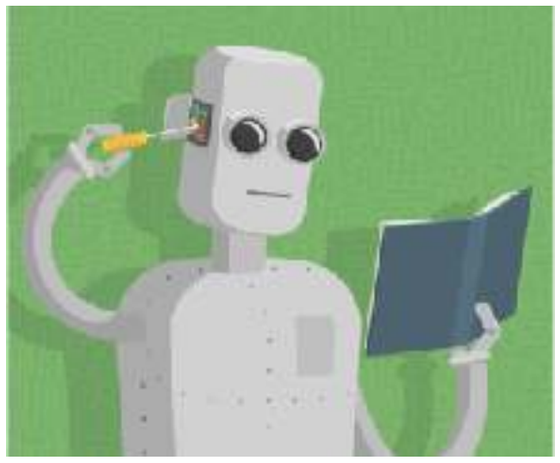

Serious
Escapist
Geared toward females
Geared toward males
Amadeus
Braveheart
The Color Purple
Sense and Sensibility
Lethal Weapon
Ocean's 11
Dave
The Lion King
The Princess Diaries
Dumb and Dumber
Independence Day
Gus

DEDUCTION VS INDUCTION

- Deductive reasoning works from general to specific.(Top-down approach) We go into hypothesis we can test, then we test these hypothesis with data to confirm theories.

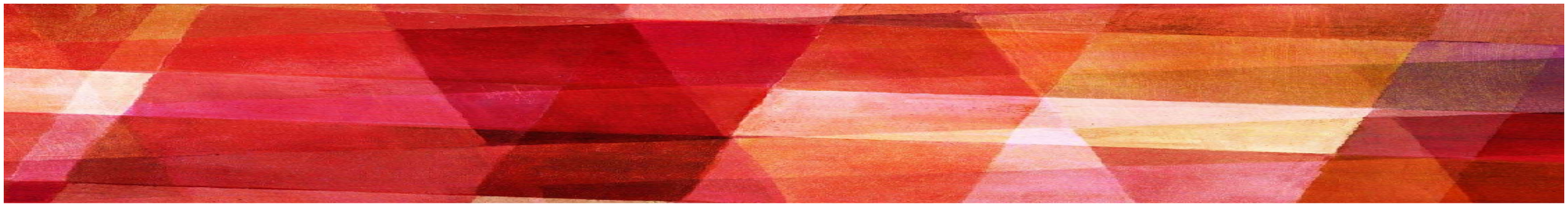
- Inductive reasoning works from specific observations to broader generalizations. (Bottom up approach)
We make observations and detect patterns, formulate hypotheses, and creating a model in the end.



