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    "test_size = 0.2\n",
    "x_train, x_test, y_train, y_test = train_test_split(df.drop(columns =
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    "df_test = pd.concat([x_test, y_test], axis = 1)\n",
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```

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    "def missing_values_reporter(df):    \n",
    "    na_count = df.isna().sum() \n",
    "    ser = na_count[na_count > 0]\n",
    "    ser_p = np.round(ser.divide(df.shape[0])*100,2)\n",
    "    tmp = pd.DataFrame({\"N missings\": ser,\"% missings\": ser_p,\"Above
Threshold (3%)\": False})\n",
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    "    return tmp"
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"      <td>11.0</td>\n",
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```

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       "      <td>11.0</td>\n",
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       "std      11.848976   21773.344045     0.531976     0.542483    29.027208   \n",
       "min    1899.000000    1730.000000     0.000000     0.000000     0.000000   \n",
```

```
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\n",
       "40%    1967.000000   44159.000000     0.000000     0.000000    38.000000
\n",
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\n",
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\n",
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\n",
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\n",
       "\n",
       "          MntWines    MntFruits  MntMeatProducts  MntFishProducts  \\\
n",
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       "mean    299.983579    25.944507       166.294451        36.650623   \n",
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       "\n",
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1766.000000   \n",
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0.070781   \n",
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0.000000   \n",
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0.000000   \n",
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0.000000   \n",
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0.000000   \n",
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```

```
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0.000000   \n",
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0.000000   \n",
       "max        1.000000      1.000000      1.000000      1.000000
1.000000   \n",
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       "count         1766.0     1766.0  1766.000000  \n",
       "mean             3.0       11.0     0.148924  \n",
       "std              0.0        0.0     0.356115  \n",
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    "display(describe_num)"
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    }
   ],
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    "const=describe_num.columns[describe_num.loc[\"std\"]<0.01]\n",
    "print(\"Columns with zero or almost zero variance to be removed:\\n\", \n",
    "      list(const))\n",
    "\n",
    "# remove constants\n",
    "df.drop(labels=const, axis=1, inplace=True) \n",
```

```
  "\n",
  "# test\n",
  "\n",
  "df_test.drop(labels=const, axis=1, inplace=True)"
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 ],
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  "print(\">>> Any column with negative values?:\", \n",
  "      (df._get_numeric_data()<0).any().any())"
 ]
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},
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  "df_y = df.Response"
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"      <th>Recency</th>\n",
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```

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```

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```

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values:',len(df_x[df_x.duplicated(keep=False)])-
len(df[df.duplicated(keep=False)]))"
   ]
  },
  {
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    "duplicates_target = list(df[df.duplicated(keep=False)].index.values)"
   ]
  },
  {
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    "len(idx_remove)"
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  {
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  {
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 "# Correlation"
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 "target = \"Response\"\n",
 "df[target]=df[target].astype('object')\n",
 "feature_list =
df.select_dtypes(include=[\"int64\", \"Float64\"]).columns.values\n",
 "feature_list = [x for x in feature_list if not
x.startswith((\"Year_B\",\"AcceptedCmp\"))]\n",
 "feature_list.append(target)"
]
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