

MACHINE LEARNING

Electrical Summer Workshops (ESW) 2022

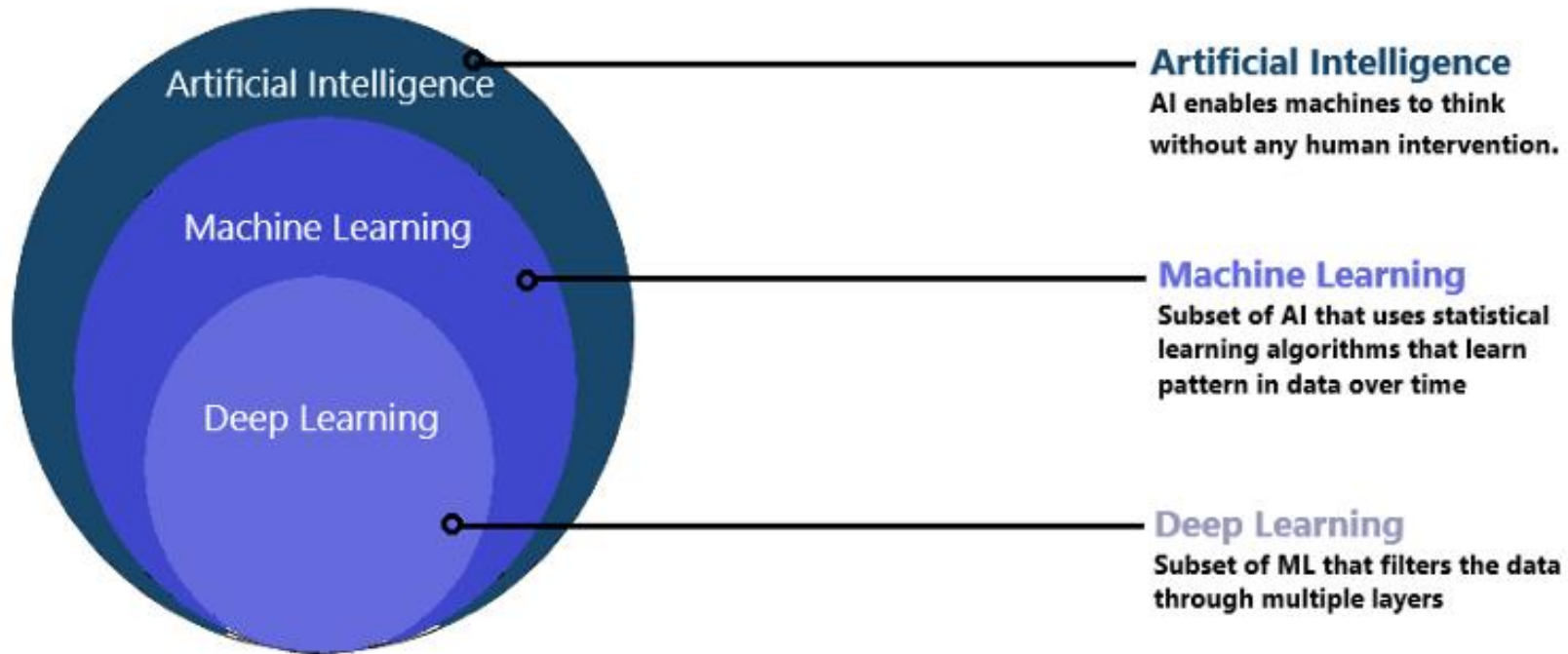
Electrical Engineering Department - Sharif University of Technology

