Graphical user interface

Description automatically generated with medium confidence

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| **Algorithms** | **K-Means** | **Logistic Regression** | **Value Function Approach** |
| **Supervised / unsupervised / Reinforcement** | An unsupervised learning algorithm – with no labelled data for its clustering | A supervised learning algorithm - It's more of a classifier than a regression technique. - You are trying to predict the odds ratio of class membership, like the odds of someone doing well in a test | Reinforcement - not needing labelled input/output pairs be presented, and in not needing sub-optimal actions to be explicitly corrected. |
| **What does it do?** | It performs the division of objects into clusters that share similarities and are dissimilar to objects belonging to another cluster | Acts more like a classifier than a regression technique. It helps when trying to predict the ratio of class membership - a classification algorithm. It is used to predict a binary outcome based on a set of independent variables. (e.g. likelihood of someone dying) | finding a balance between exploration (of uncharted territory) and exploitation (of current knowledge). - does not assume knowledge of an exact mathematical model of the MarkovDecisionProcess and they target large MDPs where exact methods become infeasible. - attempt to find a policy that maximizes the return by maintaining a set of estimates of expected returns for some policy (usually either the "current" [on-policy] or the optimal [off-policy] one).  These methods rely on the theory of Markov decision processes, where optimality is defined in a sense that is stronger than the above one: A policy is called optimal if it achieves the best-expected return from any initial state (i.e., initial distributions play no role in this definition). Again, an optimal policy can always be found amongst stationary policies. - based on estimating value functions--functions of states (or of state-action pairs) that estimate how good it is for the agent to be in a given state (or how good it is to perform a given action in a given state). The notion of "how good" here is defined in terms of future rewards that can be expected, or, to be precise, in terms of expected return. Of course the rewards the agent can expect to receive in the future depend on what actions it will take. Accordingly, value functions are defined with respect to particular policies. |
| **In which situation is it most useful?** | n capturing structure of the data if clusters have a spherical-like shape. It always try to construct a nice spherical shape around the centroid. That means, the minute the clusters have a complicated geometric shapes, kmeans does a poor job in clustering the data | hen the response variable is binary but the explanatory variables are continuous. This would be the case if one were predicting whether or not an customer is a good credit risk, using information on their income, years of employment, age, education, and other continuous variables. | Situations with problems that include a long-term versus short-term reward trade-off. It has been applied successfully to various problems, including robot control, elevator scheduling, telecommunications, backgammon, checkers and Go (AlphaGo) |
| **Examples of its use** | * **Marketing:** Finding groups of customers with similar behavior given a large database of customer data containing their properties and past buying records; * **Biology:** Classification of plants and animals given their features; * Libraries: Book ordering; * **Insurance:** Identifying groups of motor insurance policy holders with a high average claim cost; identifying frauds; * **City-planning:** Identifying groups of houses according to their house type, value and geographical location; * **Earthquake studies:** Clustering observed earthquake epicenters to identify dangerous zones; * **Academic Performance:** Distinguishing which teacher is able to nurture the highest scoring students | * **D**etermining whether an email is spam * Likelihood of someone passing from an illness * Tumor prediction * Determining credit card fraud * Predicting whether a student will pass or not | * Selfdriving cars – correceting itself not to speed, collide with objects or out of drivable zones * Spell check * Chess CPU * Distributed Coordinated Multi-Agent Bidding (DCMAB) * Robotics |