# V8

| **Variables catégorielles** | |
| --- | --- |
| Variable | Description |
| REGIONC | Région de recensement |
| DIVISION | Division de recensement |
| state\_postal | Code postal de l’Etat |
| state\_name | Nom de l’Etat |
| BA\_climate | Zone climatique |
| IECC\_climate\_code | Code climatique du Code international de conservation de l'énergie |
| UATYP10 | Code de type urbain de recensement |

Méthode 1

79 variables

| **Exemples de variables sélectionnées** | | |
| --- | --- | --- |
| **Features** | **Description** | **Corrélation avec KWH** |
| TOTROOMS | Nombres de pièces | 0.402977 |
| TOTSQFT\_EN | Surface totale du logement | 0.393136 |
| BEDROOMS | Nombre de chambres | 0.393029 |
| TVCOLOR | Nombre de TV utilisé | 0.390913 |
| NCOMBATH | Nombre de salles de bain complètes | 0.379262 |
| SWIMPOOL | Possède une piscine | 0.375599 |
| DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine | 0.355838 |
| WASHLOAD | Fréquence d’utilisation du lave-linge par semaine | 0.355415 |
| NUMFRIG | Nombre de réfrigérateurs utilisé | 0.342159 |
| TYPEHUQ | Type de logement | 0.333803 |
| NUMCFAN | Nombre de ventilateur de plafond utilisé | 0.332963 |
| SIZRFRI2 | Taille du 2nd réfrigérateur | 0.329054 |
| WINDOWS | Nombre de fenêtres | 0.322728 |
| MONPOOL | Nombre de mois d’utilisation de la piscine l’année passée | 0.320818 |
| NHSLDMEM | Nombre d’habitants du logement | 0.316398 |
| SOLAR | Utilise des panneaux solaires | 0.302685 |
| HEATAPT | Chauffage collectif | 0.300785 |
| NUMSMPHONE | Nombre de smartphones utilisé | 0.295927 |
| TVSIZE2 | Taille de la 2e TV | 0.292950 |
| TVTYPE3 | Type d’affichage de la 3e TV | 0.288869 |
| TYPERFR2 | Arrangement des portes du 2e réfrigérateur | 0.287772 |
| OUTLET | Possède une prise électrique près du garage | 0.284040 |
| ATTIC | Possède un grenier | 0.276856 |
| PRKGPLC1 | Possède un garage attenant au logement | 0.276062 |
| REGIONC\_x0\_SOUTH | Région Sud | 0.273351 |
| OUTGRILL | Possède un barbecue d'extérieur | 0.271669 |
| CONCRETE | Le logement est sur une dalle en béton | 0.269025 |
| DWASHUSE | Fréquence d’utilisation du lave-vaisselle par semaine | 0.267279 |
| TVONWD3 | Nombre d’heures d’utilisation de la 3e TV en semainee | 0.263802 |
| ATTICFAN | Utilise une VMC au grenier | 0.263380 |
| DRYER | Possède un sèche-linge | 0.259805 |
| COOLAPT | Climatisation collective | 0.259750 |
| TOPFRONT | Type d’ouverture du lave-linge | 0.258587 |
| HOUSEFAN | Possède un ventilateur de refroidissement | 0.253852 |
| GARGCOOL | Le garage est climatisé | 0.253653 |
| ATTCCOOL | Le grenier est climatisé | 0.250237 |

Méthode 2 : Catégories

| **Catégories** | **Nombre de features** | **Nombre de features total** | **Pourcentage** |
| --- | --- | --- | --- |
| Behavioral Characteristics | 22 | 65 | 33.85 % |
| Appliances | 19 | 44 | 43.18 % |
| Electronics | 14 | 37 | 37.84 % |
| Home Characteristics | 12 | 26 | 46.15 % |
| Air Conditioning | 7 | 18 | 38.89 % |
| Space Heating | 6 | 15 | 40 % |
| Household Characteristics | 4 | 12 | 33.33 % |
| Energy Bills | 2 | 10 | 20 % |
| Administration | 0 | 2 | 0 % |
| Geography | 0 | 3 | 0 % |
| Weather | 0 | 5 | 0 % |
| Water Heating | 0 | 5 | 0 % |
| Lighting | 0 | 7 | 0 % |
| Thermostat | 0 | 9 | 0 % |
| Energy Assistance | 0 | 13 | 0 % |
| **Total** | 71 | 206 | 34.47 % |

Méthode 3 : IG général

44 variables

| **Exemples de variables sélectionnées** | | |
| --- | --- | --- |
| **Features** | **Description** | **IG avec KWH** |
| TYPEHUQ | Type de logement | 0.118631 |
| MONPOOL | Nombre de mois d’utilisation de la piscine l’année passée | 0.067403 |
| REGIONC\_x0\_SOUTH | Région Sud | 0.066689 |
| TOTSQFT\_EN | Surface totale du logement | 0.037860 |
| NHSLDMEM | Nombre d’habitants du logement | 0.037511 |
| NUMFRIG | Nombre de réfrigérateurs utilisé | 0.022187 |
| DBT1 | Température des ampoules | 0.020033 |
| NCOMBATH | Nombre de salles de bain complètes | 0.018483 |
| NUMSMPHONE | Nombre de smartphones utilisé | 0.016440 |
| DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine | 0.015229 |
| BEDROOMS | Nombre de chambres | 0.015081 |
| TVCOLOR | Nombre de TV utilisé | 0.011799 |
| TOTROOMS | Nombres de pièces | 0.011484 |
| HDD65 | Nombre de jours d’utilisation du chauffage | 0.011262 |
| LGTINMORE8 | Nombre d’ampoules d’intérieur allumées plus de 8 heures par jour | 0.011138 |
| SIZFREEZ | Taille du réfrigérateur le plus utilisé | 0.010672 |
| WASHLOAD | Fréquence d’utilisation du lave-linge par semaine | 0.010355 |

Méthode 4 : Information Gain

| **Catégories** | **Nombre de features** | **Nombre de features total** | **Pourcentage** |
| --- | --- | --- | --- |
| Behavioral Characteristics | 24 | 65 | 36.92 % |
| Appliances | 16 | 44 | 36.36 % |
| Electronics | 11 | 37 | 29.73 % |
| Home Characteristics | 10 | 26 | 38.46 % |
| Thermostat | 6 | 9 | 66.66 % |
| Energy Assistance | 6 | 13 | 46.15 % |
| Space Heating | 6 | 15 | 40 % |
| Air Conditioning | 5 | 18 | 27.78 % |
| Lighting | 4 | 7 | 57.14 % |
| Household Characteristics | 4 | 12 | 33.33 % |
| Water Heating | 3 | 5 | 60 % |
| Administration | 2 | 2 | 100 % |
| Weather | 2 | 5 | 40 % |
| Energy Bills | 2 | 10 | 20 % |
| Geography | 1 | 3 | 33.33% |
| **Total** | 81 | 206 | 39.32 % |