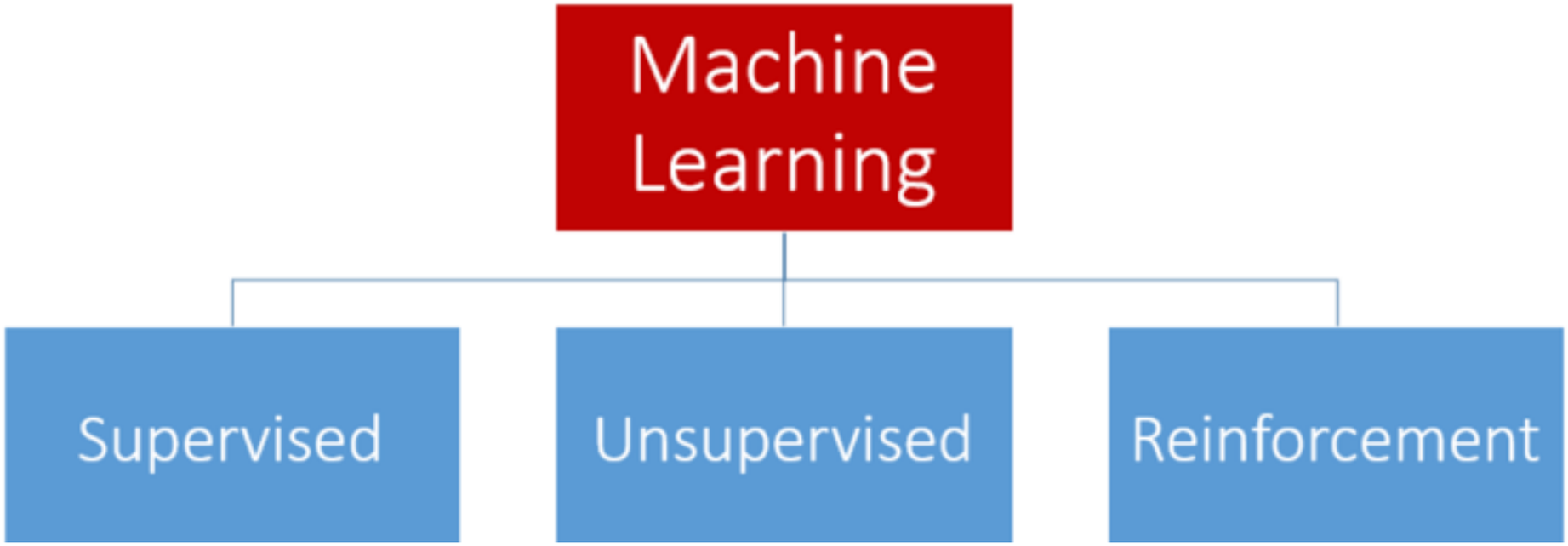


Elements of Machine Learning

- Generalization - how well a model performs on new data
- Data - Training Data - examples to learn from
  Test Data- examples used to test performance
- Models - Theoretical assumptions
  Knn, decision trees, naive bayes
- Algorithms - Learning algorithms that infer the model parameters from the data
  -Inference algorithms that infer prediction from a model



TYPES OF MACHINE LEARNING



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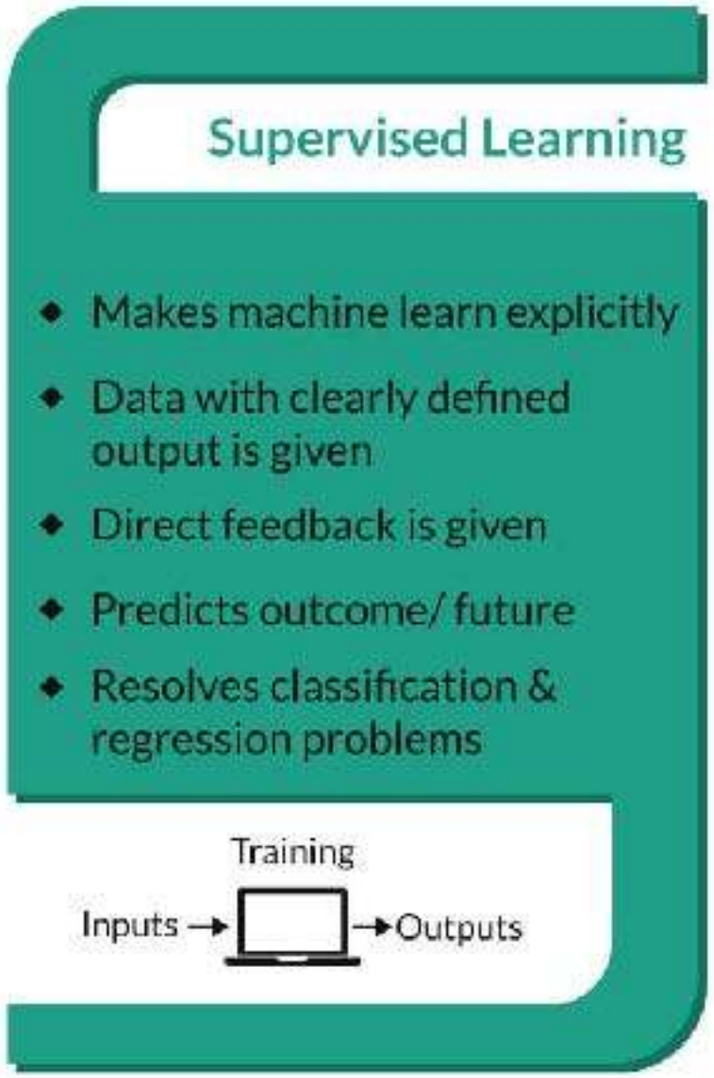
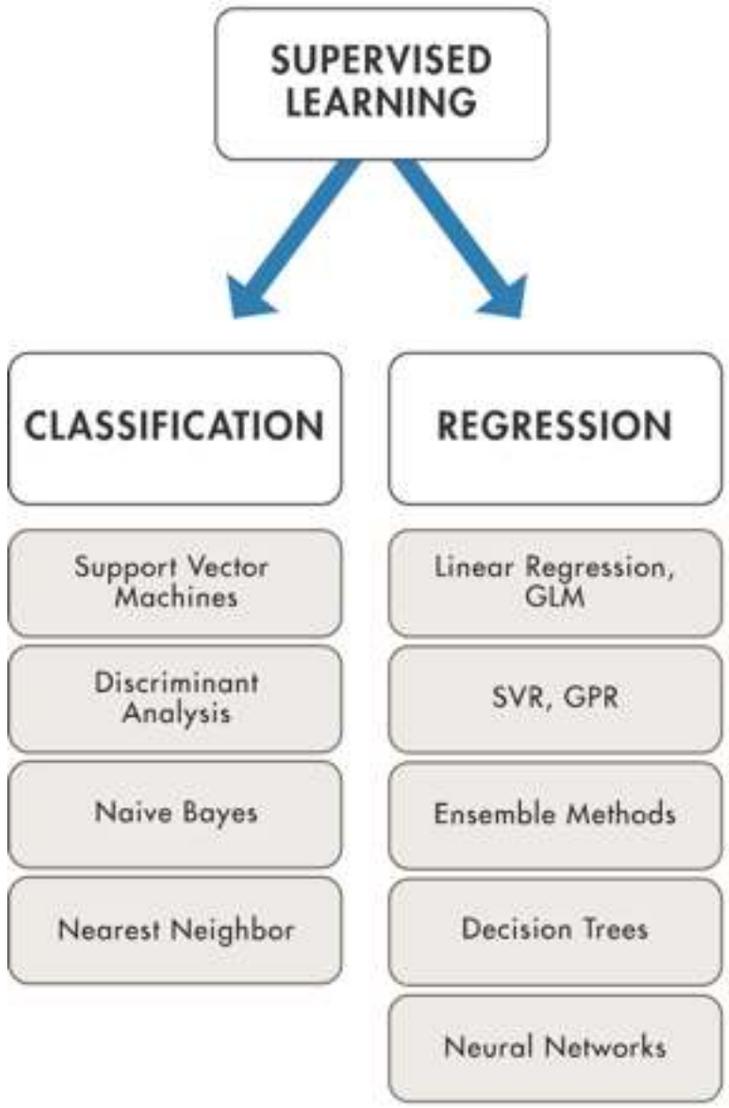