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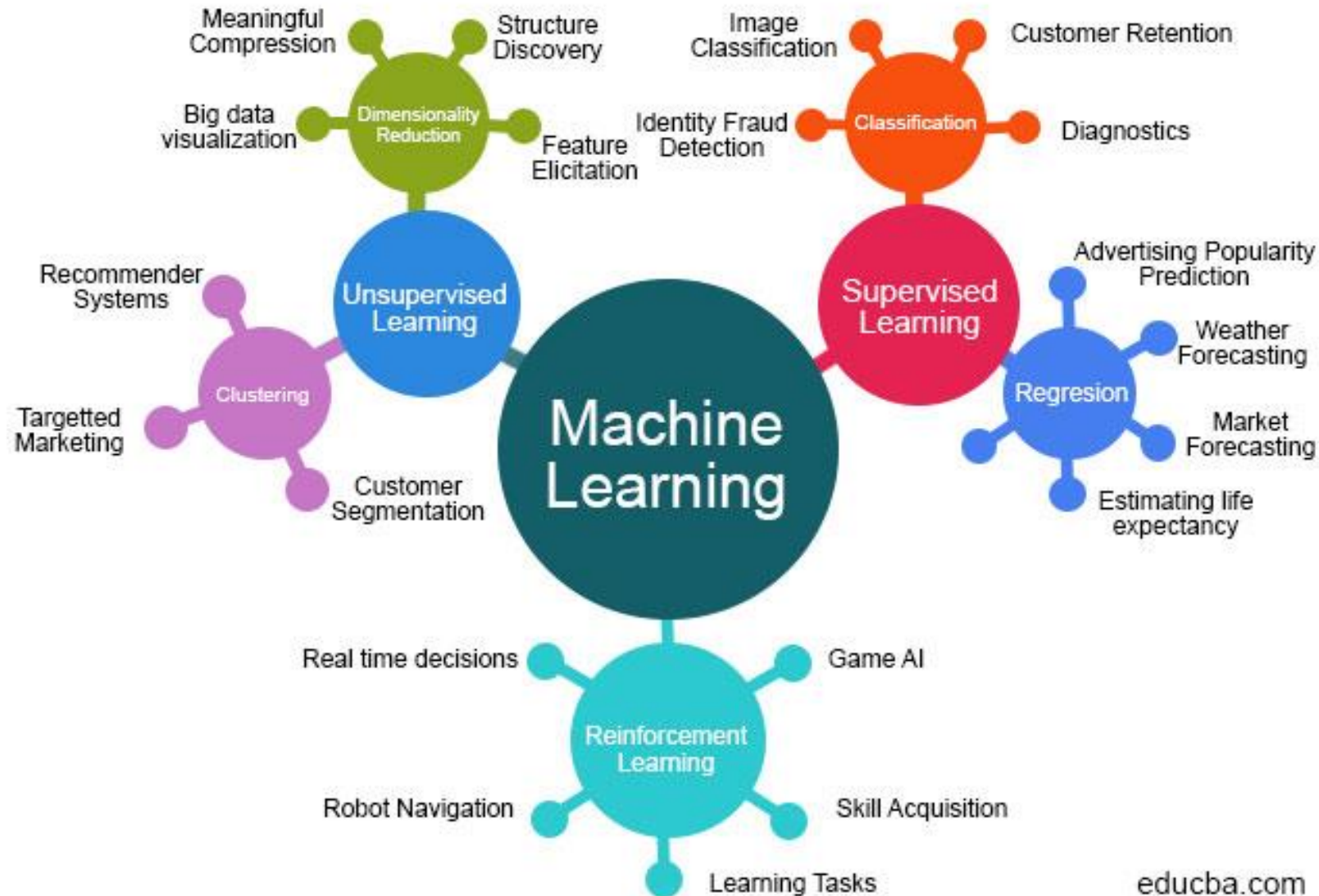


