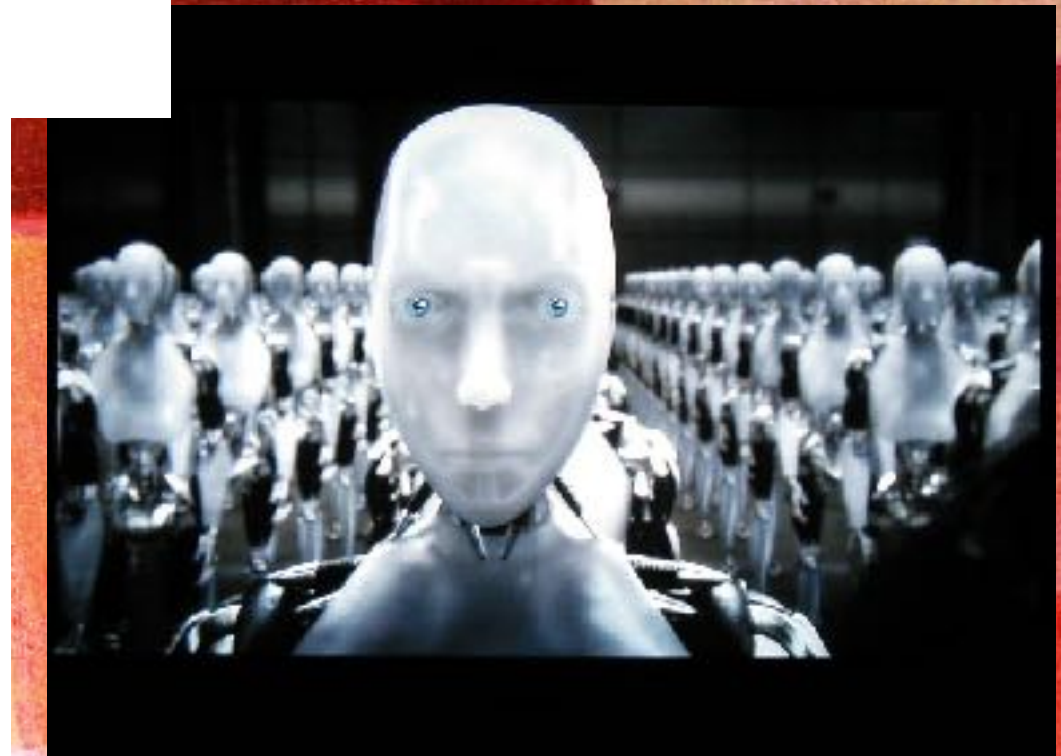
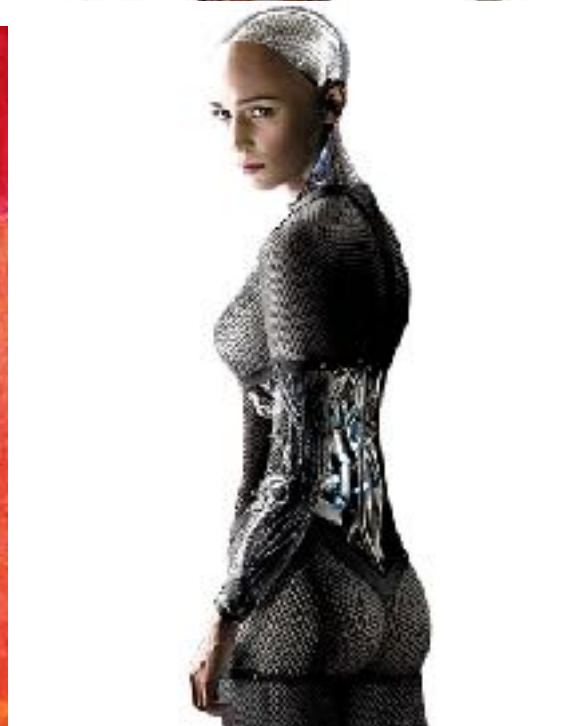