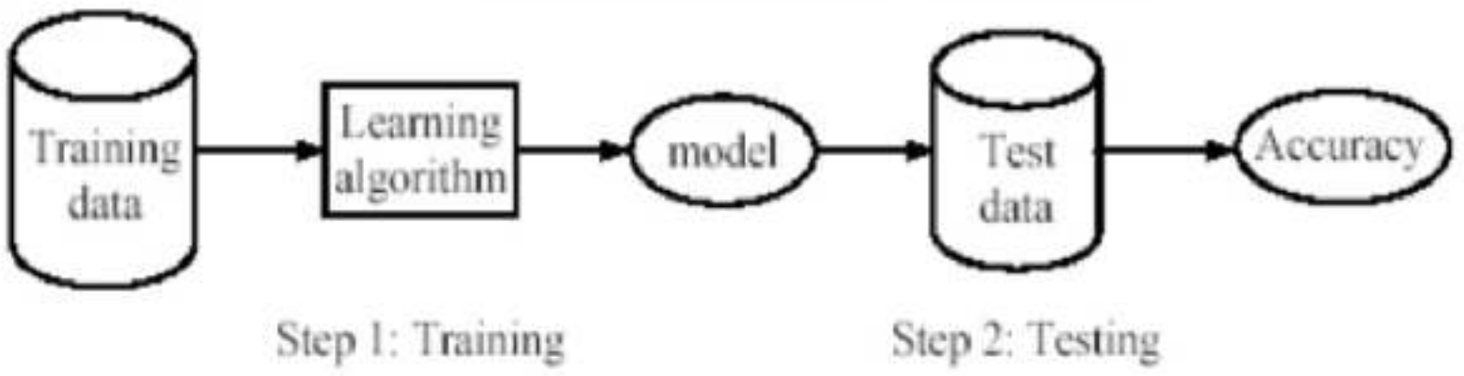
Develop predictive model based on both input and output data

