UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN
FACULTAD DE CIENCIAS FÍSICO MATEMÁTICAS

Maestria en Ciencia de Datos.

Metodos Estadisticos Multivariados
Reporte Estadistico

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Fecha entrega: 03/28/2023

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Análisis de Factores

El Análisis Factorial es, por tanto, una técnica de reducción de la dimensionalidad de los datos. Su propósito último consiste en buscar el número mínimo de dimensiones capaces de explicar el máximo de información contenida en los datos.

Para desarrollar el análisis de factores se realizaran pasos previos tales como estandarizar los datos , verificar si los datos cumplen la **normal multivariada**, revisar la **matriz de correlaciones** y realizar **supuestos e hipotesis**.

Paso 1: Carga de Datos

```
## # A tibble: 1,330,816 x 13
##       u_q coolant stator_win~1      u_d stato~2 motor_~3      i_d      i_q    pm
##     <dbl>   <dbl>        <dbl>    <dbl>   <dbl>    <dbl>    <dbl>    <dbl> <dbl>
##  1 -0.451    18.8         19.1 -0.350      18.3  2.87e-3  4.42e-3  3.28e-4  24.6
##  2 -0.326    18.8         19.1 -0.306      18.3  2.57e-4  6.06e-4 -7.85e-4  24.5
##  3 -0.441    18.8         19.1 -0.373      18.3  2.35e-3  1.29e-3  3.86e-4  24.5
##  4 -0.327    18.8         19.1 -0.316      18.3  6.10e-3  2.56e-5  2.05e-3  24.6
##  5 -0.471    18.9         19.1 -0.332      18.3  3.13e-3 -6.43e-2  3.72e-2  24.6
##  6 -0.539    18.9         19.1  0.00915    18.3  9.64e-3 -6.14e-1  3.37e-1  24.6
##  7 -0.653    18.9         19.1  0.239      18.3  1.34e-3 -1.01e+0  5.54e-1  24.6
##  8 -0.758    19.0         19.1  0.395      18.3  1.42e-3 -1.29e+0  7.06e-1  24.6
##  9 -0.727    19.0         19.1  0.547      18.3  5.77e-4 -1.49e+0  8.17e-1  24.6
## 10 -0.874    19.0         19.1  0.579      18.3 -1.25e-3 -1.63e+0  8.98e-1  24.6
## # ... with 1,330,806 more rows, 4 more variables: stator_yoke <dbl>,
## #   ambient <dbl>, torque <dbl>, profile_id <dbl>, and abbreviated variable
## #   names 1: stator_winding, 2: stator_tooth, 3: motor_speed
```

Paso 2: Estandarizar datos

```
##              u_q    coolant stator_winding        u_d stator_tooth motor_speed
## [1,] -1.29183483 -0.8867915    -1.51650702  0.4602959   -1.5444114  -1.2649497
## [2,] -1.31293311  0.3263978    -0.51176368  0.4640993   -0.3542563  -1.2649461
## [3,]  0.62421786  1.3387089     1.21168934 -1.1116891    1.4292998   1.3941570
## [4,]  0.04114151 -0.5675018    -0.04577176 -1.1198852   -0.2562540  -0.3521075
## [5,]  0.86425290 -0.8858605    -1.43790036  0.4274308   -1.3995668  -0.2013049
## [6,] -0.96581631 -0.8643845    -0.97352833  0.2550241   -1.1481965  -1.1319918
##             i_d        i_q         pm stator_yoke    ambient     torque
## [1,]  1.0677135 -0.3841408 -0.2640056  -1.4704758  0.5990896 -0.3291384
## [2,]  1.0677237 -0.3841327  0.5547905  -0.1585534  0.7712363 -0.3990913
## [3,] -0.8983460  0.1847132  1.5736111   1.4705997  0.7740222  0.2087425
## [4,] -0.1811712  1.6900853 -0.5916583  -0.5000633 -0.8405265  1.5952939
## [5,]  1.0677075 -0.3841518 -1.3907083  -1.3006456 -0.4161227 -0.4026589
## [6,]  0.4409636  1.0262421 -1.5449099  -1.1441312 -0.9967601  0.9296050
```

```
##      profile_id
## [1,]  -1.512310
## [2,]   1.412046
## [3,]  -1.512310
## [4,]   0.827175
## [5,]  -1.595863
## [6,]  -1.219874
```