Introduction to

MACHINE LEARNING

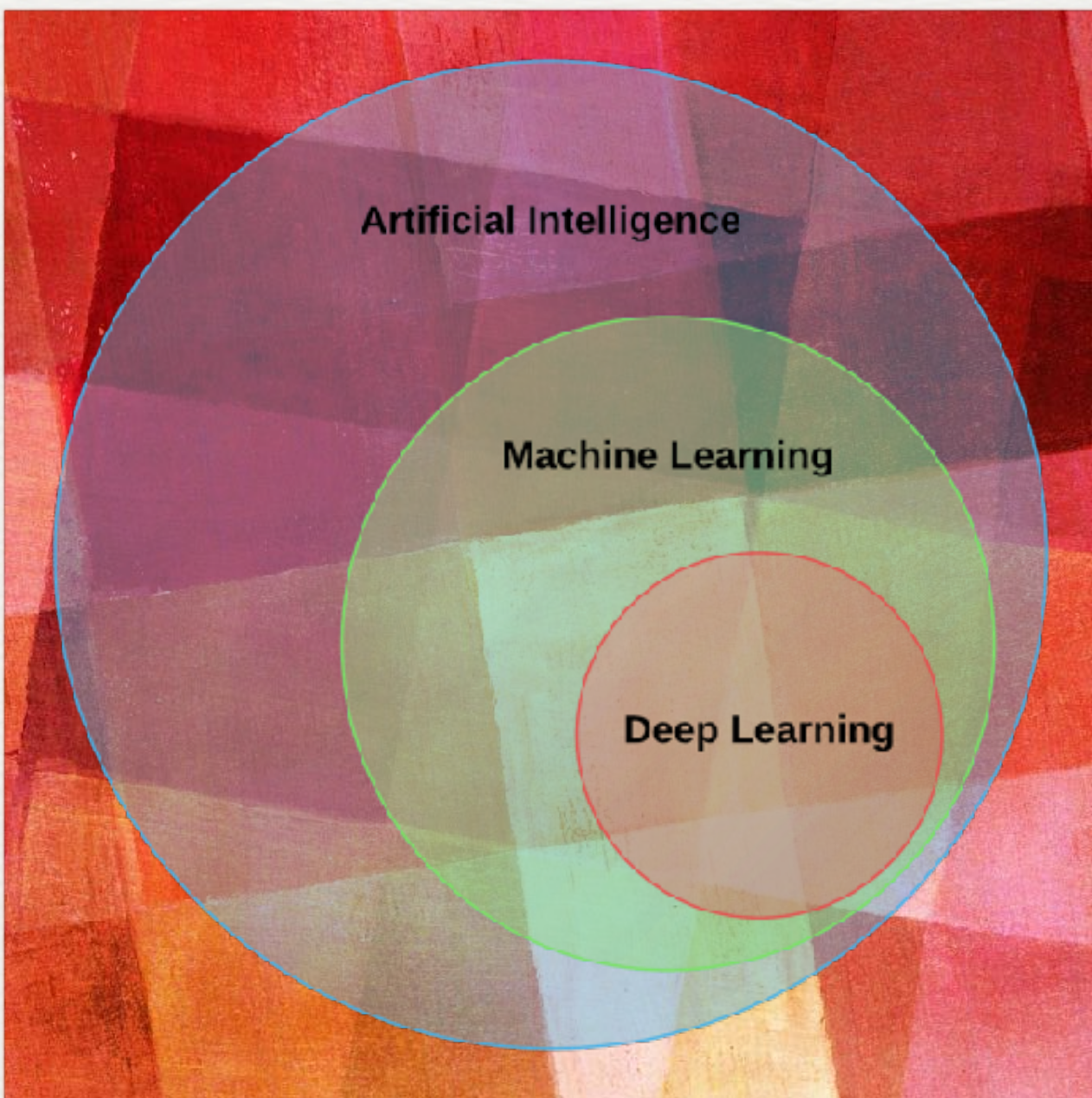


WHAT IS MACHINE LEARNING?

.....