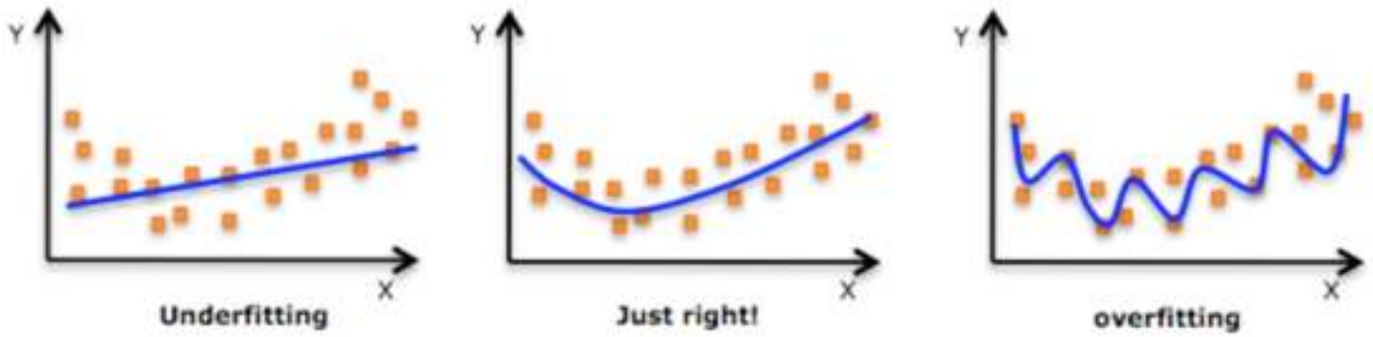
Supervised learning process: two steps

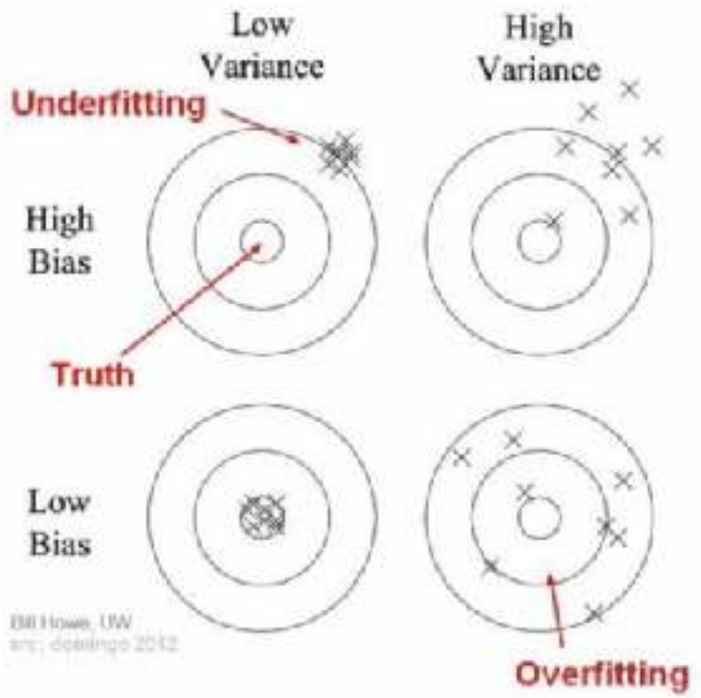
Learning (training): Learn a model using the training data

