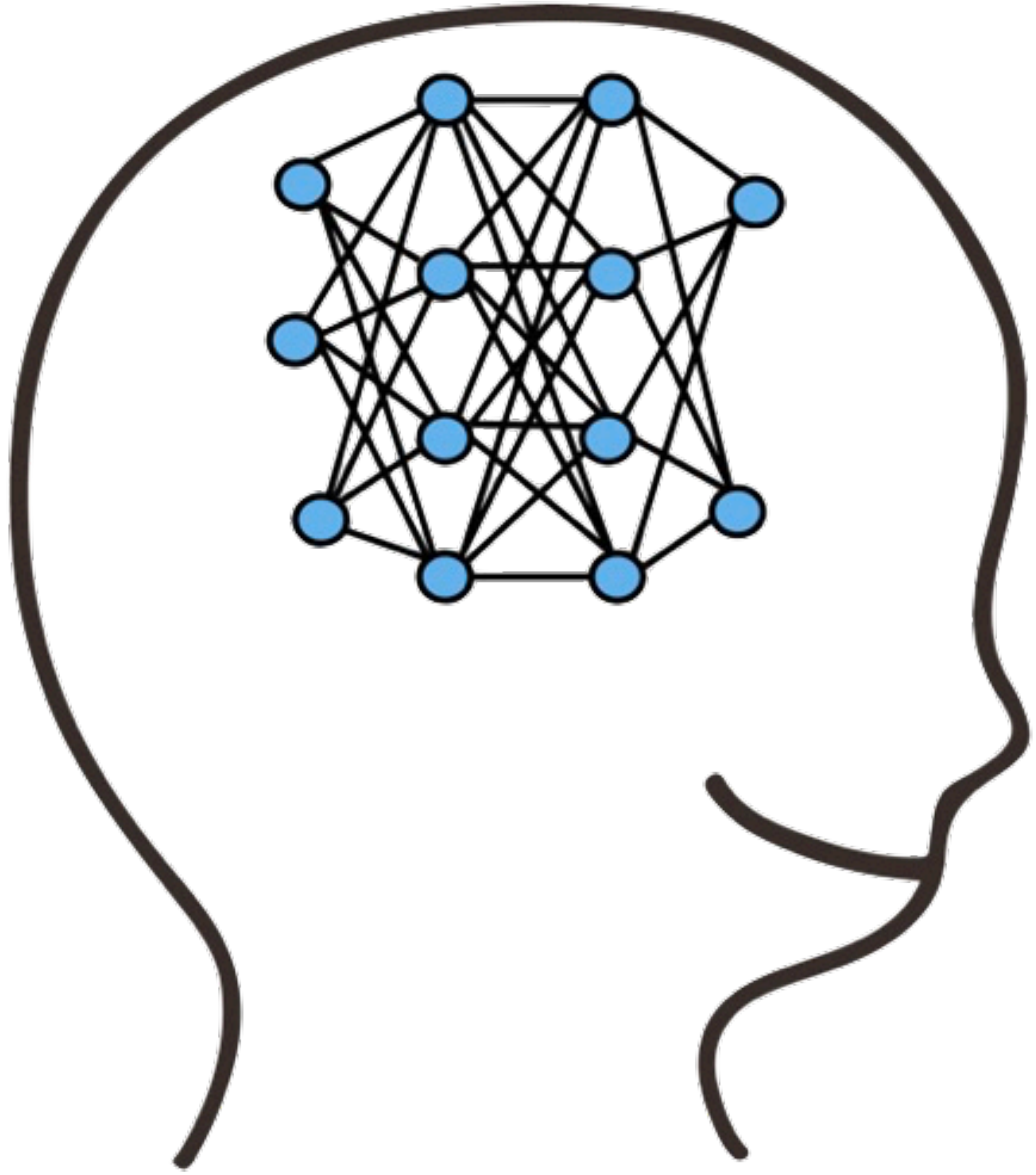
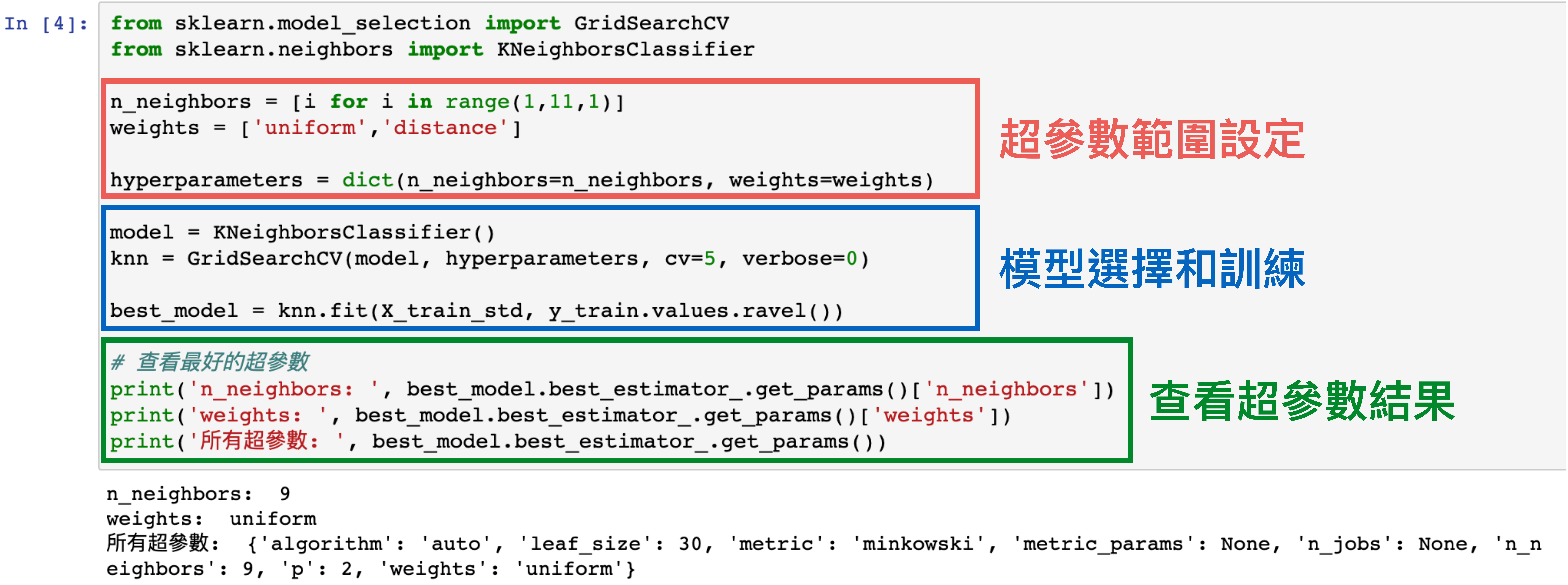