## Intersection des 4 méthodes

| **Num** | **Features** | **Catégories** | **Description** |
| --- | --- | --- | --- |
| 1 | BEDROOMS | Home | Nombre de chambres |
| 2 | COMBODVR | Electronics | Nombre de décodeurs câble ou satellite avec DVR utilisés |
| 3 | DRYRUSE | Appliances / **Behaviors** | Fréquence d’utilisation du sèche-linge par semaine |
| 4 | DWASHUSE | Appliances / **Behaviors** | Fréquence d’utilisation du lave-vaisselle par semaine |
| 5 | LGTIN1TO4 | Lighting / **Behaviors** | Nombre d’ampoules d’intérieur allumées entre 1 et 4 heures par jour |
| 6 | LGTIN4TO8 | Lighting / **Behaviors** | Nombre d’ampoules d’intérieur allumées entre 4 et 8 heures par jour |
| 7 | LGTINMORE8 | Lighting / **Behaviors** | Nombre d’ampoules d’intérieur allumées plus de 8 heures par jour |
| 8 | MONEYPY | Household | Revenu total du ménage l’année passée |
| 9 | MONPOOL | Home / **Behaviors** | Nombre de mois d’utilisation de la piscine l’année passée |
| 10 | NHSLDMEM | Household | Nombre d’habitants du logement |
| 11 | SIZFREEZ | Appliances | Taille du réfrigérateur le plus utilisé |
| 12 | TOTROOMS | Home | Nombre total de salles |
| 13 | TOTSQFT\_EN | Home | Superficie du logement qui utilise de l’énergie (chauffage ou climatisation) |
| 14 | TVCOLOR | Electronics | Nombre de TV utilisé |
| 15 | TVONWD2 | Electronics / **Behaviors** | Nombre d’heures d’utilisation de la 2e TV en semaine |
| 16 | USECFAN | Air conditioning / **Behaviors** | Type d’utilisation du ventilateur de plafond principal |
| 17 | WASHLOAD | Appliances / **Behaviors** | Fréquence d’utilisation du lave-linge par semaine |

Analyse des clusters K-Means - 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | BEDROOMS | **2.258503** | **3.505452** |
| MONPOOL | **3.782258** | **4.965235** |
| TOTROOMS | **5.142300** | **7.916597** |
| TOTSQFT\_EN | **1358.239099** | **2542.212103** |
| Electronics | TVCOLOR | **1.699788** | **2.929299** |
| TVONWD2 | 3.248862 | 3.464830 |
| COMBODVR | 0.321118 | 0.848088 |
| Appliances | DRYRUSE | **2.653974** | **5.182936** |
| DWASHUSE | **1.991092** | **4.012850** |
| WASHLOAD | **2.637581** | **5.128877** |
| SIZFREEZ | 2.476983 | 2.838792 |
| Lightning | LGTIN1TO4 | **3.656184** | **7.481366** |
| LGTIN4TO8 | **2.422772** | **5.171240** |
| LGTINMORE8 | **1.196498** | **2.498023** |
| Household | MONEYPY | **9.995874** | **13.485680** |
| NHSLDMEM | **1.861938** | **2.994368** |
| Air conditioning | USECFAN | 2.227862 | 2.569899 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 7894.210774 | 1082.569283 | 2 |
| **Cluster 1** | 13537.199650 | 1724.329605 | 1 |

Analyse des clusters Kernel K-Means - 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | BEDROOMS | **2.805019** | **3.610922** |
| MONPOOL | **1.2** | **5.234879** |
| TOTROOMS | **6.352416** | **8.231229** |
| TOTSQFT\_EN | **1867.202602** | **2779.385666** |
| Electronics | TVCOLOR | **2.219765** | **3.293515** |
| TVONWD2 | 3.386580 | 3.301595 |
| COMBODVR | **0.546775** | **1.024786** |
| Appliances | DRYRUSE | **3.878453** | **5.917313** |
| DWASHUSE | **3.071920** | **4.137962** |
| WASHLOAD | **3.829368** | **5.850644** |
| SIZFREEZ | 2.708155 | 2.878843 |
| Lightning | LGTIN1TO4 | **5.241760** | **9.057167** |
| LGTIN4TO8 | **3.546654** | **6.515358** |
| LGTINMORE8 | **1.740335** | **2.974403** |
| Household | MONEYPY | **11.525403** | **13.780717** |
| NHSLDMEM | 2.365551 | 2.989761 |
| Air conditioning | USECFAN | 2.392756 | 2.704373 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 10100.386603 | 1330.876875 | 2 |
| **Cluster 1** | 17692.047193 | 2232.573840 | 1 |

Analyse DBSCAN

| **Clusters** | **Nombre d’échantillons** |
| --- | --- |
| -1 (anomalies) |  |
| 0 |  |
| 1 |  |

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | BEDROOMS | **2.587578** | **1.607527** |
| MONPOOL | **4.941504** | **0.120000** |
| TOTROOMS | **5.844120** | **3.924731** |
| TOTSQFT\_EN | **1648.254027** | **1069.086022** |
| Electronics | TVCOLOR | **1.989850** | **0** |
| TVONWD2 | **2.529062** | **X** |
| COMBODVR | 0.397151 | **X** |
| Appliances | DRYRUSE | **3.082656** | **1.752294** |
| DWASHUSE | **2.504817** | **0.952381** |
| WASHLOAD | **3.054411** | **1.774775** |
| SIZFREEZ | **2.621446** | **1.50** |
| Lightning | LGTIN1TO4 | **4.081013** | **3.177419** |
| LGTIN4TO8 | **2.570351** | **1.752688** |
| LGTINMORE8 | 0.997672 | 0.790323 |
| Household | MONEYPY | **11.305988** | **9.865591** |
| NHSLDMEM | **2.019834** | **1.284946** |
| Air conditioning | USECFAN | 2.318053 | 2.053191 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 8903.169110 | 1197.120978 | 1 |
| **Cluster 1** | 4899.528925 | 703.292312 | 2 |

Analyse des variables comportementales

| **Num** | **Variables** | **Description** |
| --- | --- | --- |
| 1 | DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine |
| 2 | DWASHUSE | Fréquence d’utilisation du lave-vaisselle par semaine |
| 3 | LGTIN1TO4 | Nombre d’ampoules d’intérieur allumées 1 à 4 heures par jour |
| 4 | LGTIN4TO8 | Nombre d’ampoules d’intérieur allumées 4 à 8 heures par jour |
| 5 | LGTINMORE8 | Nombre d’ampoules d’intérieur allumées plus de 8h par jour |
| 6 | MONPOOL | Nombre de mois d’utilisation de la piscine l’année passée |
| 7 | TVONWD2 | Nombre d’heures d’utilisation de la 2e TV par jour en semaine |
| 8 | USECFAN | Type d’utilisation du ventilateur de plafond principal |
| 9 | WASHLOAD | Fréquence d’utilisation du lave-linge par semaine |

