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**Date: 21th December 2023**

**Support Vector Machine**

* SVM, or Support Vector Machine (SVM), is a linear algorithm that can handle classification and regression problems.
* The SVM classifier is the backbone of the SVM concept and is the most suitable for solving classification problems.
* SVM classifier creates a line in an N-dimensional space to classify data points into two classes.
* Unlike linear regression and Logistic Regression, SVM uses Margins to make predictions, unlike linear regression or Logistic Regression.

**SVM Algorithm**

* Focuses on the SVM classifier, a primary type of SVM algorithm.
* Creates a hyper-lane in N-dimensional space to divide data points between classes.
* Hyper-lane chosen based on margin, considering the maximum margin between classes.
* Support Vectors, data points near the hyper-plane, help in orienting it.

**Working of VSM**

* **Step-1:** SVM algorithm predicts classes, one identified as 1 and the other as -1.
* **Step-2:** The problem is converted into an optimization problem, aiming to maximize or minimize something.
* **Step-3:** 
  + The hinge loss function is used to find the maximum margin.
  + The loss function, also known as a cost function, is calculated when no class is incorrectly predicted.
* **Step-4:** A regularization parameter is added to balance the trade-off between maximizing margin and the loss generated.
* **Step-5:**
  + Weights are optimized by calculating gradients using advanced calculus concepts.
  + Gradients are updated using the regularization parameter and the loss function when misclassification occurs.
* **Step-6:** 
  + Regularization parameter used for classification error.
  + Loss function used for misclassification.

**Advantages of SVN**

* Dynamic algorithm.
* Reduces risk of overfitting.
* Suitable for high-dimensional data.
* Uses less memory compared to other machine learning algorithms.

**Disadvantages of SVN**

* Struggles with Naïve Bayes.
* Training phase takes a long time.
* Performance depends on the chosen kernel.
* Less interpretable than Linear Regression.
* Tuning hyper-parameters requires significant computational capability.

**Conclusion**

In conclusion, SVM is a simple, sophisticated algorithm for linear and non-linear models, suitable for high-dimensional spaces and text classification. But it takes long time to train and very careful hyper-parameter tuning.

GitHub Repository Link: [MNIST](https://github.com/M-Amman-C/Diabetes_Prediction_using_KNN) Classification [with](https://github.com/M-Amman-C/MNIST-with-SVM) SVM