超參數調校
Hyperparameter Tuning

超參數調校

- 「網格搜尋」（Grid Search）是透過「暴力法」把所有超參數跑過一遍，再看何者的訓練結果最好，提供最佳超參數的結果。
- 搭配 K 折交叉驗證法（k-fold cross-validation）一起使用。
- 若超參數量大、範圍大，相當消耗運算資源。可使用「隨機搜尋」（Randomized Search）隨機抽樣超參數組合，降低運算資源。
- 不保證每次運算出的最佳超參數一樣，也不保證在「測試資料集」獲得最佳結果，但是很好的超參數參考依據。

範例1：網格搜尋



```
In [4]: from sklearn.model_selection import GridSearchCV
        from sklearn.neighbors import KNeighborsClassifier

        n_neighbors = [i for i in range(1,11,1)]
        weights = ['uniform','distance']

        hyperparameters = dict(n_neighbors=n_neighbors, weights=weights)

        model = KNeighborsClassifier()
        knn = GridSearchCV(model, hyperparameters, cv=5, verbose=0)

        best_model = knn.fit(X_train_std, y_train.values.ravel())

        # 查看最好的超參數
        print('n_neighbors: ', best_model.best_estimator_.get_params()['n_neighbors'])
        print('weights: ', best_model.best_estimator_.get_params()['weights'])
        print('所有超參數: ', best_model.best_estimator_.get_params())
```