Analyse des clusters K-Means - 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | MONPOOL | **5.110849** | **3.901575** |
| Electronics | TVONWD2 | 3.588029 | 3.219876 |
| Appliances | DRYRUSE | **6.152776** | **2.555059** |
| DWASHUSE | **4.662595** | **1.967798** |
| WASHLOAD | **6.070573** | **2.552519** |
| Lightning | LGTIN1TO4 | **8.584596** | **3.748121** |
| LGTIN4TO8 | **6.185935** | **2.362739** |
| LGTINMORE8 | **3.117206** | **1.089304** |
| Air conditioning | USECFAN | 2.702868 | 2.208709 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 13862.245621 | 1751.338638 | 2 |
| **Cluster 1** | 8769.602101 | 1187.780519 | 1 |

Analyse des clusters Kernel K-Means - 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | MONPOOL | **5.201382** | **0.629213** |
| Electronics | TVONWD2 | **5.132662** | **3.189166** |
| Appliances | DRYRUSE | **5.953307** | **3.856968** |
| DWASHUSE | **4.000840** | **3.078179** |
| WASHLOAD | **5.802632** | **3.815581** |
| Lightning | LGTIN1TO4 | **8.866363** | **5.222882** |
| LGTIN4TO8 | **6.134396** | **3.551110** |
| LGTINMORE8 | **3.167046** | **1.713285** |
| Air conditioning | USECFAN | 2.702868 | 2.208709 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 16813.982809 | 2125.162118 | 1 |
| **Cluster 1** | 10103.863941 | 1331.546783 | 2 |

Analyse des clusters K-Means - 3 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- | --- |
| Home | MONPOOL | **0.632653** | **0.388889** | **5.191740** |
| Electronics | TVONWD2 | 3.198671 | 3.674543 | 3.071584 |
| Appliances | DRYRUSE | **2.499880** | **6.092226** | 4.739821 |
| DWASHUSE | **1.908110** | **4.626524** | 3.710581 |
| WASHLOAD | **2.499824** | **6.004934** | 4.718101 |
| Lightning | LGTIN1TO4 | **3.657475** | **8.539834** | 6.761062 |
| LGTIN4TO8 | **2.303228** | **6.158655** | 4.573255 |
| LGTINMORE8 | **1.057168** | **3.154578** | 1.967552 |
| Air conditioning | USECFAN | 2.194599 | 2.674675 | 2.685466 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 8558.481171 | 1163.097435 | 3 |
| **Cluster 1** | 13027.244041 | 1648.425821 | 2 |
| **Cluster 2** | 17686.589371 | 2248.897148 | 1 |

Analyse des clusters Kernel K-Means - 3 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- | --- |
| Home | MONPOOL | 3.090909 | **5.155359** | **0.222222** |
| Electronics | TVONWD2 | **6.432535** | 3.011944 | 3.140565 |
| Appliances | DRYRUSE | **9.671167** | 4.607143 | **3.546049** |
| DWASHUSE | **5.761448** | 3.634096 | **2.906885** |
| WASHLOAD | **9.439423** | 4.587945 | **3.511452** |
| Lightning | LGTIN1TO4 | **13.190789** | 6.671906 | **4.884439** |
| LGTIN4TO8 | **10.447368** | 4.478389 | **3.230729** |
| LGTINMORE8 | **6.566729** | 1.908644 | **1.486868** |
| Air conditioning | USECFAN | 2.662763 | 2.785403 | 2.368738 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 14810.843994 | 1836.579502 | 2 |
| **Cluster 1** | 17514.850550 | 2235.359303 | 1 |
| **Cluster 2** | 9859.912227 | 1304.478854 | 3 |

Analyse des clusters K-Means - 6 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | **0.272727** | 1.444444 | 0.703704 | 3.589744 | 3.10 | **5.262055** |
| Electronics | TVONWD2 | 2.152877 | **10.381892** | 2.220556 | 3.594272 | 2.832293 | 2.963415 |
| Appliances | DRYRUSE | 3.927994 | 3.681920 | **1.907137** | **12.032686** | 4.839273 | 4.320975 |
| DWASHUSE | 3.454129 | 2.354167 | **1.267809** | **5.931395** | 4.510878 | 3.523810 |
| WASHLOAD | 3.896001 | 3.573529 | **1.946912** | **11.848825** | 4.778261 | 4.317511 |
| Lightning | LGTIN1TO4 | 5.347224 | 3.970728 | **3.182881** | 7.185904 | **15.435185** | 6.309224 |
| LGTIN4TO8 | 3.333528 | 3.270252 | **2.075846** | 4.682329 | **12.039886** | 4.187631 |
| LGTINMORE8 | 1.206469 | 2.066031 | **1.065036** | 2.330950 | **7.344017** | 1.736897 |
| Air conditioning | USECFAN | 2.613437 | 2.386509 | **1.793282** | 2.625468 | 2.552823 | 2.666667 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 5** | 17547.188417 | 2237.299560 | 1 |
| **Cluster 3** | 14473.361808 | 1787.513851 | 2 |
| **Cluster 4** | 13425.914060 | 1705.874053 | 3 |
| **Cluster 1** | 11946.805099 | 1536.413989 | 4 |
| **Cluster 0** | 11074.726440 | 1429.682629 | 5 |
| **Cluster 2** | 7166.434971 | 1018.716688 | 6 |

Analyse des clusters Kernel K-Means - 6 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | 2.666667 | **5.231320** | **0.294118** | 0.509434 | 3.055556 | 3.678571 |
| Electronics | TVONWD2 | **11.257564** | 2.993220 | 2.577960 | **2.219592** | 3.576347 | 4.069209 |
| Appliances | DRYRUSE | 3.879706 | 4.416322 | 5.875891 | **2.745124** | 5.191919 | **15.476886** |
| DWASHUSE | 2.497319 | 3.572354 | 5.147531 | **2.091805** | 4.513228 | **6.519886** |
| WASHLOAD | 3.759209 | 4.411523 | 5.828741 | **2.735564** | 5.113350 | **15.048662** |
| Lightning | LGTIN1TO4 | 4.208896 | 6.630879 | 8.683245 | **3.989787** | **18.253589** | 7.566910 |
| LGTIN4TO8 | 3.582208 | 4.431493 | 5.952931 | **2.517575** | **15.358852** | 5.218978 |
| LGTINMORE8 | 2.386139 | 1.854072 | 2.54 | **1.048106** | **12.377419** | 2.652941 |
| Air conditioning | USECFAN | 2.466447 | 2.671946 | 2.733220 | 2.236849 | 2.545161 | 2.705882 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 1** | 17504.826299 | 2227.053845 | 1 |
| **Cluster 5** | 15287.392530 | 1885.270024 | 2 |
| **Cluster 4** | 14225.900120 | 1814.014785 | 3 |
| **Cluster 2** | 12982.412093 | 1648.07590 | 4 |
| **Cluster 0** | 11986.931946 | 1528.215854 | 5 |
| **Cluster 3** | 8783.577385 | 1186.468747 | 6 |