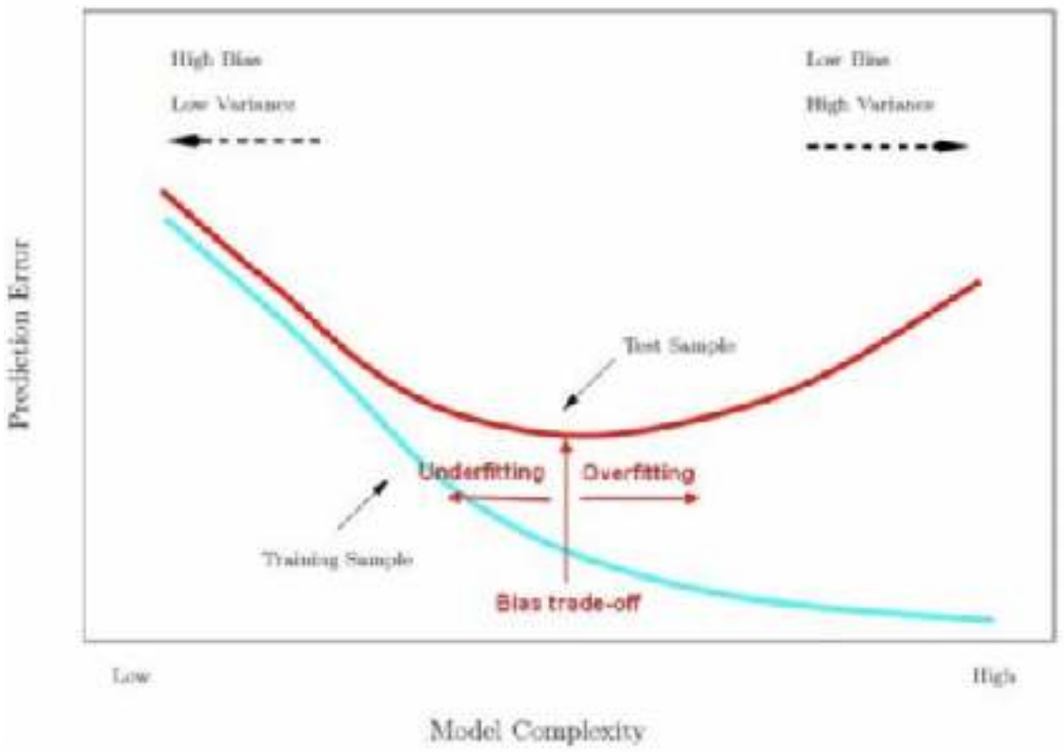
Testing: Test the model using unseen test data to assess the model accuracy

$$Accuracy = \frac{\text{Number of correct classifications}}{\text{Totalnumber of test cases}},$$