INTRODUCTION

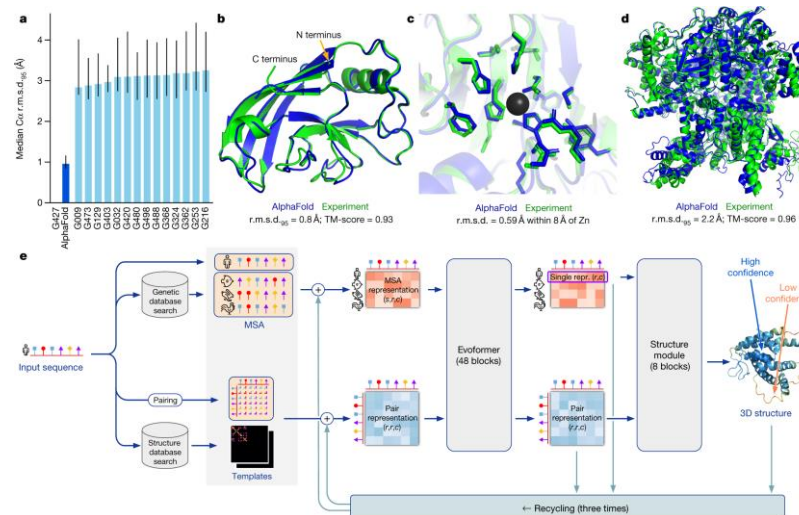
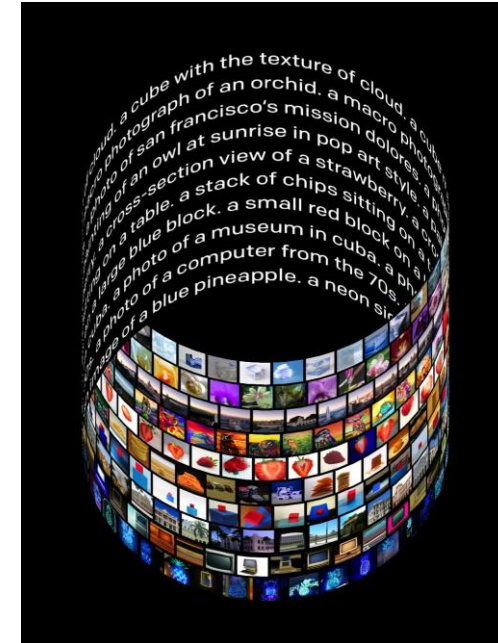
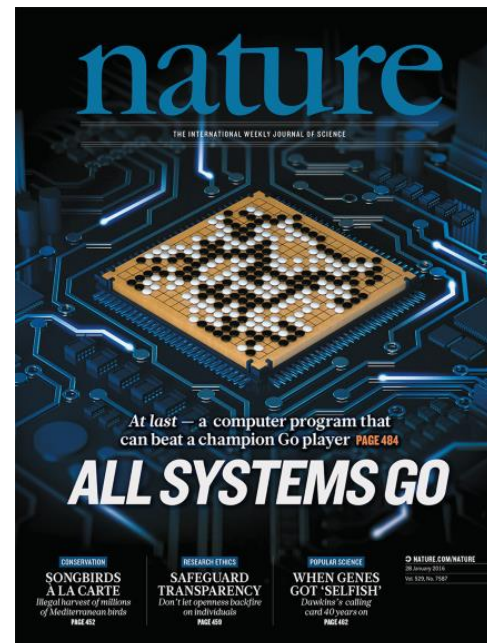
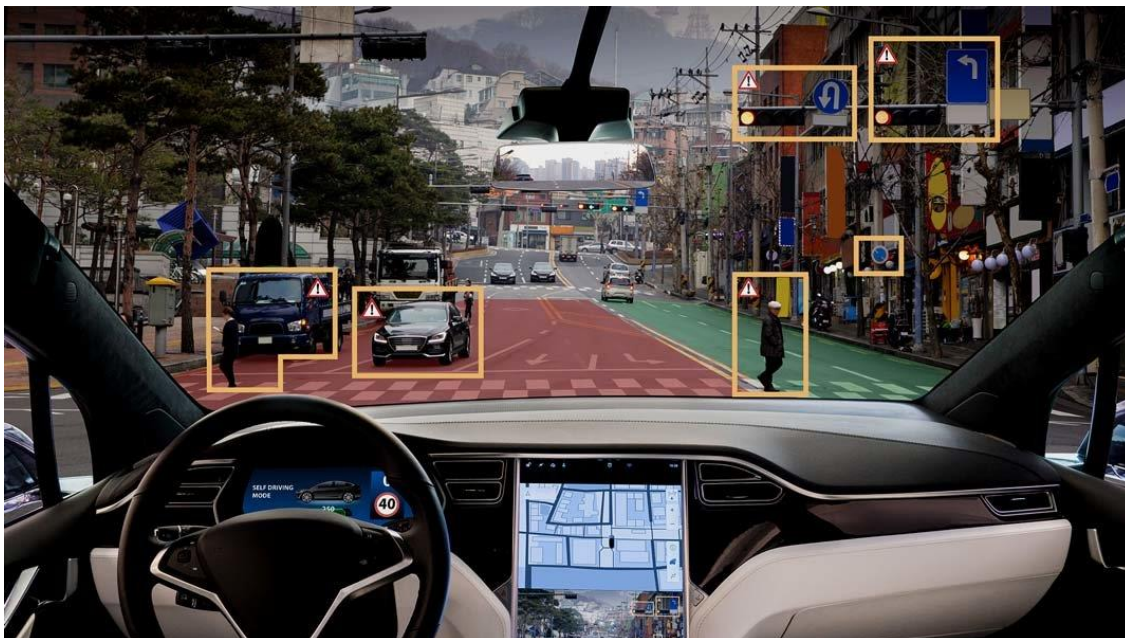
What is ML?