- 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

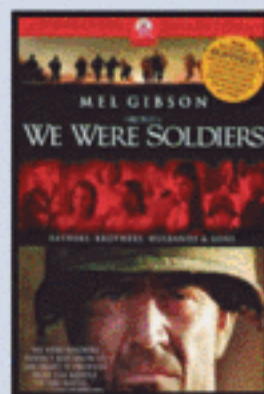


Where is ML Used Today

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



Joe



#3



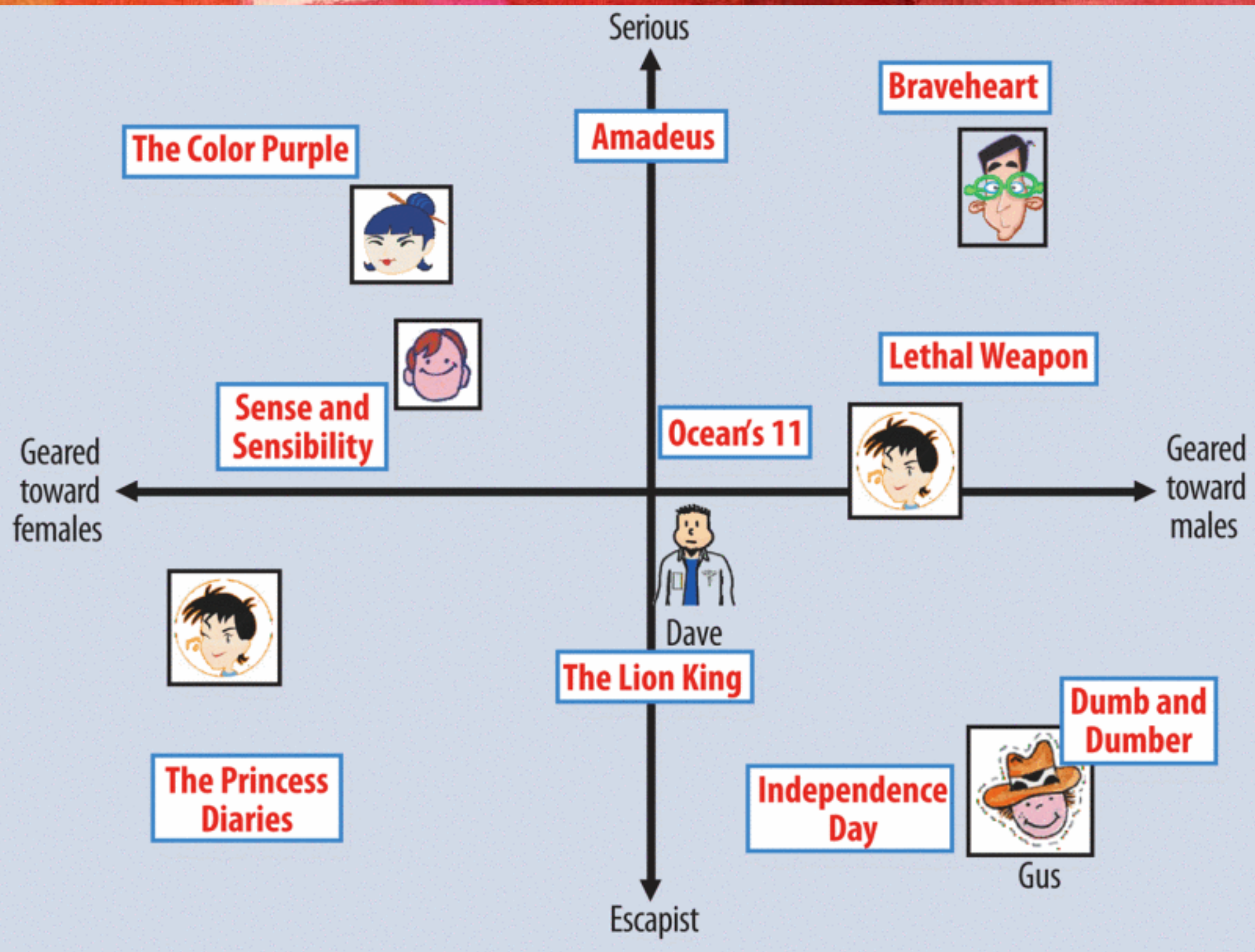
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#1

