1. **What are the key hyperparameters in KNN?**

* **Number of Neighbors (k)**: The number of nearest neighbors to consider when making predictions. It significantly affects the model's behavior.
* **Distance Metric**: The measure used to calculate the distance between data points.
* **Weights**: Specifies the weight function used in prediction. It can be uniform, where all points in each neighborhood are weighted equally, or distance-based, where closer neighbors have more influence.
* **Algorithm**: Determines the algorithm used to compute the nearest neighbors. It can be either brute-force, ball tree, KD tree, or other.
* **Leaf Size (for tree-based algorithms)**: The number of points at which the algorithm switches to brute-force search. Smaller leaf sizes lead to a more balanced tree but may increase computation time.

1. **What distance metrics can be used in KNN?**

* **Euclidean Distance**: The straight-line distance between two points in Euclidean space. It's the most commonly used distance metric.
* **Manhattan Distance (City Block Distance)**: The sum of the absolute differences between the coordinates of the points. It's often preferred when dimensions are not homogeneous.
* **Minkowski Distance**: A generalized metric that includes both Euclidean and Manhattan distances as special cases. The parameter p controls the order of the Minkowski distance, where p=1 corresponds to Manhattan distance and p=2 corresponds to Euclidean distance.
* **Chebyshev Distance**: The maximum absolute difference between the coordinates of the points, considering all dimensions. It's useful when different dimensions have different units of measurement.
* **Hamming Distance**: Used for categorical variables, it calculates the proportion of bits that are different between two binary vectors.
* **Cosine Similarity**: Measures the cosine of the angle between two vectors, often used for text mining or high-dimensional data where the magnitude of the vectors is less important than the orientation.
* **Jaccard Distance**: Used for sets, it calculates the dissimilarity between sample sets by dividing the difference between the sizes of the intersection and the union of two sets by the size of the union.