Machine Learning Algorithms

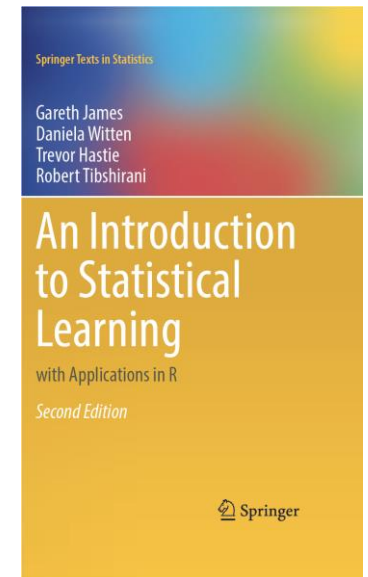
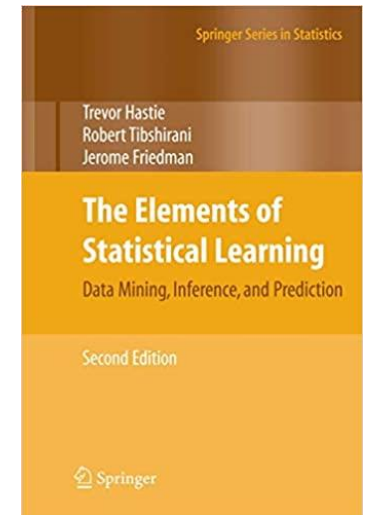


Why ML?



Course Overview

- Week 1
 - Introduction to ML
 - Linear Regression
 - Regularization
 - Logistic Regression
- Week 2
 - Support Vector Machines (SVM)
 - Decision Trees & Ensemble Methods (bagging, boosting, random forests, XGboost)
- Week 3
 - Dimensionality Reduction (PCA, Kernel PCA, t-SNE)
 - Clustering (K-means, Expectation Maximization, ...)
- Week 4
 - Neural Networks
 - Multi Layer Perceptrons (MLP)
 - Convolutional Neural Networks (CNN)
 - Recurrent Neural Networks (RNN)



Prerequisites

- Linear Algebra
 - Basic Matrix Operations
 - Matrix Decompositions (SVD, Eigen-decomposition)
 - Matrix Calculus
- Probability and Statistics
 - Expectation and Variance
 - Covariance Matrix
- Programming in Python

Notation Conventions

- Y refers to true target values.
- \hat{Y} refers to value of predictions of our model.
- Subscript j refers to j 'th variable (feature).
- Superscript i refers to i 'th sample.
 - So $x_j^{(i)}$ means j 'th feature of i 'th sample.
- Non-bold letters denote scalars.
- Capital bold letters denote matrices.
- Small bold letters denote vectors.