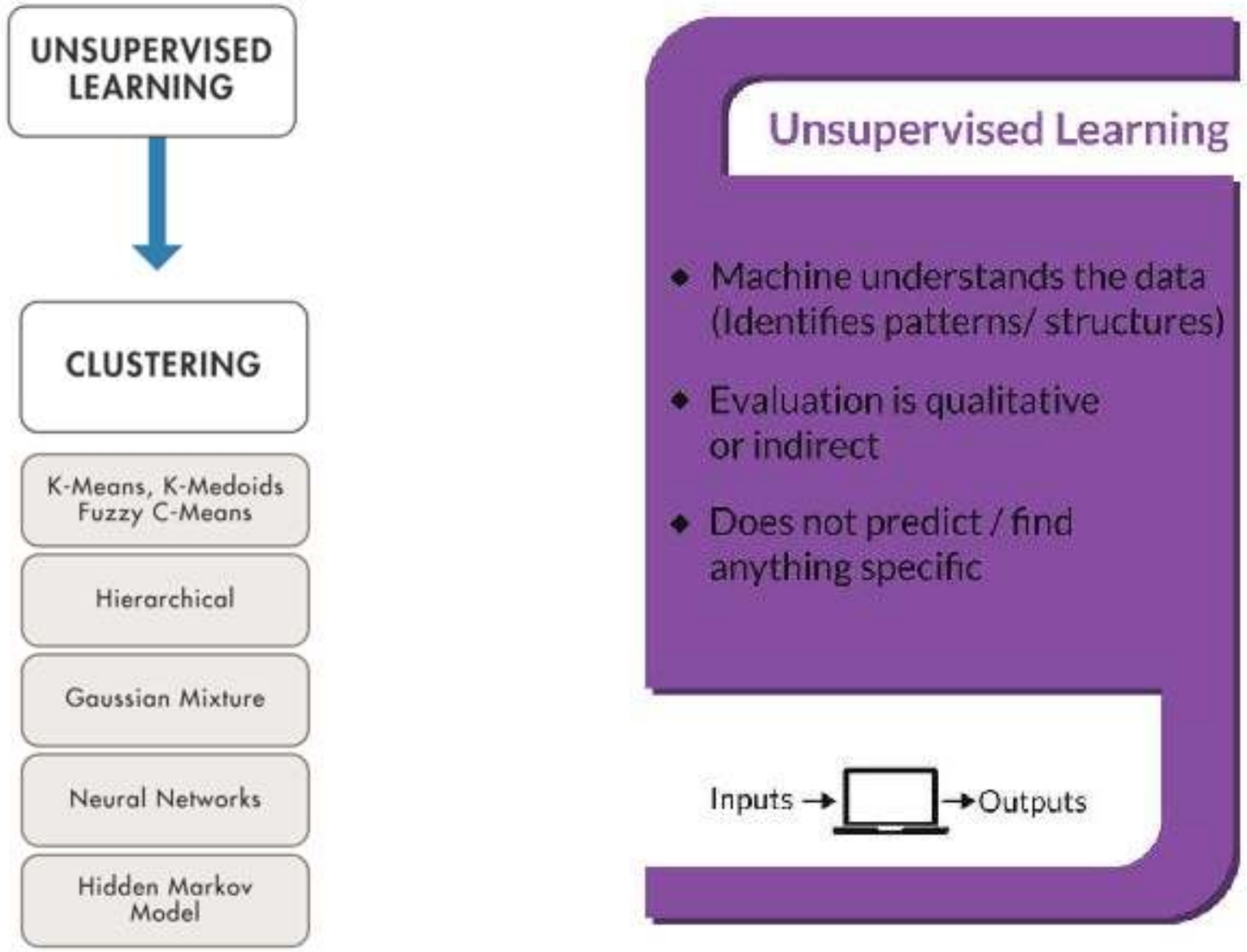






HOW GOOD IS OUR PREDICTION?

TYPES OF MACHINE LEARNING



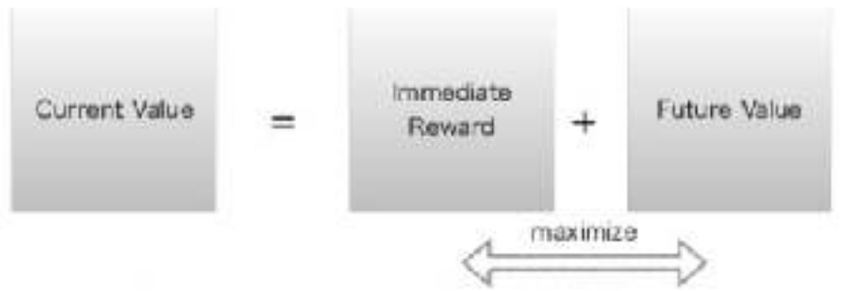
Group and interpret data based only on input data

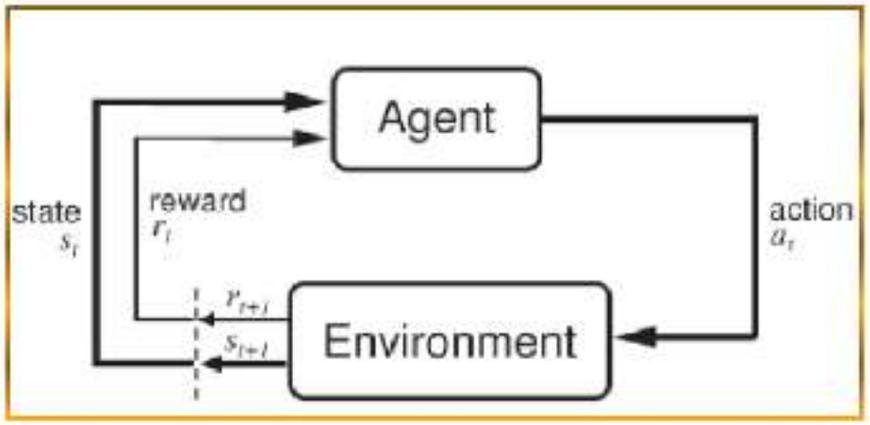
TYPES OF MACHINE LEARNING

Reinforcement Learning

- An approach to AI
- Reward based learning
- Learning from +ve & -ve reinforcement
- Machine learns how to act in a certain environment
- To maximize rewards

Structure of Bellman equation





Q learning
-Initiate Q table
-Observes
-Execute a, observe s',r
-Update Q with<s,a,s',r>

Dyna Q
-Learn Model
-Hallucinate Experience
-Update Q

Is this Machine Learning?