Analyse des clusters K-Means - 10 clusters

| **Clusters** | **Inertie** |
| --- | --- |
| Cluster 0 | 7386.959355436931 |
| Cluster 1 | 5880.488457410588 |
| Cluster 2 | 10352.774073475215 |
| Cluster 3 | 5085.782699281081 |
| Cluster 4 | 5644.131003400235 |
| Cluster 5 | 5599.3402288647285 |
| Cluster 6 | 6431.8052805718535 |
| Cluster 7 | 6251.67914949703 |
| Cluster 8 | 7704.692682630577 |
| Cluster 9 | 11776.341342642734 |
| Inertie totale | 72113.99427321098 |

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** |
| --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | 3.210526 | 1.111111 | 0.428571 | 1.333333 | 2.444444 |
| Electronics | TVONWD2 | 3.210926 | 2.411442 | **2.100822** | 2.795047 | 2.366337 |
| Appliances | DRYRUSE | 4.504253 | 3.590661 | 2.382666 | **1.124019** | 4.259502 |
| DWASHUSE | 4.056555 | 2.945930 | **1.320174** | **1.365408** | 3.682861 |
| WASHLOAD | 4.446191 | 3.533564 | 2.402312 | **1.266106** | 4.241514 |
| Lightning | LGTIN1TO4 | 7.380397 | 4.554353 | 3.571879 | **2.725250** | **21.727506** |
| LGTIN4TO8 | 7.266044 | 3.279390 | 2.255570 | **1.841054** | 6.284062 |
| LGTINMORE8 | **11.108518** | 1.184948 | **0.875788** | 1.033606 | 1.821337 |
| Air conditioning | USECFAN | 2.377778 | **X** | 2.303069 | 1.385396 | 2.531532 |

| **Catégories** | **Variables** | **Cluster 5** | **Cluster 6** | **Cluster 7** | **Cluster 8** | **Cluster 9** |
| --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | 4.045455 | **5.283120** | 1.444444 | 3.605263 | **0.238095** |
| Electronics | TVONWD2 | 3.331933 | 2.975148 | **11.541667** | 3.741980 | 2.448066 |
| Appliances | DRYRUSE | 5.751724 | 4.312837 | 3.715145 | **12.603842** | 4.578932 |
| DWASHUSE | 4.971119 | 3.523164 | 2.280781 | **5.822469** | 4.456889 |
| WASHLOAD | 5.627586 | 4.309345 | 3.620452 | **12.421369** | 4.532060 |
| Lightning | LGTIN1TO4 | **17.341297** | 6.117521 | 3.954710 | 6.842737 | 5.361001 |
| LGTIN4TO8 | **23.948805** | 4.077991 | 3.216486 | 4.719088 | 3.977828 |
| LGTINMORE8 | 6.402730 | 1.658120 | 1.901268 | 2.229292 | 1.251279 |
| Air conditioning | USECFAN | 2.573840 | 2.666667 | 2.391813 | 2.647399 | 2.597547 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 6** | 17539.317607 | 2238.249348 | 1 |
| **Cluster 5** | 15399.639488 | 1930.151843 | 2 |
| **Cluster 8** | 14674.761477 | 1810.379088 | 3 |
| **Cluster 0** | 12522.800000 | 1610.557223 | 4 |
| **Cluster 7** | 12157.507373 | 1552.430444 | 5 |
| **Cluster 9** | 12122.421725 | 1540.663005 | 6 |
| **Cluster 4** | 12116.532326 | 1549.677134 | 7 |
| **Cluster 2** | 9124.108069 | 1201.505929 | 8 |
| **Cluster 1** | 8952.760762 | 1266.787334 | 9 |
| **Cluster 3** | 5795.462666 | 870.286912 | 10 |

Analyse des clusters Kernel K-Means - 10 clusters

| **Clusters** | **Inertie** |
| --- | --- |
| Cluster 0 | 20911.364813611464 |
| Cluster 1 | 13646.102030541448 |
| Cluster 2 | 4011.040886765295 |
| Cluster 3 | 3508.1467529156726 |
| Cluster 4 | 10752.037984392857 |
| Cluster 5 | 6658.171893923311 |
| Cluster 6 | 4658.183209249023 |
| Cluster 7 | 5461.791724714982 |
| Cluster 8 | 4898.823248579864 |
| Cluster 9 | 4947.863448842469 |
| Inertie totale | 79453.52599353639 |

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** |
| --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | **0.581395** | 1.368421 | **5.727273** | **5.0** | **0.466667** |
| Electronics | TVONWD2 | 2.548179 | 2.712217 | 2.977941 | **5.828283** | 2.733488 |
| Appliances | DRYRUSE | 2.792346 | **2.568839** | 6.119048 | **19.803738** | 5.300415 |
| DWASHUSE | 1.943752 | **1.851711** | **5.481928** | **6.925532** | **5.579204** |
| WASHLOAD | 2.784564 | **2.547570** | 5.869048 | **18.962617** | 5.247178 |
| Lightning | LGTIN1TO4 | 4.231757 | **3.486355** | **34.364706** | 9.663551 | 6.601501 |
| LGTIN4TO8 | 2.616152 | **2.334234** | **17.858824** | 7.224299 | 7.224299 |
| LGTINMORE8 | **1.045641** | 1.145636 | **16.011765** | 4.485981 | 1.798499 |
| Air conditioning | USECFAN | 2.361028 | **1.376866** | 2.720588 | 2.793103 | 2.491364 |

| **Catégories** | **Variables** | **Cluster 5** | **Cluster 6** | **Cluster 7** | **Cluster 8** | **Cluster 9** |
| --- | --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | **5.267159** | 0.8 | 2.181818 | 2.461538 | 2.384615 |
| Electronics | TVONWD2 | 3.013403 | **14.231467** | 2.518939 | 3.340102 | 3.530550 |
| Appliances | DRYRUSE | 4.355390 | 4.125654 | 4.758763 | **11.612447** | 4.838333 |
| DWASHUSE | 3.521739 | 2.459530 | 3.955032 | **5.500838** | 4.184211 |
| WASHLOAD | 4.360255 | 3.976231 | 4.691358 | **11.499293** | 4.80 |
| Lightning | LGTIN1TO4 | 6.346357 | 4.043873 | **22.083673** | 6.697313 | 8.809826 |
| LGTIN4TO8 | 4.224921 | 4.224921 | **12.957143** | 4.547383 | 4.547383 |
| LGTINMORE8 | 1.726505 | 2.072617 | 2.491837 | 2.050919 | **11.684628** |
| Air conditioning | USECFAN | 2.670930 | 2.534737 | 2.613402 | 2.647260 | 2.428571 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 5** | 17466.132323 | 2225.727212 | 1 |
| **Cluster 2** | 17146.584471 | 2068.306235 | 2 |
| **Cluster 3** | 16360.234299 | 1983.512243 | 3 |
| **Cluster 8** | 14485.533083 | 1783.552122 | 4 |
| **Cluster 7** | 13663.413673 | 1716.932918 | 5 |
| **Cluster 9** | 12980.365578 | 1658.473930 | 6 |
| **Cluster 6** | 12685.414024 | 1612.591936 | 7 |
| **Cluster 4** | 12478.072994 | 1606.946289 | 8 |
| **Cluster 0** | 9707.680466 | 1267.613173 | 9 |
| **Cluster 1** | 7079.168579 | 1034.188041 | 10 |

