Machine Learning

Faculty

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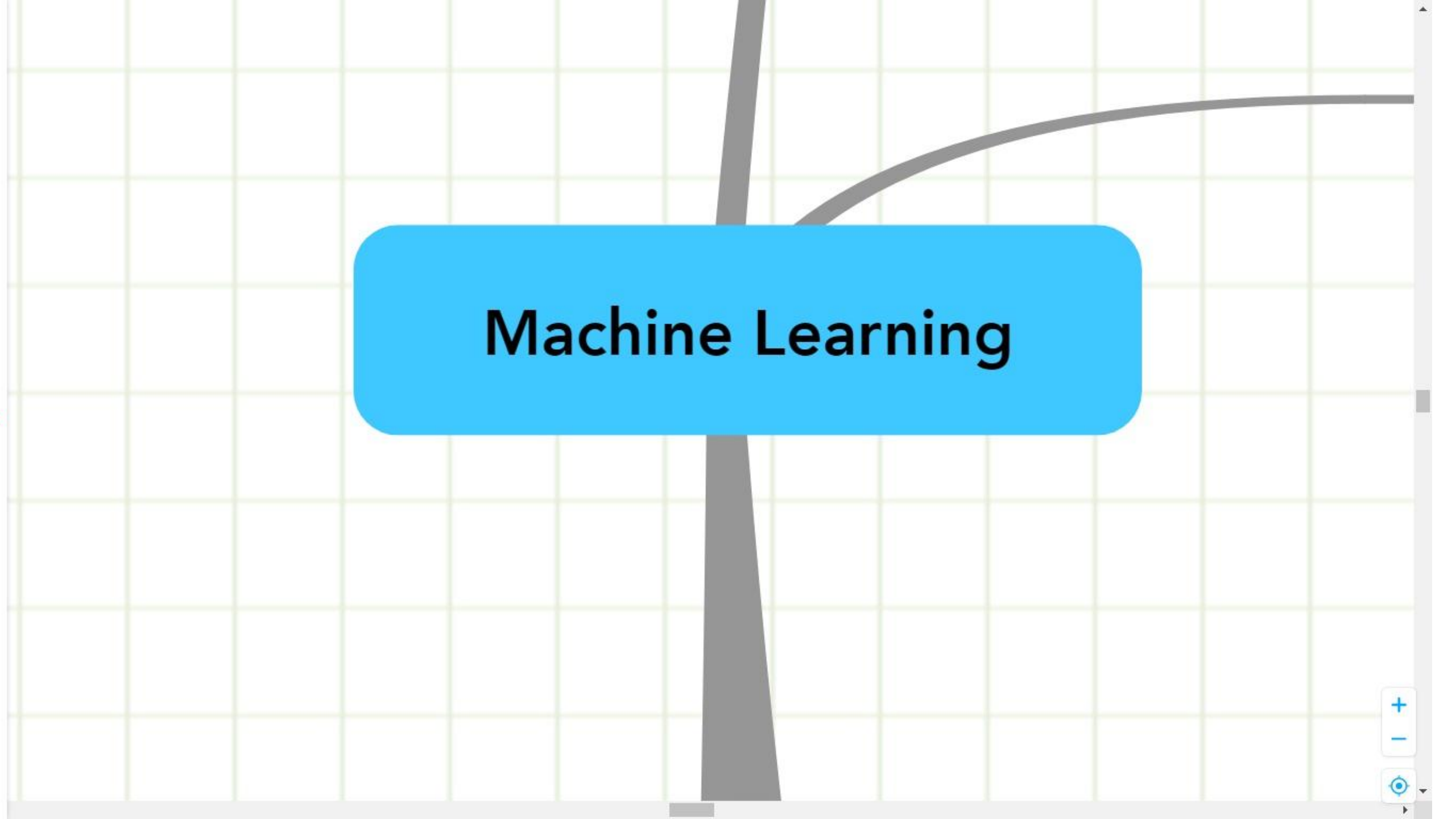
