**Classification of Patients with Abnormal Blood Pressure**

**Background**

**Hypertension** with aging is a major medical concern even in this ultramodern era of advanced therapies. Preliminary testing is a key element in analyzing the procedures of mild abnormality of blood pressure for a substantial period of time, but presently has a limited value in the prediction of progression to hypertension. Although **hypotension**, low blood pressure in common parlance, is less common among the ones with abnormal blood pressure, but the adverse effect it has on their health is equivalent to that of hypertension.

Although recent studies have hypothesized that, keeping other factors constant, hemoglobin level is positively associated with blood pressure in a large cohort of healthy individuals, but genetic causes are also prominent in some of individuals. However, there are numerous other factors which determine whether an individual is likely to develop this abnormality.

Data scientists lay out the hypothesis that newer statistical classification methods derived from data mining and machine learning methods are capable of reducing the prediction error manifolds and help cardiologists to conduct a two-tailed preliminary prediction of abnormality of blood pressure in an individual.

**Objective**

Employing statistical techniques, conduct a preliminary prognosis of Hypertension/hypotension, based on the level of **hemoglobin** and **genetic** **history** of the individual.  
*[Please refer to the Data Dictionary (on the next page) to know more about these variables]*

**Deliverables**

1. Lay out an **approach plan**, consisting of:
   1. Your **understanding of data**, based on a preliminary exploratory analysis
   2. **Different** traditional as well as state-of-the-art statistical **techniques**, which you are going to use to come up with different models to meet the objective
2. Contrast the **pros** **and cons** **of** applying each **technique** on this problem
3. **Build a model** using the most promising technique on the dataset.

**Model Validation** is supposed to be done on the test dataset *(to be given to you during your case-study presentation)*

1. What would be your **approach**, **if** there were **other variables also** in the data:

*Smoking, obesity (BMI), Lack of physical activity, salt content in the diet, alcohol consumption per day, Level of Stress, Age, Sex, Pregnancy, Chronic kidney disease* and *Adrenal & thyroid disorders*.

*[Please refer to the Data Dictionary (on the next page) to know more about these variables]*

Share the software code used to execute each technique or operation.

The approach plan, model outputs, model diagnostics, software codes etc. are supposed to be shared in an Excel file.

Support your deliverables with exhibits and slabs, wherever required.

***Note: The data are hypothetical.***

**Data Dictionary**

**Total** Number of Patients (N) = 2000

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Position** | **Variable Label** | **Value Labels** | **Measurement Level** | **Role** |
| **Patient\_Number** | 1 | Patient Number | Not Applicable | Ratio | None |
| **Blood\_Pressure\_Abnormality** | 2 | Blood Pressure Abnormality | 0 = Normal | Nominal | Target |
| 1 = Abnormal |
| **Level\_of\_Hemoglobin** | 3 | Level of Hemoglobin (g/dl) | Not Applicable | Ratio | Input |
| **Genetic\_Pedigree\_Coefficient** | 4 | Genetic Pedigree Coefficient\* | Not Applicable | Ratio | Input |
| **Age** | 5 | Age | Not Applicable | Ratio | Input |
| **BMI** | 6 | BMI | Not Applicable | Ratio | Input |
| **Sex** | 7 | Sex | 0 = Male | Nominal | Input |
| 1 = Female |
| **Pregnancy** | 8 | Pregnancy | 0 = No | Nominal | Input |
| 1 = Yes |
| **Smoking** | 9 | Smoking | 0 = No | Nominal | Input |
| 1 = Yes |
| **Physical\_activity** | 10 | Physical activity  (No. of steps/day) | Not Applicable | Ratio | Input |
| **salt\_content\_in\_the\_diet** | 11 | Salt content in the diet (mg/per day) | Not Applicable | Ratio | Input |
| **alcohol\_consumption\_per\_day** | 12 | Alcohol consumption per day (ml/day) | Not Applicable | Ratio | Input |
| **Level\_of\_Stress** | 13 | Level of Stress  (Cortisol Secretion) | 1 = Less | Ordinal | Input |
| 2 = Normal |
| 3 = High |
| **Chronic\_kidney\_disease** | 14 | Chronic kidney disease | 0 = No | Nominal | Input |
| 1 = Yes |
| **Adrenal\_and\_thyroid\_disorders** | 15 | Adrenal and thyroid disorders | 0 = No | Nominal | Input |
| 1 = Yes |

***\*Genetic Pedigree Coefficient*** *(GPC) of an individual for a particular disease is a continuum between 0 and 1, where*

*GPC* ***closer to 0*** *indicates very* ***distant occurrence*** *of that disease in her/his pedigree, and*

*GPC* ***closer to 1*** *indicates very* ***immediate occurrence*** *of that disease in her/his pedigree]*