Analyse DBSCAN variables comportementales

| **Clusters** | **Nombre d’échantillons** |
| --- | --- |
| -1 (anomalies) |  |
| 0 |  |
| 1 |  |
| 2 |  |

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- | --- |
| Home | MONPOOL | **X** | **X** | **4.450000** |
| Electronics | TVONWD2 | 2.683813 | 2.895492 | 2.025000 |
| Appliances | DRYRUSE | 3.369220 | 2.895759 | 3.690 |
| DWASHUSE | 2.722415 | 2.323112 | 2.830 |
| WASHLOAD | 3.335648 | 2.865377 | 3.630 |
| Lightning | LGTIN1TO4 | **4.479427** | 3.513114 | 3.780 |
| LGTIN4TO8 | 2.794813 | 2.374721 | 1.70 |
| LGTINMORE8 | 1.013679 | 0.999442 | 0.350 |
| Air conditioning | USECFAN | 2.339462 | **X** | 2.910 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 10231.712431 | 1327.727541 | 2 |
| **Cluster 1** | 7503.959235 | 1085.637430 | 3 |
| **Cluster 2** | 15699.514200 | 2016.905000 | 1 |

| Classement des comportements les plus énergivores | |
| --- | --- |
| 1 | Utilisation de la piscine |
| 2 | Utilisation des appareils électroménagers |
| 3 | Allumage prolongé des lumières extérieures la nuit |
| 4 | Allumage prolongé des lumières intérieures |
| 5 | Utilisation des appareils de cuisine |
| 6 | Visionner la télévision longtemps |
| 7 | Allumage pendant un temps court des lumières intérieures |

Méthode 1 : Corrélation sur toutes les variables

| **Variables** | **Corr. avec KWH** | **Corr. avec DOLLAREL** |
| --- | --- | --- |
| WASHLOAD | 0.356665 | 0.324310 |
| DRYRUSE | 0.356058 | 0.322085 |
| MONPOOL | 0.283956 | 0.279079 |
| DWASHUSE | 0.261183 | 0.248307 |
| USECFAN | 0.243469 | 0.179844 |
| TVONWD2 | 0.220182 | 0.197816 |
| LGTIN4TO8 | 0.188764 | 0.194263 |
| LGTIN1TO4 | 0.175418 | 0.160078 |
| LGTINMORE8 | 0.142039 | 0.131615 |

| **Variables** | **Corr. avec KWH** | **Corr. avec DOLLAREL** |
| --- | --- | --- |
| WASHLOAD | 0.356665 | 0.324310 |
| DRYRUSE | 0.356058 | 0.322085 |
| MONPOOL | 0.283956 | 0.279079 |
| DWASHUSE | 0.261183 | 0.248307 |

Méthode 2 : Correlation par categories

| **Catégories** | **Variables** | **Corr. avec KWH** | **Corr. avec DOLLAREL** |
| --- | --- | --- | --- |
| Home | MONPOOL | 0.283956 | 0.279079 |
| Electronics | TVONWD2 | 0.220182 | 0.197816 |
| Appliances | DRYRUSE | 0.356058 | 0.322085 |
| DWASHUSE | 0.261183 | 0.248307 |
| WASHLOAD | 0.356665 | 0.324310 |
| Lightning | LGTIN1TO4 | 0.175418 | 0.160078 |
| LGTIN4TO8 | 0.188764 | 0.194263 |
| LGTINMORE8 | 0.142039 | 0.131615 |
| Air conditioning | USECFAN | 0.243469 | 0.179844 |

| **Catégories** | **Variables** | **Corr. avec KWH** | **Corr. avec DOLLAREL** |
| --- | --- | --- | --- |
| Home | MONPOOL | 0.283956 | 0.279079 |
| Electronics | TVONWD2 | 0.220182 | 0.197816 |
| Appliances | DRYRUSE | 0.356058 | 0.322085 |
| WASHLOAD | 0.356665 | 0.324310 |
| Lightning | LGTIN1TO4 | 0.175418 | 0.160078 |
| LGTIN4TO8 | 0.188764 | 0.194263 |
| Air conditioning | USECFAN | 0.243469 | 0.179844 |

Méthode 3 : IG GENERAL

| **Num** | **Variables** | **Description** |
| --- | --- | --- |
| 1 | DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine |
| 2 | DWASHUSE | Fréquence d’utilisation du lave-vaisselle par semaine |
| 3 | LGTIN1TO4 | Nombre d’ampoules d’intérieur allumées 1 à 4 heures par jour |
| 4 | LGTIN4TO8 | Nombre d’ampoules d’intérieur allumées 4 à 8 heures par jour |
| 5 | TVONWD2 | Nombre d’heures d’utilisation de la 2e TV par jour en semaine |

Méthode 4 : IG par catégorie

| **Num** | **Variables** | **Description** |
| --- | --- | --- |
| Home Characteristics | | |
| 1 | MONPOOL | Nombre de mois d’utilisation de la piscine l’année passée |
| Appliances | | |
| 3 | DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine |
| 4 | WASHLOAD | Fréquence d’utilisation du lave-linge par semaine |
| Electronics | | |
| 5 | TVONWD2 | Nombre d’heures d’utilisation de la 2e TV par jour en semaine |
| Air Conditioning | | |
| 6 | USECFAN | Type d’utilisation du ventilateur de plafond principal |
| Lighting | | |
| 7 | LGTIN4TO8 | Nombre d’ampoules d’intérieur allumées 4 à 8 heures par jour |
| 8 | LGTIN1TO4 | Nombre d’ampoules d’intérieur allumées 1 à 4 heures par jour |

Intersection des 4 méthodes sur les variables comportementales

| **Num** | **Variables** | **Description** |
| --- | --- | --- |
| 1 | DRYRUSE | Fréquence d’utilisation du sèche-linge par semaine |

Analyse K-Means : 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | MONPOOL | **2.827907** | **5.469077** |
| Appliances | DRYRUSE | **2.806872** | **7.838585** |
| WASHLOAD | **2.802241** | **7.729141** |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 9530.325531 | 1274.035438 | 2 |
| **Cluster 1** | 15226.163247 | 1925.192164 | 1 |