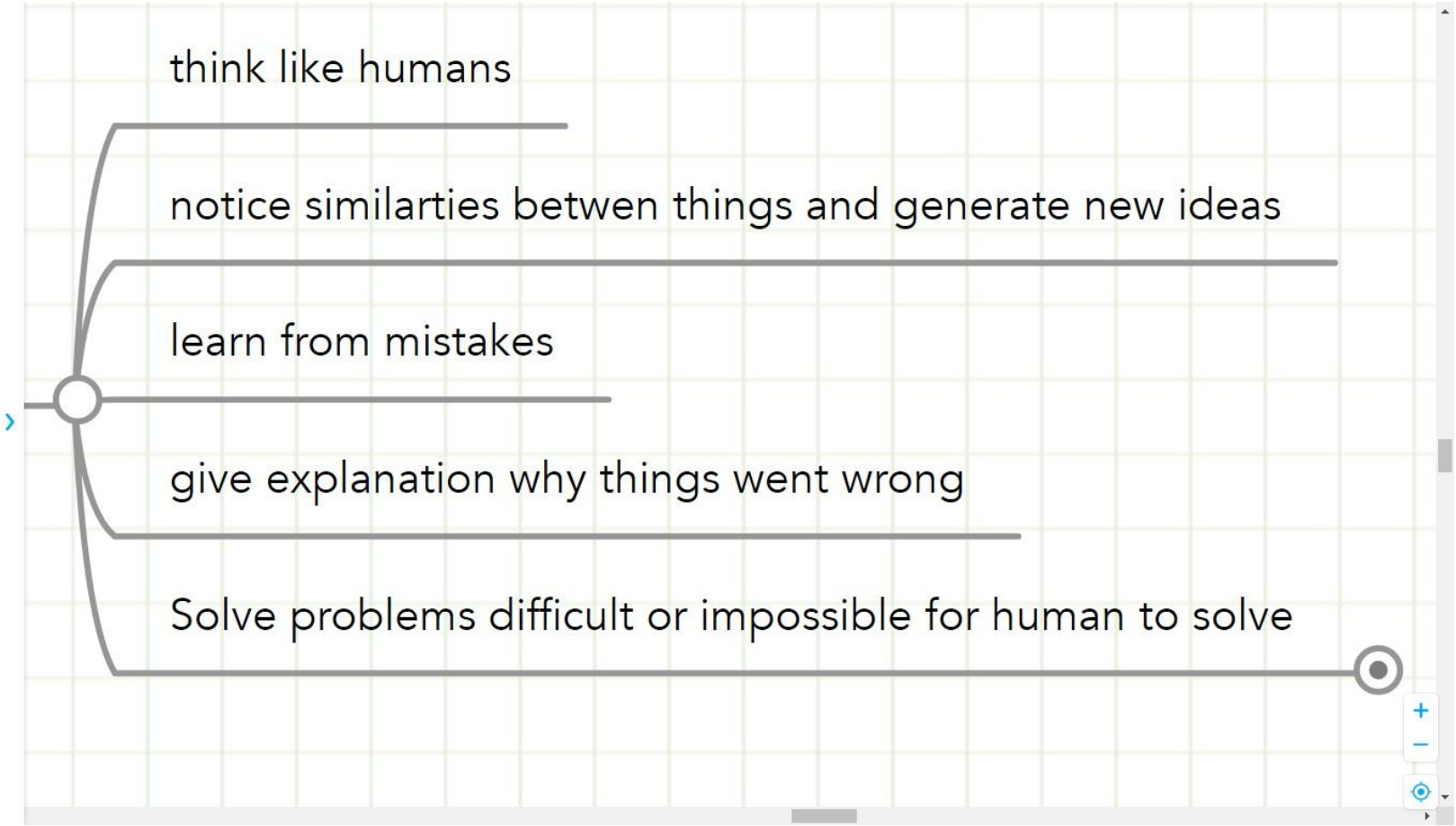
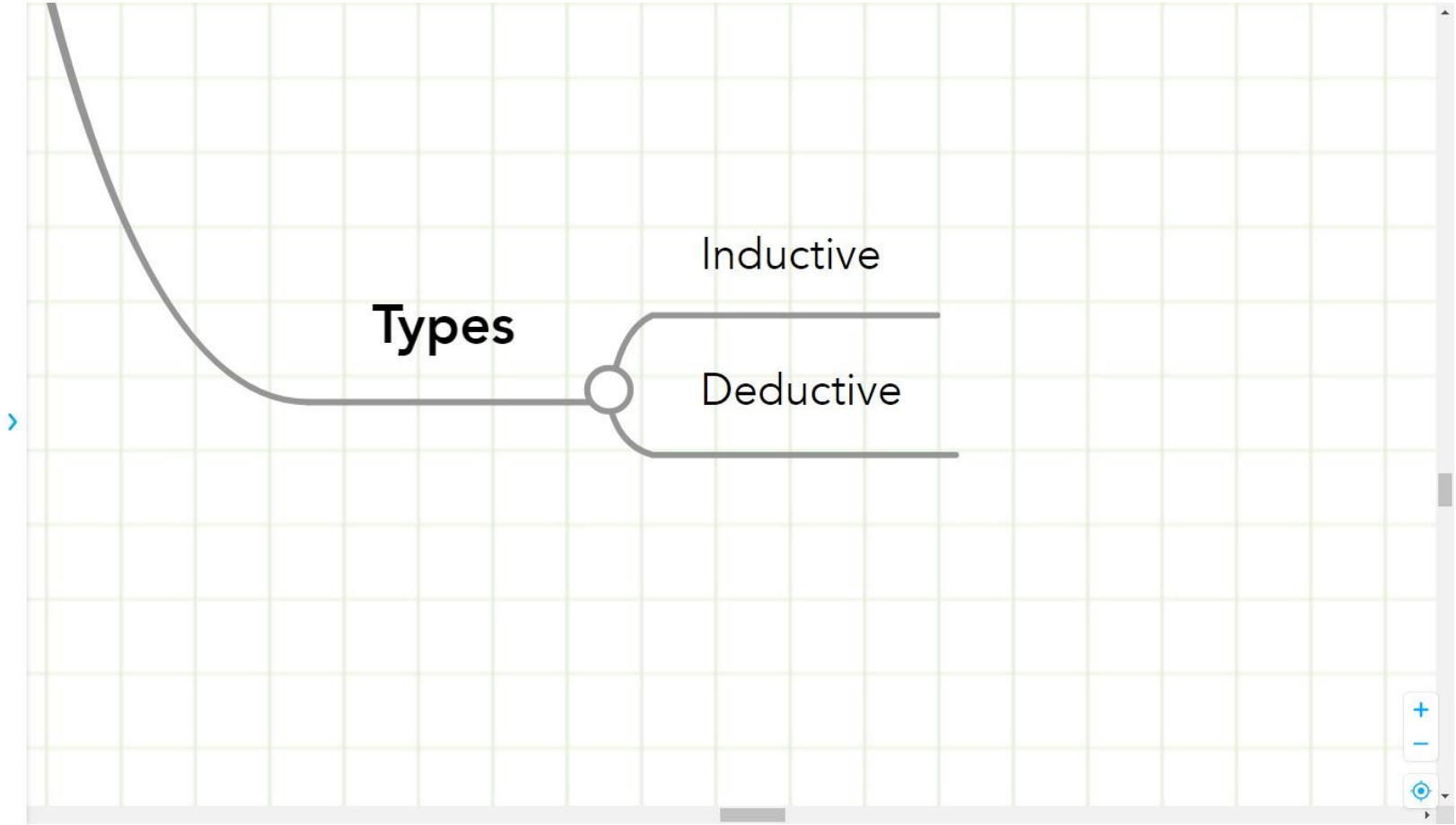
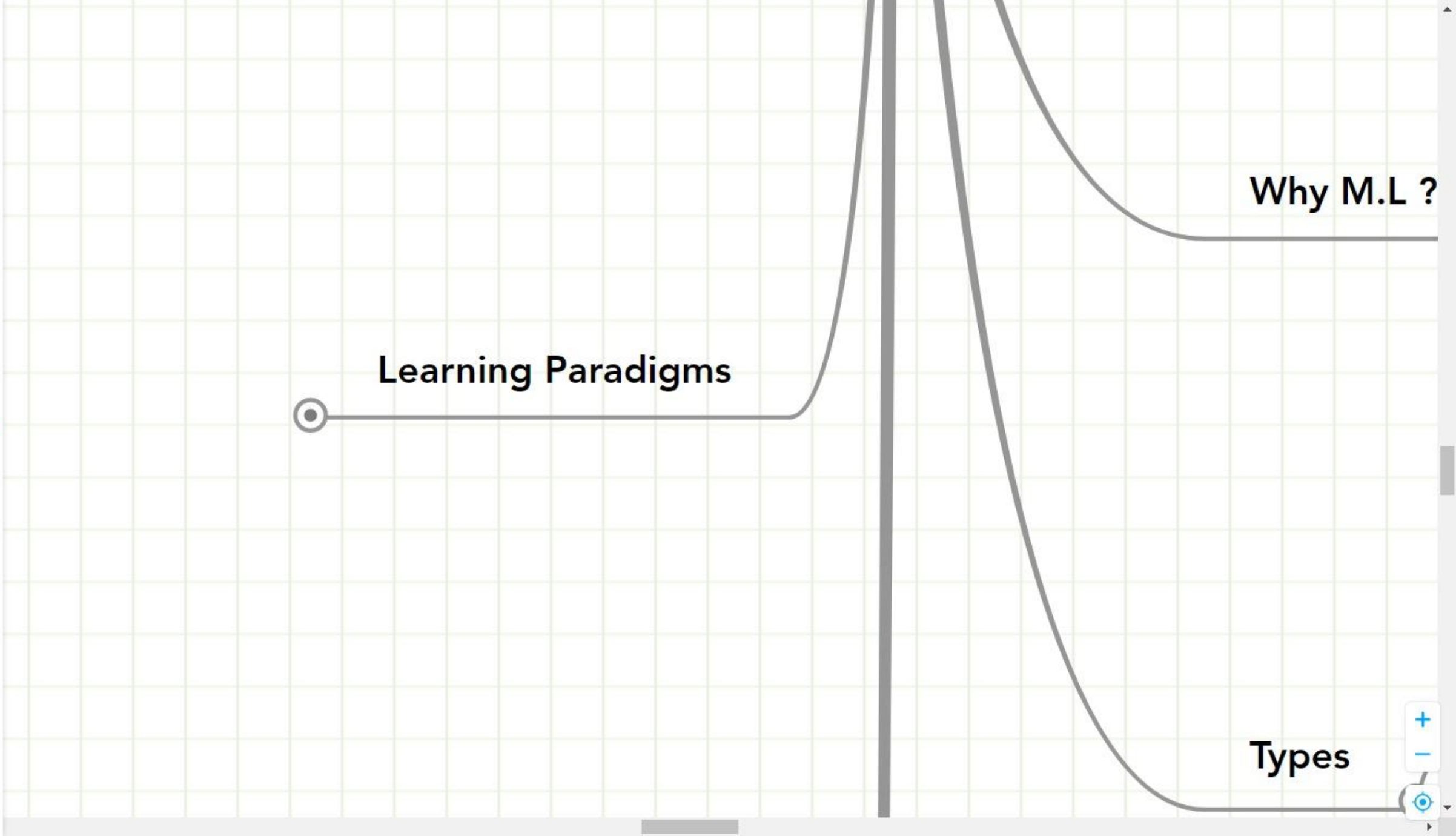