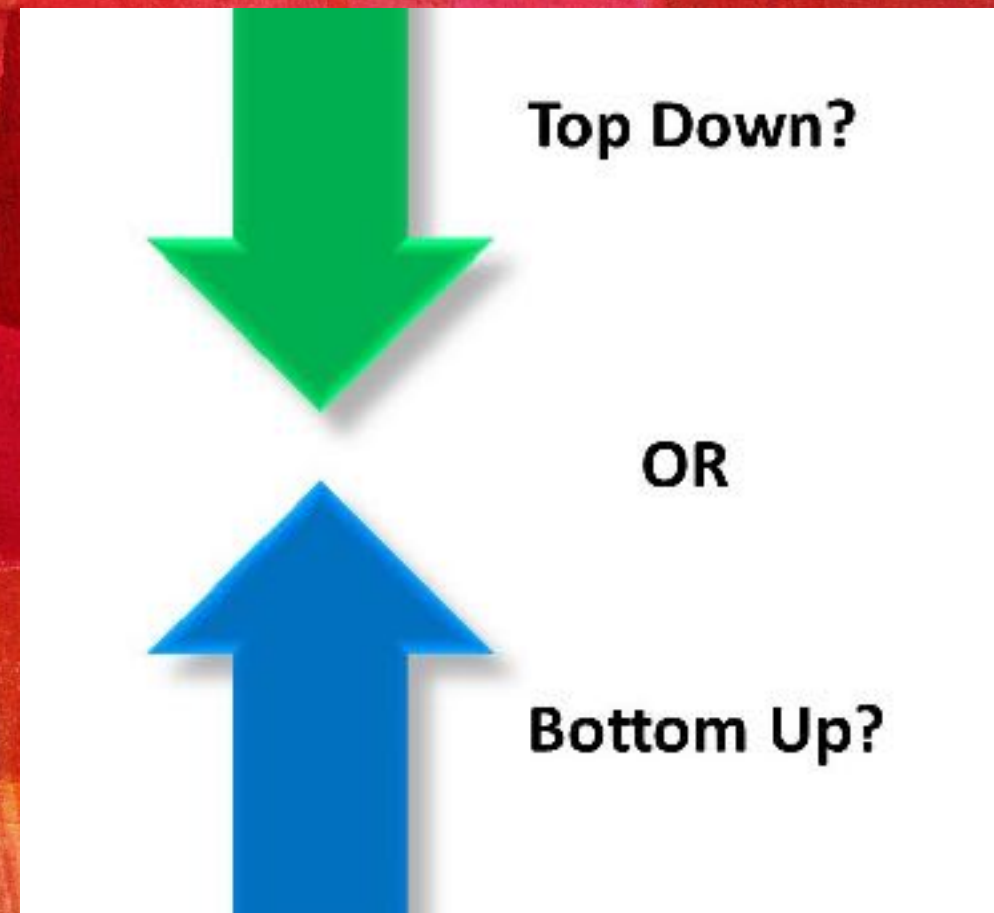


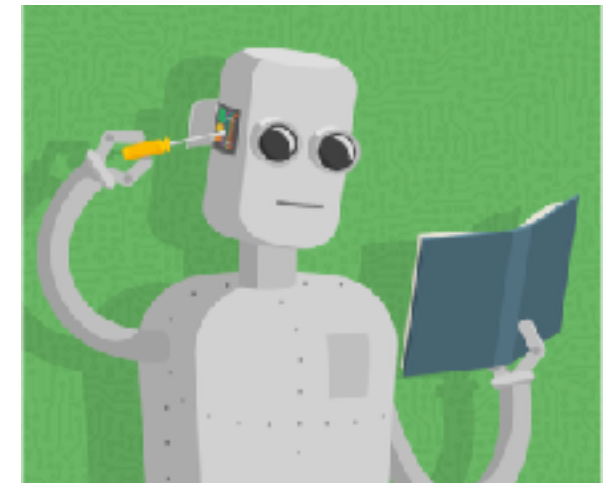
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DEDUCTION VS INDUCTION

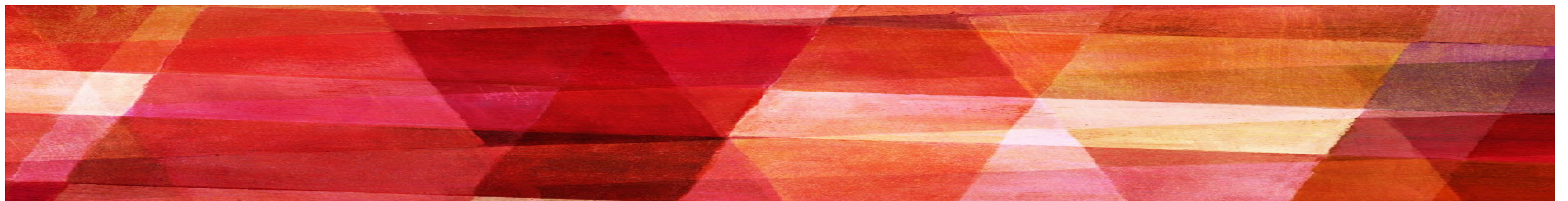
- Deductive reasoning works from general to specific. (Top-down approach) We go into hypothesis we can test, then we test these hypothesis with data to confirm theories.
- Inductive reasoning works from specific observations to broader generalizations. (Bottom up approach) We make observations and detect patterns, formulate hypotheses, and creating a model in the end.