Analyse Kernel K-Means : 2 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** |
| --- | --- | --- | --- |
| Home | MONPOOL | **8.403614** | **4.51** |
| Appliances | DRYRUSE | **10.523810** | **3.54424** |
| WASHLOAD | **9.493984** | **3.537017** |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 9157.271742 | 1251.283143 | 2 |
| **Cluster 1** | 11201.298460 | 1460.359649 | 1 |

### 

Analyse K-Means : 3 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- | --- |
| Home | MONPOOL | **0.245902** | 1.185185 | **5.355688** |
| Appliances | DRYRUSE | **2.497363** | **7.486276** | 4.762232 |
| WASHLOAD | **2.500907** | **7.389249** | 4.751282 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 9177.337029 | 1234.037208 | 3 |
| **Cluster 1** | 13271.029117 | 1692.562746 | 2 |
| **Cluster 2** | 18593.339109 | 2342.170789 | 1 |

Analyse Kernel K-Means : 3 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- | --- |
| Home | MONPOOL | 0.750 | **5.381523** | 0.662921 |
| Appliances | DRYRUSE | **0.360656** | **8.461538** | 3.459561 |
| WASHLOAD | **1.038835** | **8.345217** | 3.448435 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 6000.944257 | 905.785976 | 3 |
| **Cluster 1** | 16906.320189 | 2127.523947 | 1 |
| **Cluster 2** | 10707.845477 | 1400.467969 | 2 |

Analyse K-Means : 4 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** |
| --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | **0.238095** | **5.380245** | 3.869565 | **0.382353** |
| Appliances | DRYRUSE | 4.472744 | 4.464254 | **12.347749** | **1.487844** |
| WASHLOAD | 4.434423 | 4.449912 | **12.149912** | **1.550820** |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 11655.514050 | 1508.022068 | 3 |
| **Cluster 1** | 18524.883881 | 2331.318488 | 1 |
| **Cluster 2** | 15102.131772 | 1903.732337 | 2 |
| **Cluster 3** | 7916.786377 | 1096.983573 | 4 |

Analyse Kernel K-Means : 4 clusters

| **Catégories** | **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** |
| --- | --- | --- | --- | --- | --- |
| Home | MONPOOL | 0.5 | 0.224138 | **0** | **5.341484** |
| Appliances | DRYRUSE | **8.724242** | 2.902932 | **0.360656** | 5.056540 |
| WASHLOAD | **8.587899** | 2.904481 | **1.038835** | 5.063866 |

|  | **Moy KWH** | **Moy DOLLAREL** | **Classement Énergivore** |
| --- | --- | --- | --- |
| **Cluster 0** | 13857.451570 | 1758.178299 | 2 |
| **Cluster 1** | 10278.889521 | 1351.115359 | 3 |
| **Cluster 2** | 6003.471950 | 906.048859 | 4 |
| **Cluster 3** | 18561.709324 | 2341.576937 | 1 |

| Classement des comportements les plus énergivores | |
| --- | --- |
| 1 | Utilisation de la piscine |
| 2 | Utilisation des appareils électroménagers |