Machine Learning

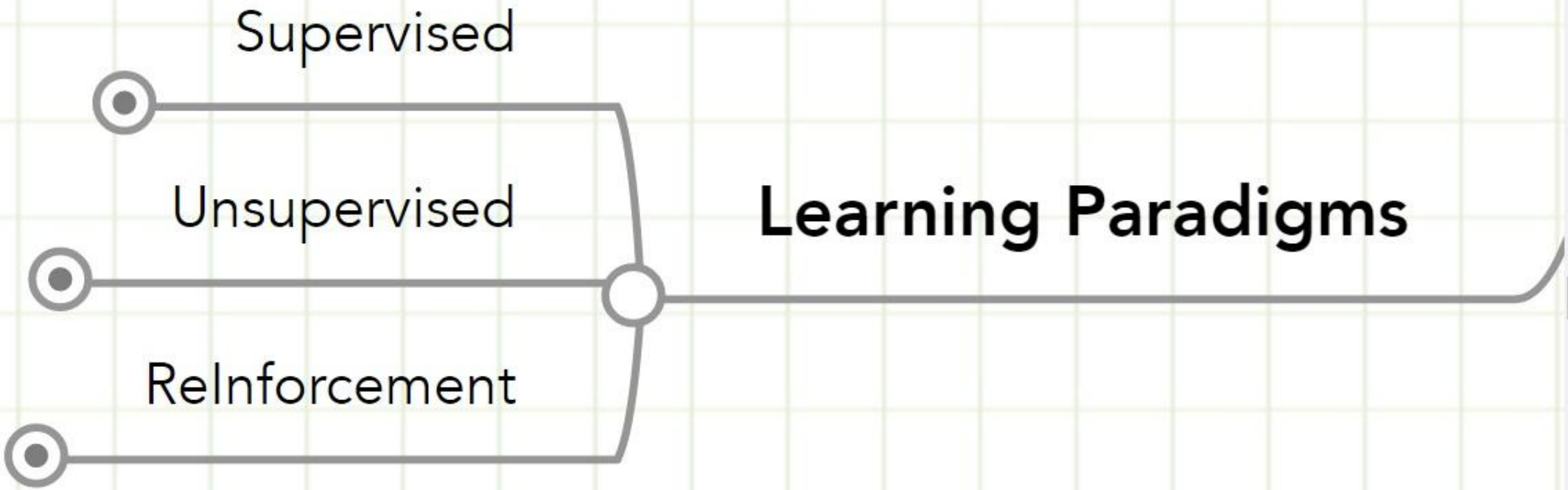
Why ML?

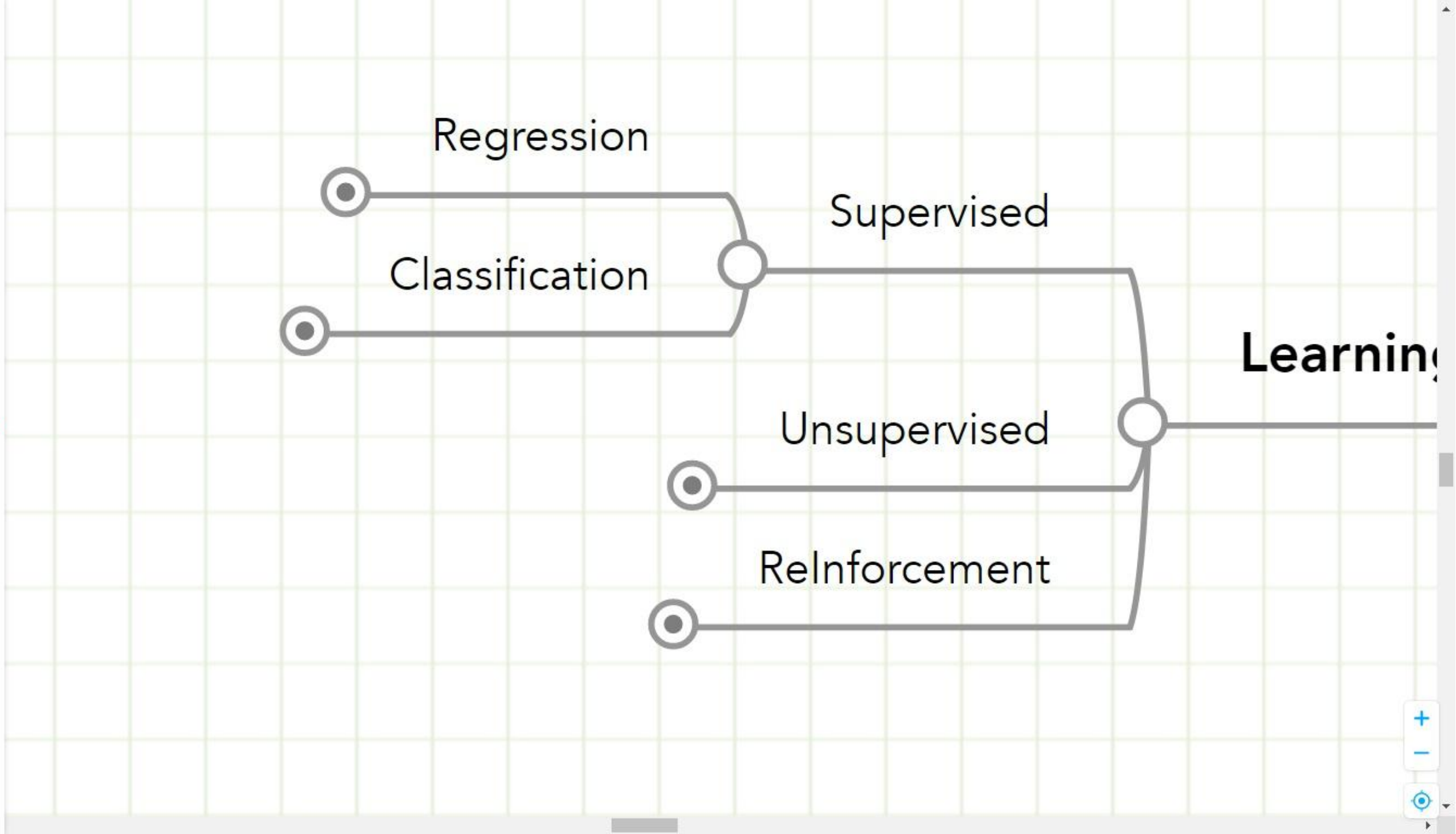

think like humans
notice similarties betwen things and generate new ideas
learn from mistakes
give explanation why things went wrong
Solve problems difficult or impossible for human to solve

