*Solution 1.a.i)*

**Facial Recognition** can be classified as Classification algorithm. Because when we are trying to recognize a face, the face either will match with a person or it will not match. So we have a finite set of faces/data of different people and against which we are trying to match a given face/data. This will produce qualitative response.

*Solution 1.a.ii)*

**Mobile Price Prediction** can be classified as Regression algorithm, because the price range (output) is not set and it can vary depending on various factors. This will produce quantitative response.

*Solution 1.a.iii)*

**Credit Card Fraud Prediction** can be classified as Classification algorithm, because the response/output is a finite set of values: **YES** (fraud can happen) or **NO** (fraud cannot happen).

*Solution 1.a.iv)*

**Customer Churn Prediction** can be classified as a Classification algorithm, because the response/output is a finite set of values: **YES** (the customer will churn), **NO** (the customer will not churn)

*Solution 1.b)*

**Regression problem:**

We tend to refer to problems with a quantitative response as regression problems. Quantitative variables take on numerical values. Least squares linear regression is used with a quantitative response.

**Example of Regression problem:** a person’s age, height, or income, the value of a house, and the price of a stock.

**Classification problem:**

We tend to refer to problems with a qualitative response as classification problems. Qualitative variables take on values in one of K different classes, or categories.

**Examples of Classification problem:** variables include a person’s gender (male or female), the brand of product purchased (brand A, B, or C), whether a person defaults on a debt (yes or no), or a cancer diagnosis (Acute Myelogenous Leukemia, Acute Lymphoblastic Leukemia, or No Leukemia).

**Clustering problem:**

The goal of cluster analysis is to ascertain, on the basis of X1, X2, . . , Xn, whether the observations fall into relatively distinct groups. Identifying such groups can be of interest because it might be that the groups differ with respect to some property of interest. A clustering method could not be expected to assign all of the overlapping points to their correct group.

**Example of clustering problem:** in a market segmentation study we might observe multiple characteristics (variables) for potential customers, such as zip code, family income, and shopping habits. We might believe that the customers fall into different groups, such as big spenders versus low spenders. If the information about each customer’s spending patterns were available, then a supervised analysis would be possible. However, this information is not available—that is, we do not know whether each potential customer is a big spender or not. In this setting, we can try to cluster the customers on the basis of the variables measured, in order to identify distinct groups of potential customers.