Analyse clustering meilleure inertie

K-means avec 10 clusters

| **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** | **Cluster 6** | **Cluster 7** | **Cluster 8** | **Cluster 9** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| REGIONC | 1.60677 | 1.67683 | 1.60488 | 1.57266 | 1.68638 | 1.64846 | 1.74039 | 1.59149 | 1.56423 | 1.60 |
| DIVISION | 4.8891 | 4.7083 | 4.89954 | 4.56176 | 5.02057 | 5.06485 | 4.6688 | 4.92210 | 4.7635 | 4.943 |
| state\_name | 25.871 | 24.852 | 24.58 | 24.26 | 25.16 | 24.580 | 21.70 | 25.197 | 24.99 | 25.355 |
| UATYP10 | 1.63 | 1.58 | 1.53 | 1.66 | 1.568 | 1.60 | 1.59 | 1.578 | 1.478 | 1.52274 |
| HDD65 | 4429.76 | 4913.70 | 4076.85 | 4475.15 | 4363.84 | 4538.96 | **3278.46** | 3975.61 | 4487.65 | 4397.70 |
| CDD65 | 1416.49 | 1120.17 | 1637.12 | 1362.92 | 1451.33 | 1349.29 | **2158.43** | 1681.54 | 1420.22 | 1499.47 |
| TYPEHUQ | 2.387 | 2.697 | 2.435 | **3.771** | 2.195 | 2.123 | 2.0 | 2.38 | 2.16 | 2.26 |
| CELLAR | 0.52 | 0.546 | 0.441 | 0.457 | 0.497 | 0.544 | **0.393** | 0.44 | 0.503 | 0.499 |
| YEARMADERANGE | 4.694 | 4.437 | 4.352 | **3.762** | 5.168 | 5.147 | 4.878 | 4.248 | 4.709 | 5.079 |
| BEDROOMS | 3.21 | 2.752 | 2.72 | **1.833** | 3.393 | 3.618 | 3.536 | 2.88 | 3.324 | 3.189 |
| NCOMBATH | 2.075 | 1.697 | 1.674 | **1.203** | 2.213 | 2.365 | 2.267 | 1.659 | 1.988 | 2.033 |
| TOTROOMS | 7.392 | 6.079 | 6.185 | **4.305** | 7.778 | **8.406** | 8.036 | 6.35 | 7.388 | 7.213 |
| WINDOWS | 4.292 | 3.727 | 3.738 | **2.706** | 4.616 | 4.928 | 4.665 | 3.709 | 4.277 | 4.222 |
| ADQINSUL | 1.774 | 1.916 | 1.924 | **2.127** | 1.738 | 1.672 | 1.718 | 2.025 | 1.909 | 1.772 |
| MONPOOL | 3.211 | 1.111 | 0.429 | 1.333 | 2.444 | 4.045 | **5.283** | 1.444 | 3.605 | **0.238** |
| RECBATH | 0.081 | 0.041 | 0.049 | 0.018 | 0.111 | 0.116 | 0.24 | 0.033 | 0.072 | 0.087 |
| MONTUB | 4.899 | 4.928 | 4.339 | **3.359** | **6.291** | 5.235 | 6.173 | 4.5 | 5.133 | 5.83 |
| NUMFRIG | 1.581 | 1.318 | 1.357 | **1.095** | 1.676 | 1.778 | 1.851 | 1.483 | 1.639 | 1.584 |
| NUMFREEZ | 0.491 | 0.348 | 0.395 | 0.163 | 0.505 | 0.577 | 0.529 | 0.485 | 0.583 | 0.53 |
| COOKTOP | 0.207 | 0.113 | 0.115 | 0.062 | 0.248 | 0.283 | 0.268 | 0.128 | 0.131 | 0.165 |
| OVEN | 0.307 | 0.156 | 0.143 | 0.081 | 0.337 | 0.399 | 0.382 | 0.138 | 0.173 | 0.22 |
| RCOOKUSE | 9.188 | 7.98 | 6.756 | **6.482** | 9.149 | 9.938 | 7.839 | 7.573 | **10.309** | 8.628 |
| ROVENUSE | 4.07 | 3.327 | 2.589 | **2.452** | 3.672 | 4.573 | 3.596 | 3.759 | **5.207** | 3.896 |
| COOKTOPUSE | 9.14 | 8.348 | 6.932 | **6.526** | 9.408 | 10.0 | 8.201 | 7.38 | **10.352** | 8.618 |
| OVENUSE | 4.745 | 3.844 | 2.914 | **2.612** | 4.404 | 4.952 | 3.919 | 4.233 | **5.22** | 4.328 |
| AMTMICRO | 14.73 | 12.467 | 11.406 | 10.096 | 15.442 | 16.817 | 13.441 | 14.521 | **18.053** | 13.955 |
| DISHWASH | 0.908 | 0.846 | 0.676 | **0.373** | 0.952 | 0.945 | 0.946 | 0.603 | 0.866 | 0.992 |
| DWASHUSE | 4.057 | 2.946 | **1.32** | 1.365 | 3.683 | 4.971 | 3.523 | 2.281 | **5.822** | 4.457 |
| WASHLOAD | 4.446 | 3.534 | 2.402 | 1.266 | 4.242 | 5.628 | 4.309 | 3.62 | **12.421** | 4.532 |
| DRYER | 0.96 | 0.99 | 0.929 | **0.289** | 0.981 | 0.99 | 0.99 | 0.903 | 1.0 | 0.996 |
| DRYRUSE | 4.504 | 3.591 | 2.383 | 1.124 | 4.26 | 5.752 | 4.313 | 3.715 | **12.604** | 4.579 |
| TVCOLOR | 2.593 | 2.001 | 1.966 | **1.504** | 2.577 | 2.86 | 3.121 | **3.055** | 2.969 | 2.593 |
| TVUSE1 | 2.876 | 2.797 | 3.05 | 3.837 | 2.818 | 3.314 | 2.111 | 2.169 | 2.473 | 2.698 |
| TVONWD1 | 6.554 | 5.404 | 6.042 | 6.204 | 5.11 | 5.572 | 6.062 | **12.154** | 7.137 | 5.789 |
| TVONWE1 | 7.415 | 6.327 | 6.807 | 6.87 | 6.186 | 6.912 | 6.943 | **12.894** | 8.342 | 6.707 |
| TVONWD2 | 3.211 | 2.411 | 2.101 | 2.795 | 2.366 | 3.332 | 2.975 | **11.542** | 3.742 | 2.448 |
| TVUSE3 | 3.975 | 4.632 | 4.287 | 4.441 | 4.609 | 4.284 | 2.982 | 3.029 | **5.349** | 3.615 |
| TVONWD3 | 2.447 | 2.169 | 1.908 | 2.712 | 1.889 | 2.472 | 2.222 | **6.356** | 2.851 | 1.915 |
| COMBODVR | 0.742 | 0.465 | 0.478 | 0.243 | 0.681 | 0.776 | 0.94 | 0.811 | 0.758 | 0.69 |
| INTSTREAM | 1.278 | 1.015 | 0.873 | 0.683 | 1.271 | 1.5 | 1.425 | 1.215 | 1.528 | 1.311 |
| DESKTOP | 0.672 | 0.54 | 0.461 | **0.29** | 0.697 | **0.908** | 0.646 | 0.525 | 0.598 | 0.619 |
| NUMLAPTOP | 1.875 | 1.422 | 1.038 | 0.888 | 1.851 | **2.177** | 1.721 | 1.267 | 1.969 | 1.63 |
| NUMSMPHONE | 2.265 | 1.925 | 1.533 | 1.342 | 2.338 | 2.683 | 2.347 | 2.123 | **2.785** | 2.24 |
| TELLDAYS | 4.825 | 4.672 | 4.339 | 4.451 | 4.627 | 4.847 | 4.49 | 4.637 | 4.701 | 4.555 |
| TLDESKTOP | 0.323 | 0.313 | 0.293 | 0.257 | 0.312 | 0.413 | 0.279 | **0.42** | 0.284 | 0.305 |
| TLLAPTOP | 0.902 | 0.899 | 0.842 | 0.868 | 0.907 | 0.907 | 0.868 | **0.783** | 0.86 | 0.882 |
| ONLNEDUC | 0.272 | 0.198 | 0.122 | 0.126 | 0.237 | 0.331 | 0.22 | 0.241 | 0.352 | 0.224 |
| SMARTSPK | 0.96 | 0.614 | 0.479 | 0.33 | 0.958 | 1.062 | 0.987 | 0.583 | 0.98 | 0.879 |
| SSTEMP | 0.179 | 0.108 | 0.127 | 0.048 | 0.184 | 0.219 | 0.145 | 0.104 | 0.105 | 0.144 |
| HEATAPT | 0.448 | 0.356 | 0.338 | 0.544 | 0.353 | 0.333 | X | 0.43 | 0.39 | 0.273 |
| EQUIPAUXTYPE | 7.279 | 5.526 | 6.909 | **3.473** | 8.994 | 8.483 | 7.846 | 6.519 | 8.105 | 7.745 |
| COOLAPT | 0.303 | 0.311 | 0.231 | 0.225 | 0.156 | 0.167 | X | 0.285 | 0.302 | 0.319 |
| ACEQUIPM\_PUB | 1.508 | 1.864 | 1.754 | **2.634** | 1.377 | 1.333 | 1.346 | 1.874 | 1.55 | 1.478 |
| NUMDLHPAC | 2.0 | 2.316 | 1.935 | 1.88 | 1.964 | **2.545** | 1.71 | 2.429 | 1.87 | 2.121 |
| NUMCFAN | 2.583 | **0.0** | 2.716 | 0.37 | 3.032 | 3.0 | **3.802** | 2.271 | 2.75 | 3.238 |
| USECFAN | 2.378 | X | 2.303 | 1.385 | 2.532 | 2.574 | 2.667 | 2.392 | 2.647 | 2.598 |
| DEHUMTYPE | 0.271 | 0.21 | 0.197 | 0.07 | 0.257 | 0.246 | 0.224 | 0.119 | 0.233 | 0.271 |
| TEMPNITE | 67.991 | 67.292 | 68.06 | 68.341 | 67.281 | 67.764 | 68.06 | 69.571 | 68.256 | 67.857 |
| TEMPHOMEAC | 72.167 | 71.526 | 72.363 | 70.97 | 72.637 | 72.301 | **73.081** | **70.971** | 71.461 | 72.251 |
| TEMPGONEAC | 73.549 | 72.909 | 73.834 | 72.645 | 74.446 | 73.692 | **74.416** | **71.793** | 72.752 | 73.688 |
| LGTIN1TO4 | 7.38 | 4.554 | 3.572 | **2.725** | **21.728** | **17.341** | 6.118 | 3.955 | 6.843 | 5.361 |
| LGTIN4TO8 | 7.266 | 3.279 | 2.256 | **1.841** | 6.284 | **23.949** | 4.078 | 3.216 | 4.719 | 3.978 |
| LGTINMORE8 | **11.109** | 1.185 | **0.876** | 1.034 | 1.821 | 6.403 | 1.658 | 1.901 | 2.229 | 1.251 |
| LGTINLED | 2.172 | 2.081 | 2.04 | **1.672** | 2.285 | 2.345 | 2.17 | 1.947 | 2.178 | 2.2 |
| LGTOUTNITE | 3.165 | 2.272 | 2.219 | 2.17 | 3.54 | **4.652** | 3.303 | 2.057 | 2.922 | 2.722 |
| POWEROUT | 0.172 | 0.16 | 0.179 | 0.137 | 0.161 | 0.198 | **0.228** | 0.193 | 0.184 | 0.181 |
| WHYPOWEROUT | 3.19 | 2.089 | 2.264 | 3.973 | 2.76 | **1.138** | **1.131** | **4.469** | 2.536 | 1.945 |
| BACKUP | 0.16 | 0.149 | 0.134 | 0.084 | 0.159 | 0.222 | 0.269 | 0.115 | 0.178 | 0.185 |
| EMPLOYHH | 1.992 | 1.997 | 2.153 | 2.263 | 1.96 | **1.782** | 1.989 | **2.386** | 1.965 | 1.966 |
| EDUCATION | 3.735 | 3.491 | 3.213 | 3.006 | 3.85 | **3.939** | 3.472 | 2.812 | 3.367 | 3.59 |
| SDESCENT | 0.049 | 0.08 | 0.095 | **0.146** | 0.036 | 0.055 | 0.054 | 0.082 | 0.062 | 0.053 |
| NHSLDMEM | 2.751 | 2.361 | 1.943 | **1.819** | 2.78 | 3.348 | 2.759 | 2.801 | **3.587** | 2.692 |
| NUMCHILD | 0.69 | 0.444 | 0.258 | 0.277 | 0.68 | 1.038 | 0.582 | 0.594 | **1.169** | 0.588 |
| NUMADULT1 | 1.478 | 1.384 | 1.104 | 1.131 | 1.53 | 1.836 | 1.604 | 1.533 | **1.956** | 1.53 |
| NUMADULT2 | 0.583 | 0.532 | 0.582 | 0.411 | 0.571 | 0.474 | 0.573 | **0.674** | 0.462 | 0.573 |
| MONEYPY | 13.134 | 12.061 | 10.948 | **8.716** | 13.797 | 13.84 | 13.669 | 9.906 | 12.902 | 13.032 |
| NOHEATBROKE | 0.135 | 0.174 | 0.198 | 0.262 | 0.081 | 0.16 | 0.124 | **0.46** | 0.46 | 0.138 |
| NOHEATDAYS | 4.312 | 15.655 | **43.962** | **43.16** | 6.429 | 6.0 | 24.0 | 20.549 | 24.679 | 23.377 |
| NOHEATHELP | 0.125 | 0.052 | 0.146 | 0.23 | 0.0 | 0.5 | 0.071 | 0.225 | 0.107 | 0.066 |
| NOACDAYS | 12.435 | 40.538 | 44.59 | 40.287 | 16.636 | **63.8** | 42.967 | 28.655 | 17.788 | 34.472 |
| TOTSQFT\_EN | 2301.77 | 1806.01 | 1767.46 | **1064.62** | 2561.56 | **2852.9** | 2670.81 | 1721.67 | 2226.04 | 2249.09 |