Types of ML

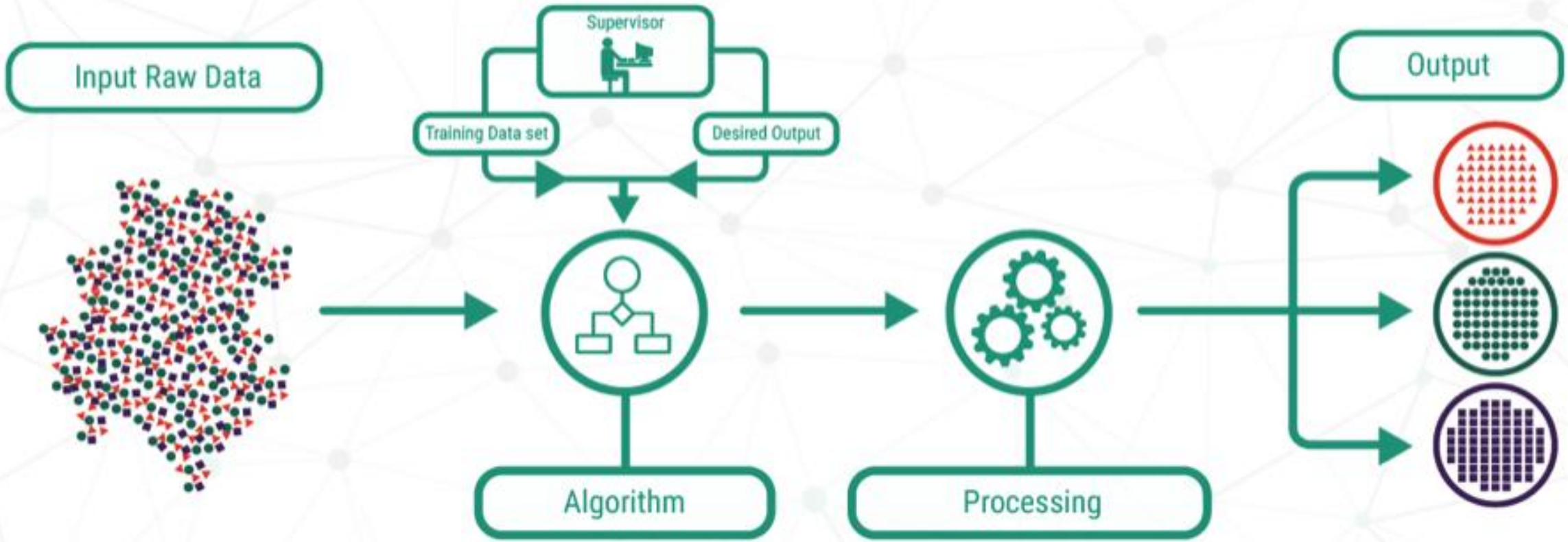


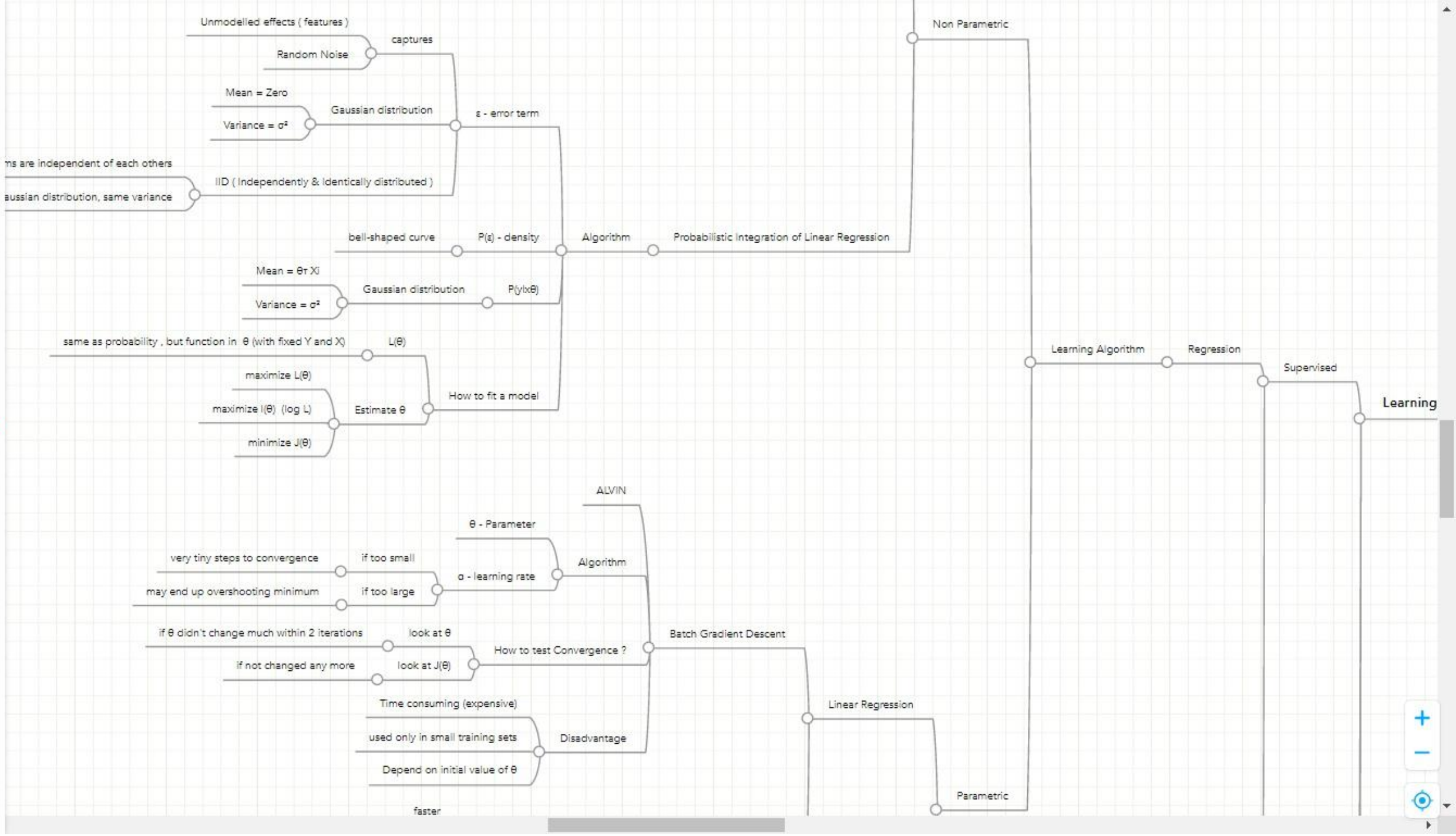

Why M.L ?
Learning Paradigms
Types


Supervised
Unsupervised
ReInforcement
Learning Paradigms

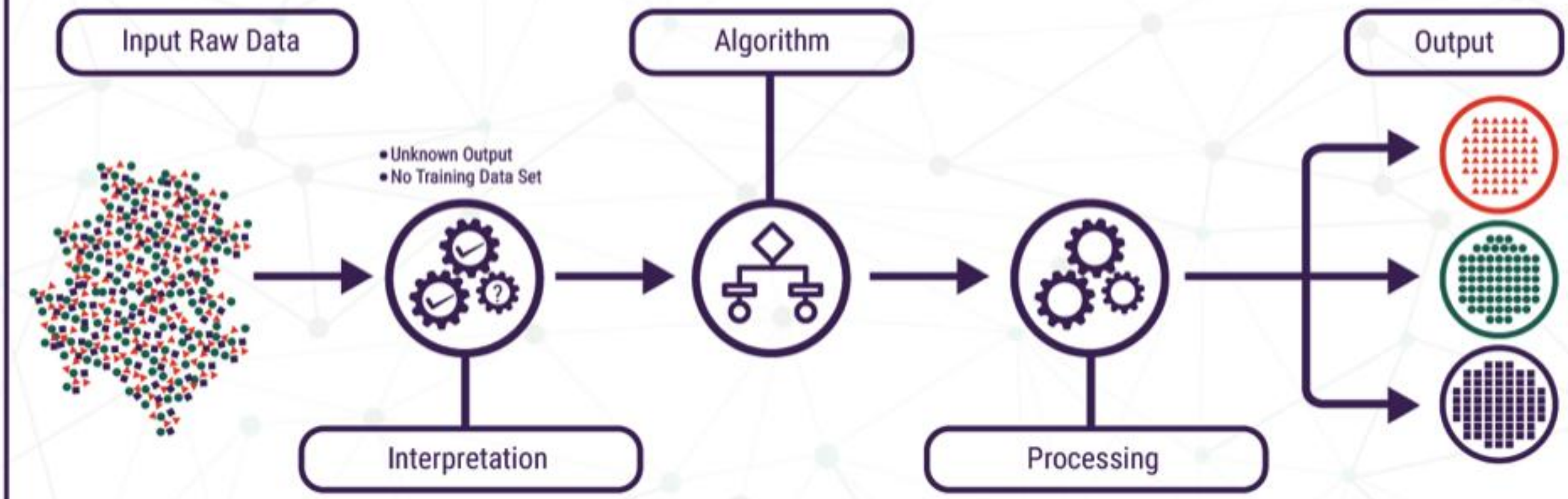

Regression
Classification
Supervised
Unsupervised
ReInforcement
Learnin

SUPERVISED LEARNING

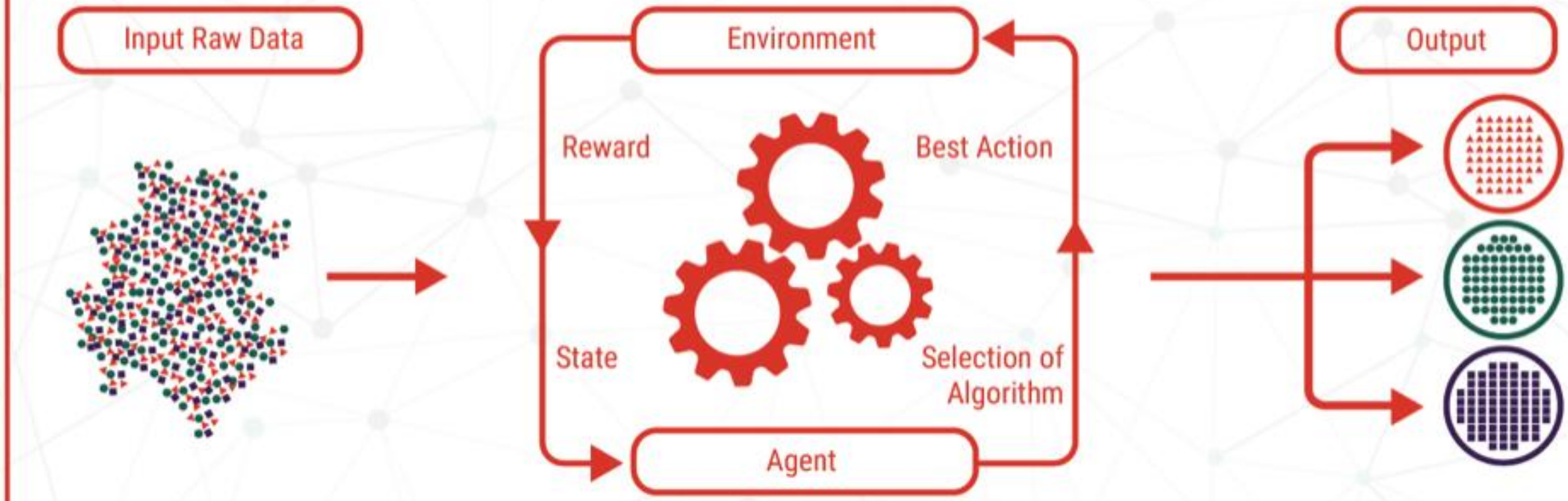



Learning
Supervised
Regression
Learning Algorithm
Non Parametric
Parametric
Linear Regression
Batch Gradient Descent
How to test Convergence ?
look at θ
look at J(θ)
if θ didn't change much within 2 iterations
if not changed any more
Disadvantage
Time consuming (expensive)
used only in small training sets
Depend on initial value of θ
faster
Algorithm
ALVIN
θ - Parameter
α - learning rate
if too small
very tiny steps to convergence
if too large
may end up overshooting minimum
How to fit a model
Estimate θ
maximize L(θ)
maximize l(θ) (log L)
minimize J(θ)
L(θ)
same as probability , but function in θ (with fixed Y and X)
Probabilistic Integration of Linear Regression
Algorithm
P(s) - density
bell-shaped curve
P(y|x;θ)
Gaussian distribution
Mean = θT Xi
Variance = σ²
ε - error term
Gaussian distribution
Mean = Zero
Variance = σ²
captures
Unmodelled effects (features)
Random Noise
IID (Independently & Identically distributed)
ms are independent of each others
aussian distribution, same variance