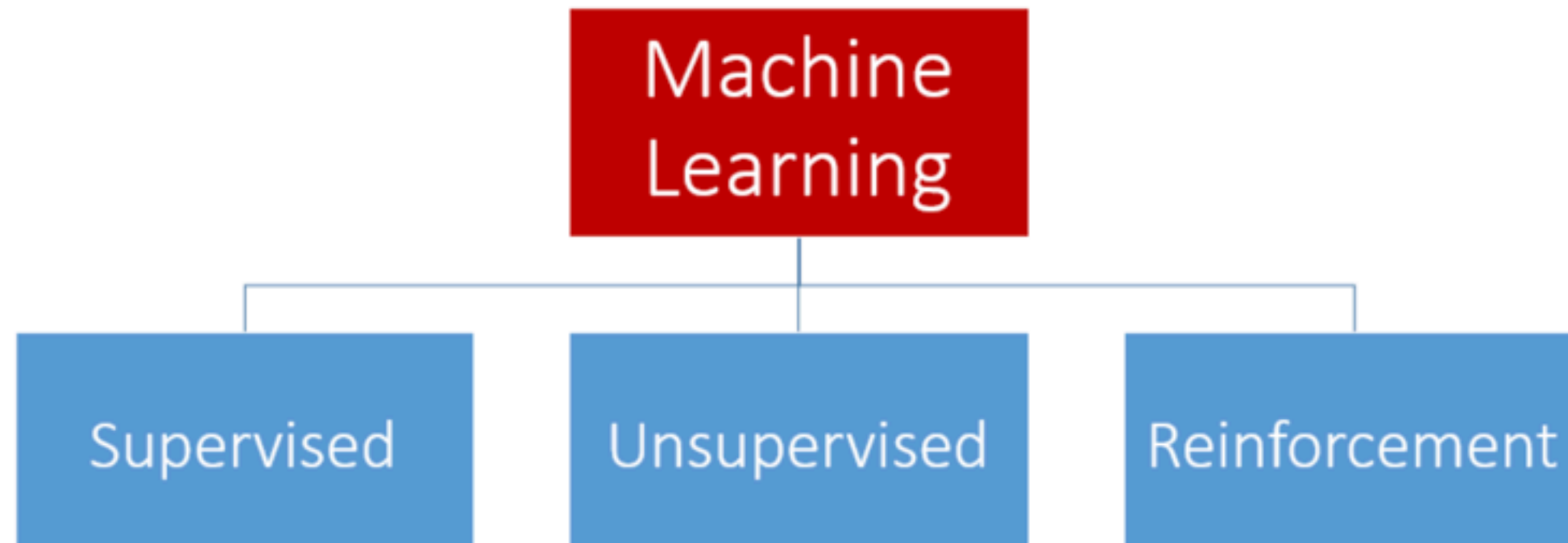


Elements of Machine Learning

- 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



TYPES OF MACHINE LEARNING

Supervised Learning

- ◆ Makes machine learn explicitly
- ◆ Data with clearly defined output is given
- ◆ Direct feedback is given
- ◆ Predicts outcome/ future
- ◆ Resolves classification & regression problems



SUPERVISED LEARNING

CLASSIFICATION

Support Vector
Machines

Discriminant
Analysis

Naive Bayes

Nearest Neighbor

REGRESSION

Linear Regression,
GLM

SVR, GPR

Ensemble Methods

Decision Trees

Neural Networks

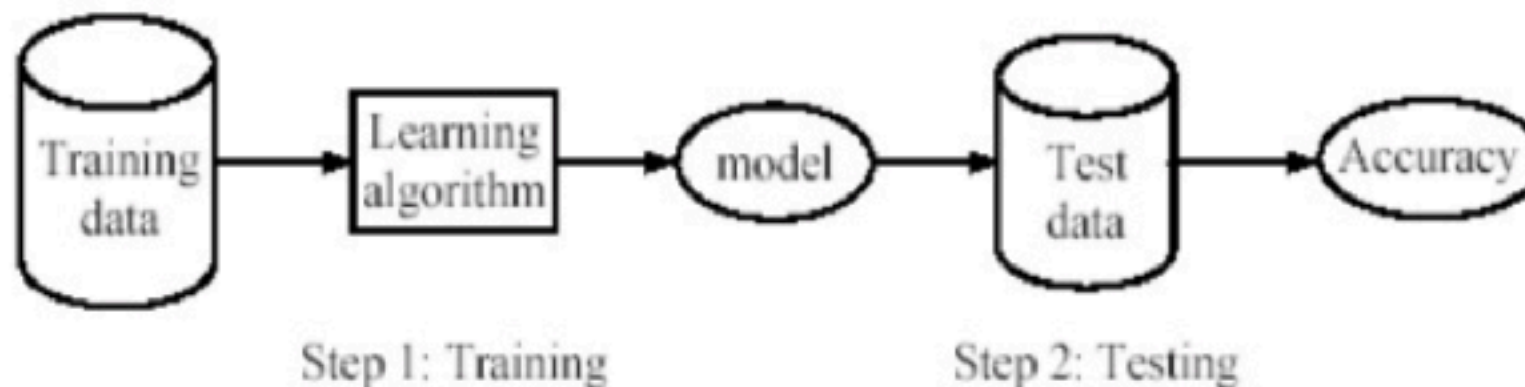
Develop predictive model based on both input and output data