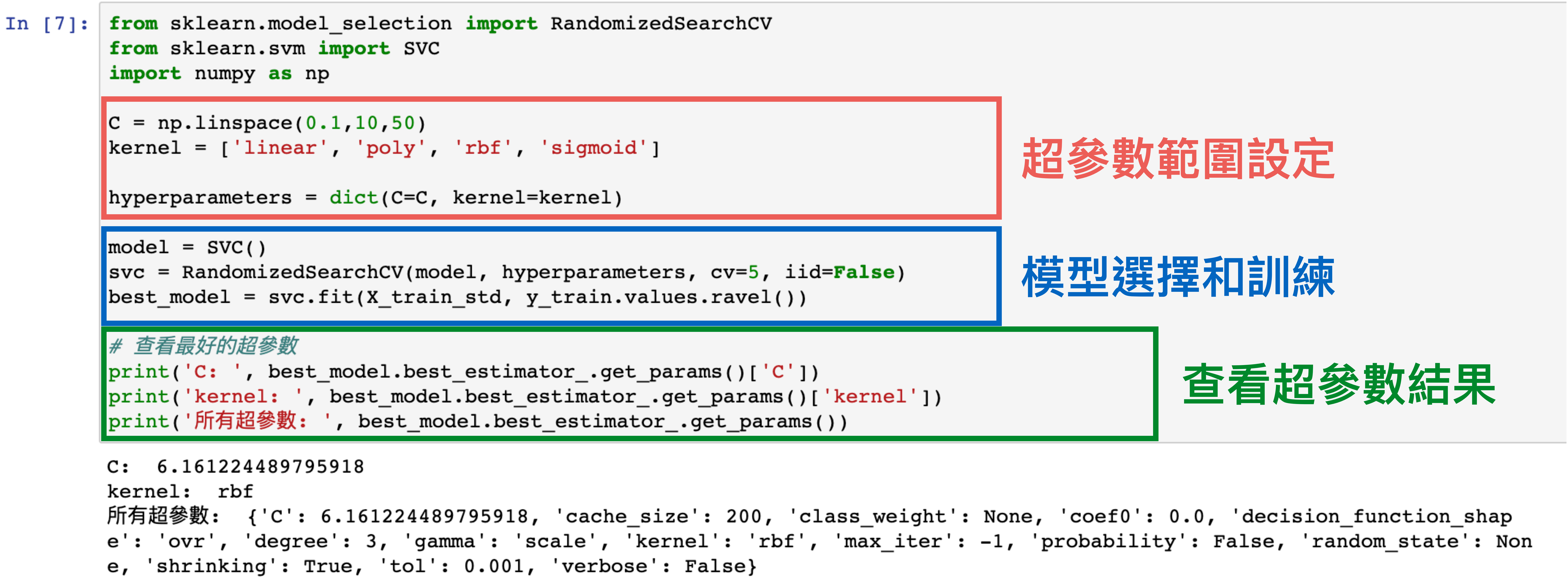
```
n_neighbors:  9
weights:  uniform
所有超參數:  {'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': None, 'n_n
eighbors': 9, 'p': 2, 'weights': 'uniform'}
```

超參數範圍設定

模型選擇和訓練

查看超參數結果

範例2：隨機搜尋



```
In [7]: from sklearn.model_selection import RandomizedSearchCV
        from sklearn.svm import SVC
        import numpy as np

        C = np.linspace(0.1,10,50)
        kernel = ['linear', 'poly', 'rbf', 'sigmoid']

        hyperparameters = dict(C=C, kernel=kernel)

        model = SVC()
        svc = RandomizedSearchCV(model, hyperparameters, cv=5, iid=False)
        best_model = svc.fit(X_train_std, y_train.values.ravel())

        # 查看最好的超參數
        print('C: ', best_model.best_estimator_.get_params()['C'])
        print('kernel: ', best_model.best_estimator_.get_params()['kernel'])
        print('所有超參數: ', best_model.best_estimator_.get_params())
```

```
C:  6.161224489795918
kernel:  rbf
所有超參數:  {'C': 6.161224489795918, 'cache_size': 200, 'class_weight': None, 'coef0': 0.0, 'decision_function_shap
e': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'rbf', 'max_iter': -1, 'probability': False, 'random_state': Non
e, 'shrinking': True, 'tol': 0.001, 'verbose': False}
```

超參數範圍設定

模型選擇和訓練

查看超參數結果