UNSUPERVISED LEARNING



REINFORCEMENT LEARNING



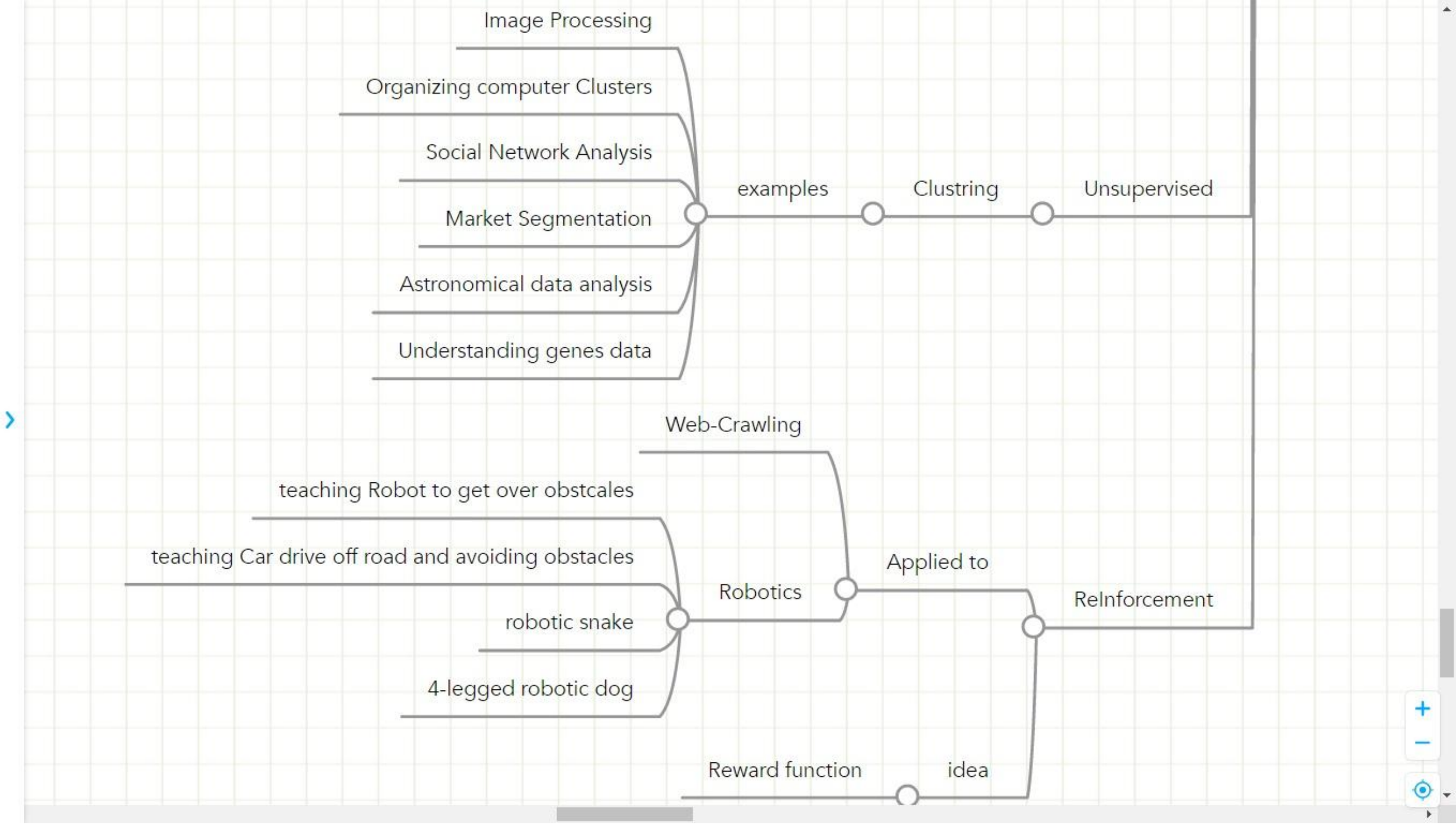
