Chapter 5 of Hands-on Machine Learning with SciKit-Learn, Keras and TensorFlow introduces support vector machines (SVMs), a powerful and versatile machine learning technique that can perform both linear and nonlinear classification, regression, and outlier detection. The author explains the core concepts of SVMs, such as the large margin classification, the kernel trick, and the hinge loss function. The author also discusses how to use Scikit-Learn’s SVM classes to train and fine-tune SVM models on various datasets, and how to deal with common challenges such as scaling the features, handling nonlinear problems, and choosing the right kernel and hyperparameters. The basic idea of SVMs, which is to fit the widest possible street between two classes while avoiding or limiting margin violations. The author shows how to train a linear SVM classifier using the Linear SVC class, and how to regularize it by adjusting the C hyperparameter.

Nonlinear SVM Classification, deals with the problem of nonlinearly separable datasets, and how to tackle it using polynomial features or similarity features. The author introduces the kernel trick, which makes it possible to obtain the same result as if many features were added, without adding them. The author demonstrates how to use the SVC class with various kernels, such as the polynomial kernel and the Gaussian RBF kernel, and how to tune the gamma hyperparameter.

SVM Regression explains how SVMs can also be used for regression tasks, by reversing the objective, instead of trying to fit the largest possible street between two classes, SVM regression tries to fit as many instances as possible on the street while limiting margin violations. The author shows how to use the Linear SVR class for linear SVM regression, and the SVR class for nonlinear SVM regression with kernels.

Under the Hood dives deeper into the mathematical details of SVMs, such as the quadratic programming problem, the dual problem, the kernelized SVMs, and the hinge loss function. The author also discusses the computational complexity and the online SVMs.