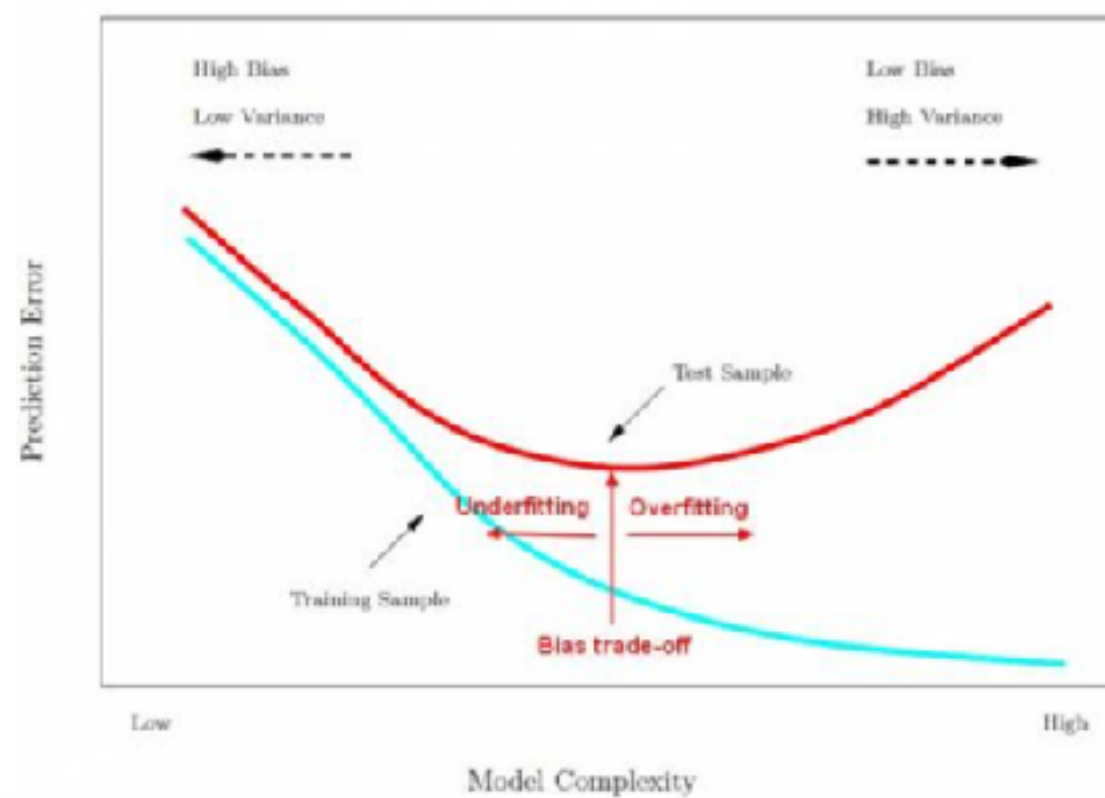
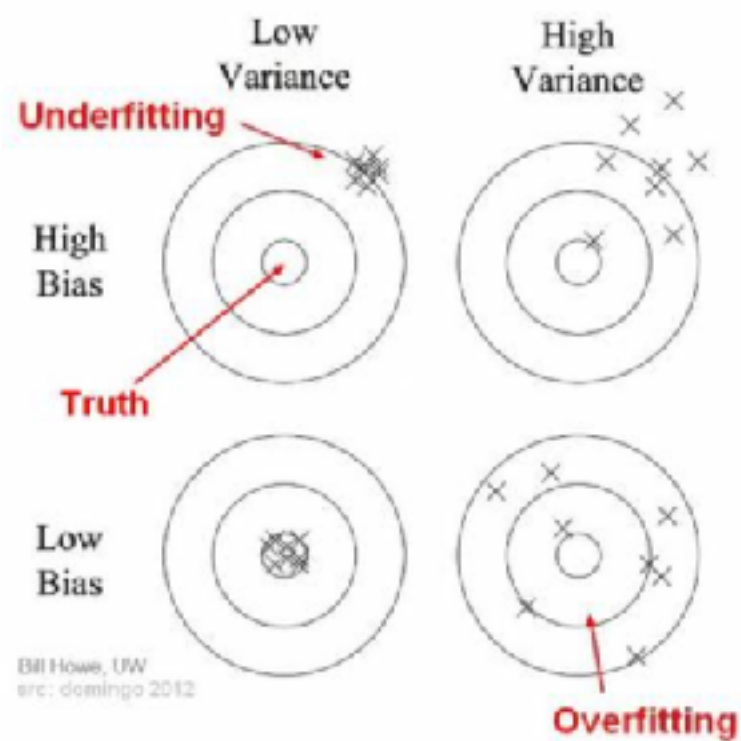
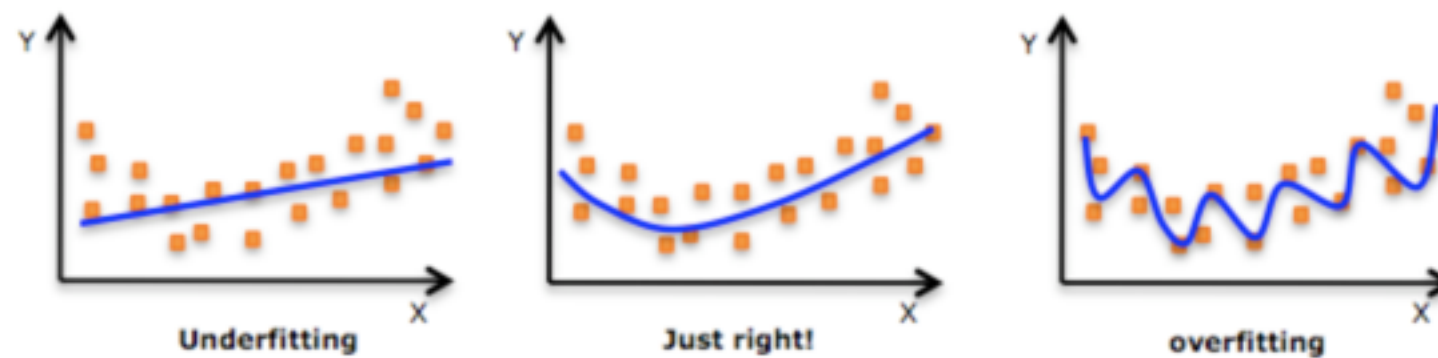
Supervised learning process: two steps