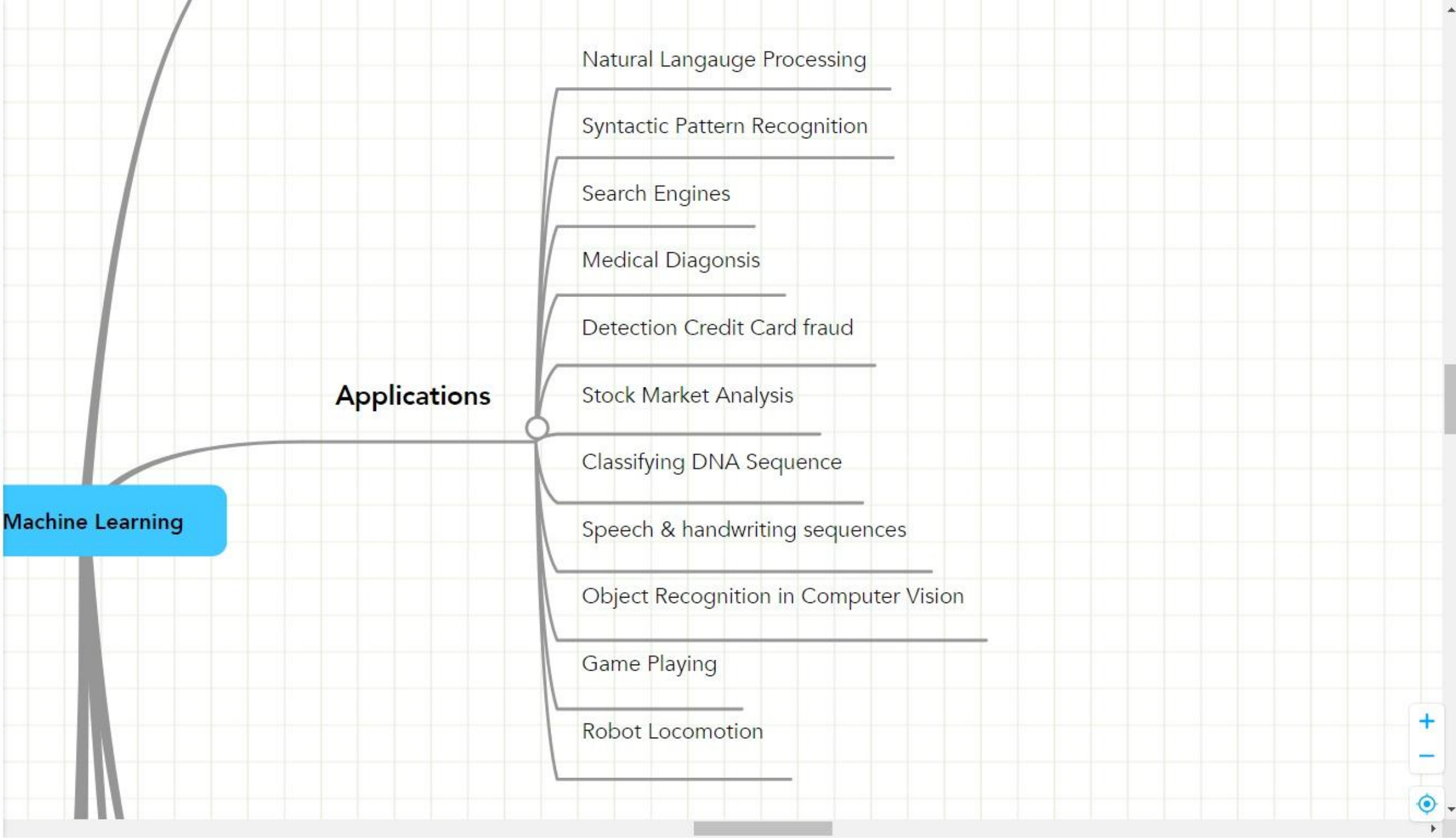
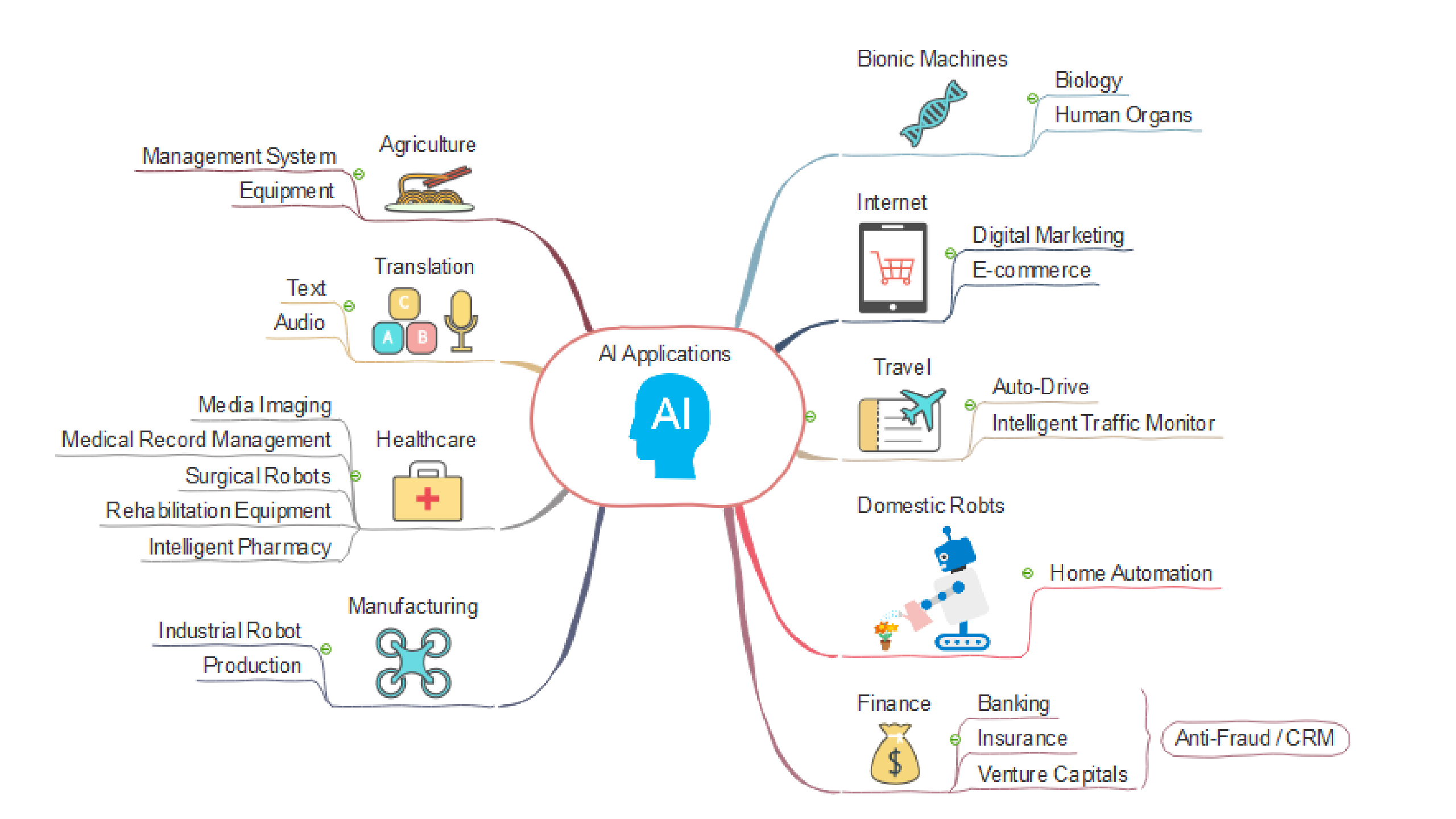
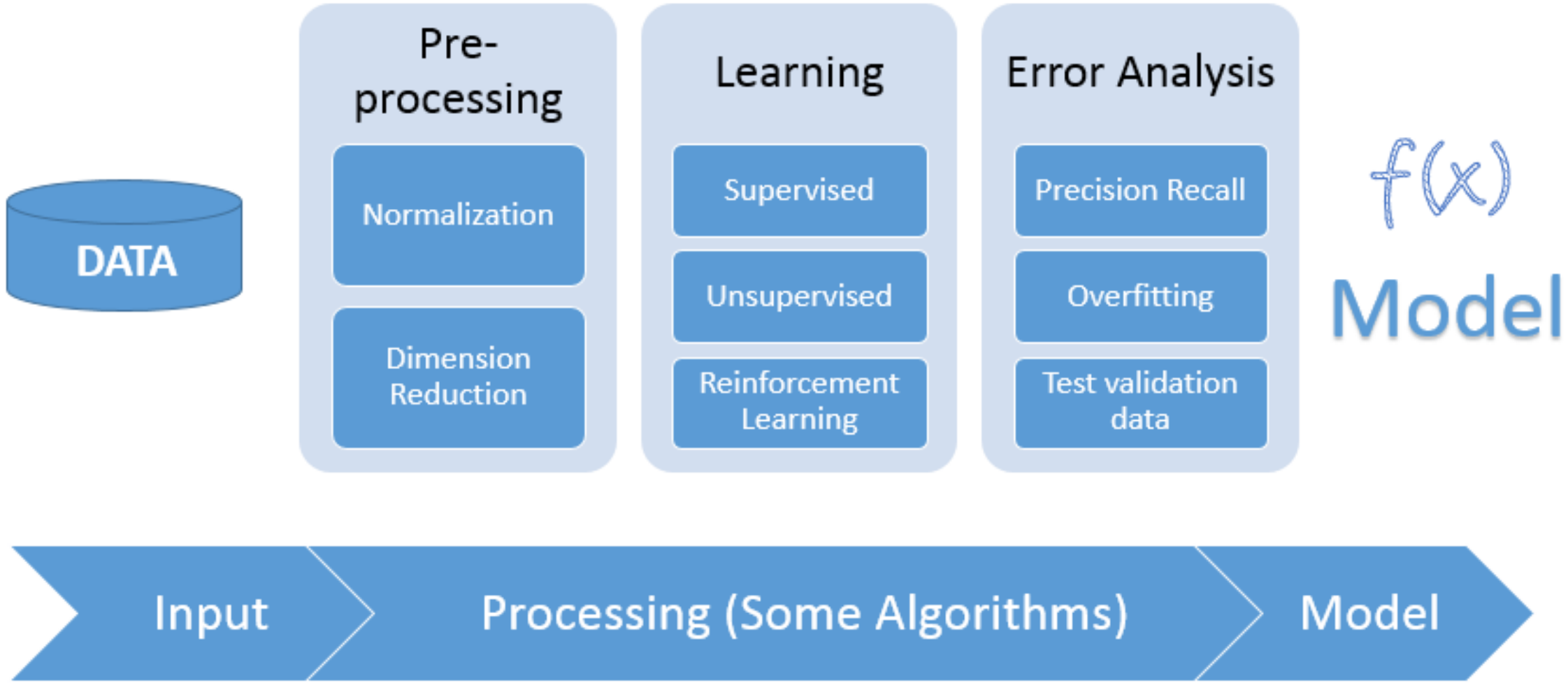


