**Hands-on Meta Learning**

This document corresponds to summary of the book **Hands-On Meta Learning with Python** by author Sudharsan Ravichandiran.

* **Introduction to Meta Learning**

the problem with deep neural networks is that we need to have a large training set to train our model and it will fail abruptly when we have very few data points. Let's say we trained a deep learning model to perform task A. Now, when we have a new task, B, that is closely related to A, we can't use the same model.

How do we humans learn? We generalize our learning to multiple concepts and learn from there.

Meta learning produces a versatile AI model that can learn to perform various tasks without having to train them from scratch. We train our meta learning model on various related tasks with few data points, so for a new related task, it can make use of the learning obtained from the previous tasks and we don't have to train them from scratch.

* **Meta learning and few-shot**

Learning from fewer data points is called **few-shot learning** or **k-shot learning** where **k** denotes the number of data points in each of the classes in the dataset.

If we have exactly one dog and one cat image then it is called one-shot learning, that is, we are learning from just one data point per class. If we have, say 10 images of a dog and 10 images of a cat, then that is called 10-shot learning. So, **k** in k-shot learning implies a number of data points we have per class.

zero-shot learning where we don't have any data points per class.

two-way k-shot learning; so, n-way means the number of classes we have in our dataset.

we have a dataset, D, we sample a few data points from each of the classes present in our data set and we call it as **support set**.

we sample some different data points from each of the classes and call it as **query set.**

**train** our model with a **support** **set** and **test** with a **query** **set**. We train our model in an **episodic fashion**—that is, in each episode, we sample a few data points from our dataset, D, prepare our support set and query set, and train on the support set and test on the query set. Therefore, our model will learn how to learn from a smaller dataset.

* **Types of meta learning**

1. Learning the metric space
2. Learning the initializations
3. Learning the optimizer