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

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

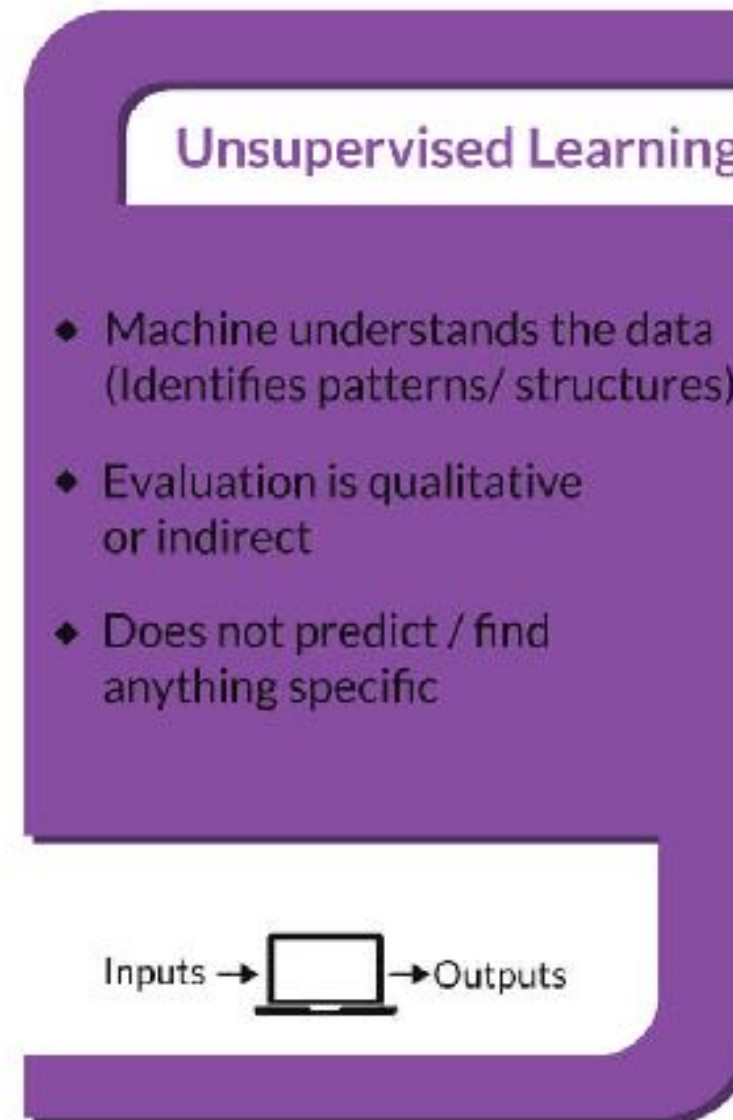
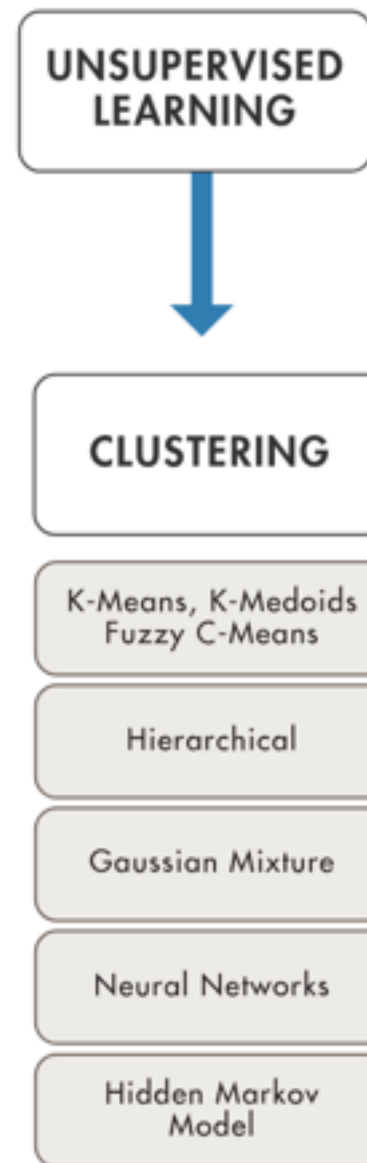
$$Accuracy = \frac{\text{Number of correct classifications}}{\text{Total number of test cases}},$$