Image Processing
Organizing computer Clusters
Social Network Analysis
Market Segmentation
Astronomical data analysis
Understanding genes data
examples
Clustring
Unsupervised
Web-Crawling
teaching Robot to get over obstcales
teaching Car drive off road and avoiding obstacles
robotic snake
4-legged robotic dog
Robotics
Applied to
ReInforcement
Reward function
idea

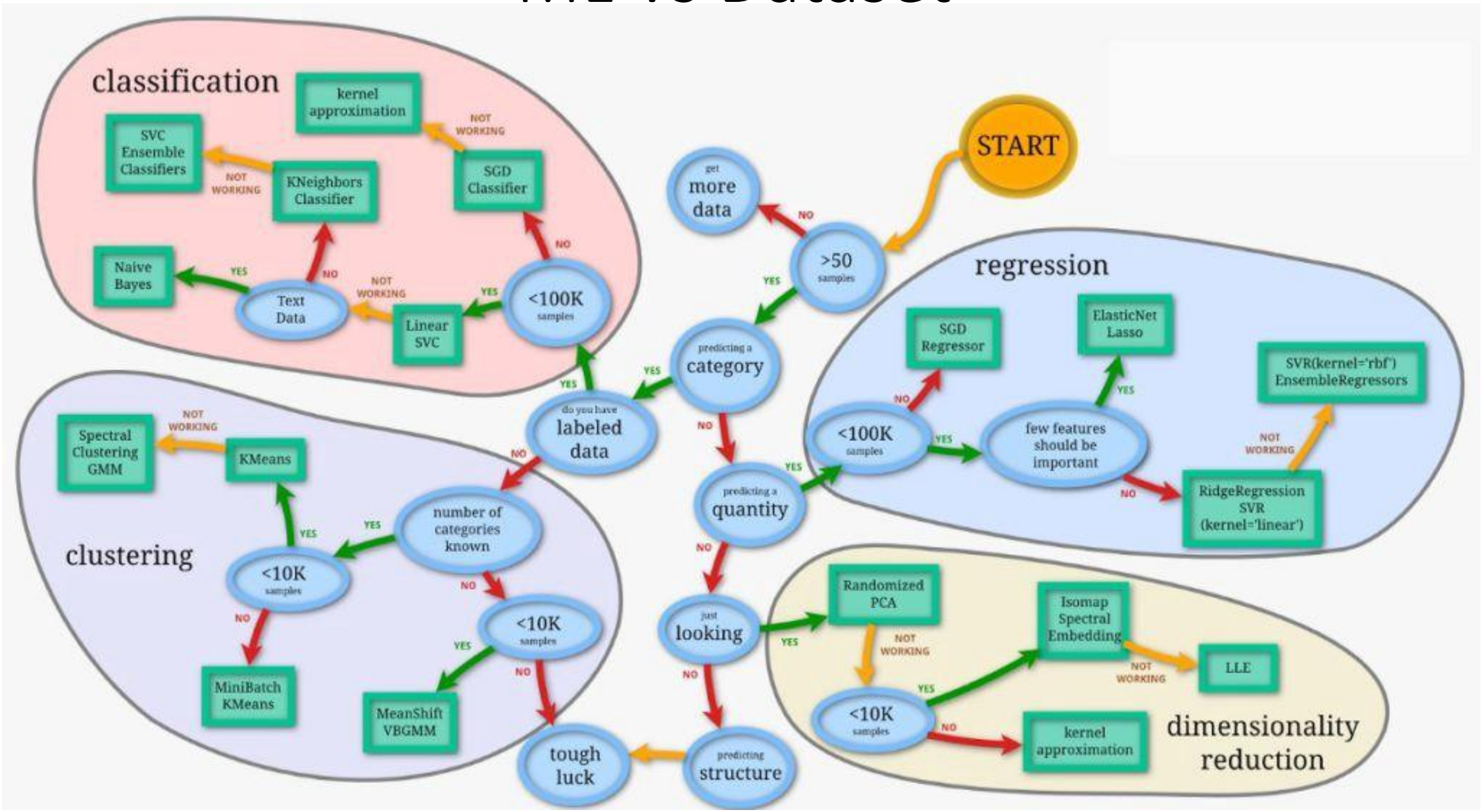

Machine Learning
Applications
Natural Langauge Processing
Syntactic Pattern Recognition
Search Engines
Medical Diagonsis
Detection Credit Card fraud
Stock Market Analysis
Classifying DNA Sequence
Speech & handwriting sequences
Object Recognition in Computer Vision
Game Playing
Robot Locomotion

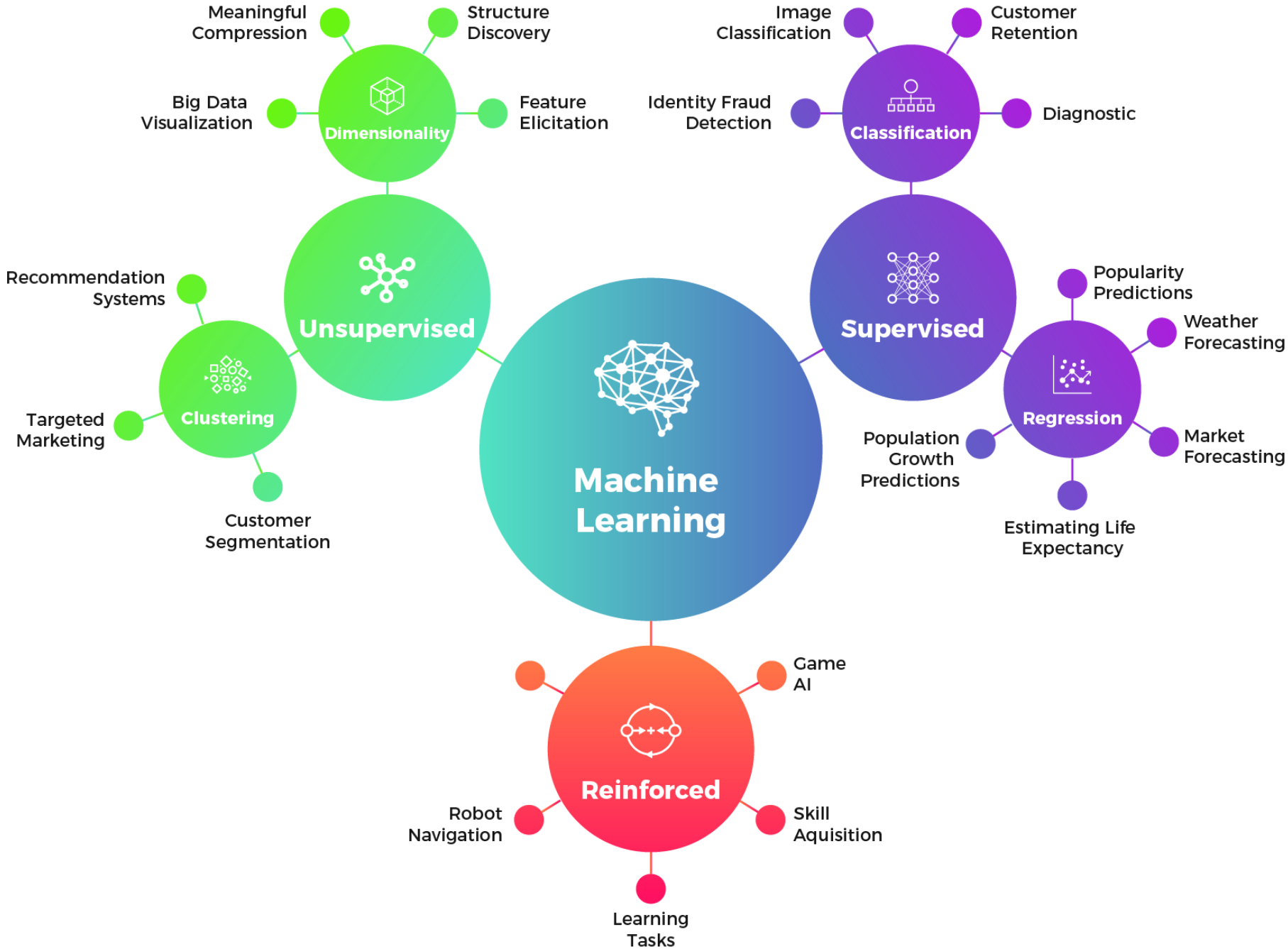
AI Applications




DATA
Pre-processing
Normalization
Dimension Reduction
Learning
Supervised
Unsupervised
Reinforcement Learning
Error Analysis
Precision Recall
Overfitting
Test validation data
f(x)
Model
Input
Processing (Some Algorithms)
Model

ML Vs Dataset




Machine Learning
Unsupervised
Dimensionality
Meaningful Compression
Structure Discovery
Big Data Visualization
Feature Elicitation
Clustering
Recommendation Systems
Targeted Marketing
Customer Segmentation
Supervised
Classification
Image Classification
Customer Retention
Identity Fraud Detection
Diagnostic
Regression
Popularity Predictions
Weather Forecasting
Population Growth Predictions
Market Forecasting
Estimating Life Expectancy
Reinforced
Game AI
Robot Navigation
Skill Aquisition
Learning Tasks