Paso 3: Revisar de cumplimiento de normal multivariada

```
## $multivariateNormality
##            Test       HZ p value MVN
## 1 Henze-Zirkler 2.207221       0  NO
##
## $univariateNormality
##                Test       Variable Statistic   p value Normality
## 1  Anderson-Darling      u_q          5.0606  <0.001      NO
## 2  Anderson-Darling    coolant       13.0622  <0.001      NO
## 3  Anderson-Darling stator_winding    1.2450   0.003      NO
## 4  Anderson-Darling      u_d          5.2192  <0.001      NO
## 5  Anderson-Darling  stator_tooth     1.7611   2e-04      NO
## 6  Anderson-Darling  motor_speed      4.2807  <0.001      NO
## 7  Anderson-Darling      i_d          6.5823  <0.001      NO
## 8  Anderson-Darling      i_q          3.7795  <0.001      NO
## 9  Anderson-Darling       pm          1.0939  0.0071      NO
## 10 Anderson-Darling  stator_yoke      1.8236   1e-04      NO
## 11 Anderson-Darling    ambient        2.0071  <0.001      NO
## 12 Anderson-Darling     torque        3.7208  <0.001      NO
## 13 Anderson-Darling   profile_id      4.2864  <0.001      NO
##
## $Descriptives
##                   n          Mean Std.Dev      Median       Min      Max
## u_q             200 -2.818926e-18       1 -0.15109133 -1.315580 1.633495
## coolant         200 -3.835148e-17       1 -0.43089861 -1.010383 2.591313
## stator_winding  200 -2.275595e-16       1 -0.07427076 -1.640162 2.104073
## u_d             200 -5.992928e-18       1  0.30515852 -1.614484 2.483549
## stator_tooth    200 -1.228005e-16       1  0.01480349 -1.694251 2.186784
## motor_speed     200 -7.523685e-17       1 -0.09163353 -1.264952 1.925989
## i_d             200  5.798032e-17       1  0.30829292 -2.405510 1.067754
## i_q             200  1.274209e-18       1 -0.22675186 -3.048706 2.839468
## pm              200 -1.005221e-16       1  0.11382000 -1.917382 2.570163
## stator_yoke     200 -1.753368e-16       1  0.03165322 -1.522645 2.492686
## ambient         200  6.615807e-16       1  0.03694657 -2.557809 2.366904
## torque          200 -2.848091e-17       1 -0.25975364 -3.021320 2.909808
## profile_id      200 -1.278667e-16       1  0.15875076 -1.679416 1.579152
##                       25th      75th        Skew   Kurtosis
## u_q             -0.9661438 0.8433559  0.25665684 -1.3336764
## coolant         -0.8557682 0.6272561  0.86283332 -0.5014301
## stator_winding  -0.8210674 0.7898167  0.11748295 -0.9700921
## u_d             -0.9716060 0.4605654  0.12670913 -0.4422127
## stator_tooth    -0.8224551 0.9266864  0.01474445 -1.0651724
## motor_speed     -0.9990244 0.8623359  0.27724578 -1.2221045
## i_d             -0.7391066 1.0262070 -0.59470099 -0.8249797
## i_q             -0.3841599 0.6396433 -0.01480069  0.7740078
## pm              -0.6708661 0.6768794 -0.08697290 -0.5722818
## stator_yoke     -0.8278385 0.6505697  0.26928833 -0.8844317
## ambient         -0.7824757 0.7767847 -0.24060641 -0.3690296
## torque          -0.4036428 0.6591036 -0.01650906  0.7520424
```

```
## profile_id     -0.9378828 0.8376191 -0.11191085 -1.3585615
```

Conclusiones

Referencias