HOW GOOD IS OUR PREDICTION?

TYPES OF MACHINE LEARNING



Group and interpret data based only on input data

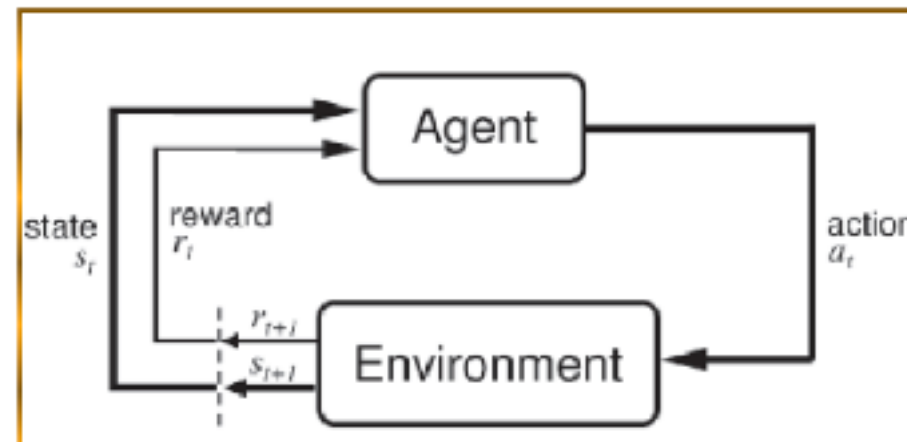
TYPES OF MACHINE LEARNING

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

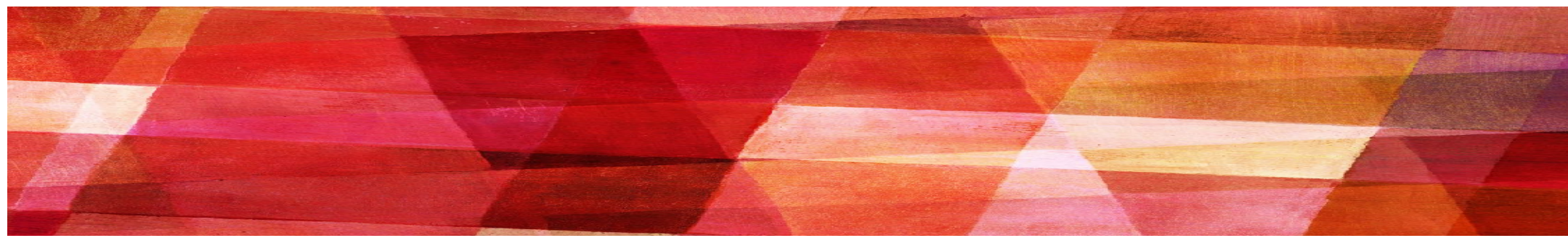


Q learning

- Initiate Q table
- Observes
- Execute a, observe s', r
- Update Q with $\langle s, a, s', r \rangle$

Dyna Q

- Learn Model
- Hallucinate Experience
- Update Q



Is this Machine Learning?