La plupart possede un thermostat où il ajuste manuellement la temperature

regarde tres peu les donnees des compteurs

utilise peu l’energie solaire

* Cluster 0 : Utilise la lumière très longtemps
* Cluster 1 : Ne possède pas de ventilateur
* Cluster 2 :
* Cluster 3 : Les ménages avec le revenu le plus bas, vivant en appartement, vivant seul ou à deux,
* Cluster 4 : Utilise beaucoup le jacuzzi, utilise la lumière sur des demi-journées
* Cluster 5 : Vivent dans les maisons les plus grandes avec piscine, télétravail sur ordi, utilise la lumière toute la journée et la nuit
* Cluster 6 : Vivent dans une région froide, utilise beaucoup le chauffage, a parfois des coupures de courant
* Cluster 7 : Possède et utilise beaucoup la télévision, utilise plus le pc fixe pour le télétravail, beaucoup de retraité
* Cluster 8 : Les familles avec enfants, utilise beaucoup les appareils de cuisine et l’électroménager, joue aux jeux vidéo
* Cluster 9 :

Analyse Clustering

K-means 6 clusters

| **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** |
| --- | --- | --- | --- | --- | --- | --- |
| REGIONC | 1.62 | 1.56 | 1.61 | 1.55 | 1.65 | 1.74 |
| DIVISION | 4.93 | 4.89 | 4.69 | 4.72 | 5.07 | 4.68 |
| state\_name | 25.23 | 25.25 | 24.1 | 25.11 | 25.95 | **21.76** |
| BA\_climate |  |  |  |  |  |  |
| UATYP10 | 1.54 | 1.57 | 1.59 | 1.49 | 1.6 | 1.6 |
| HDD65 | 4340.4 | 4067.17 | 4399.55 | 4546.23 | 4459.78 | **3278.82** |
| CDD65 | 1515.61 | 1636.57 | 1410.67 | 1382.91 | 1398.5 | **2156.78** |
| TYPEHUQ | 2.34 | 2.39 | 3.06 | 2.17 | 2.23 | 2.0 |
| CELLAR | 0.48 | 0.46 | 0.47 | 0.52 | 0.52 | 0.39 |
| YEARMADERANGE | 4.87 | 4.25 | 4.0 | 4.77 | 5.02 | 4.88 |
| BEDROOMS | 3.04 | 2.88 | 2.29 | 3.35 | 3.44 | 3.54 |
| NCOMBATH | 1.93 | 1.67 | 1.67 | 1.99 | 2.23 | 2.27 |
| TOTROOMS | 6.9 | 6.38 | **5.22** | 7.45 | 7.88 | 8.04 |
| WINDOWS | 4.09 | 3.72 | 3.23 | 4.3 | 4.64 | 4.68 |
| ADQINSUL | 1.81 | 2.01 | 2.03 | 1.9 | 1.73 | 1.72 |
| MONPOOL | 0.27 | 1.44 | **0.7** | 3.59 | 3.1 | **5.26** |
| RECBATH | 0.08 | 0.03 | 0.03 | 0.08 | 0.1 | 0.24 |
| MONTUB | 5.46 | 4.33 | 3.88 | 5.19 | 5.65 | 6.17 |
| NUMFRIG |  |  |  |  |  |  |
| NUMFREEZ |  |  |  |  |  |  |
| COOKTOP |  |  |  |  |  |  |
| OVEN |  |  |  |  |  |  |
| RCOOKUSE | 8.12 | 7.62 | 6.57 | **10.31** | 9.61 | 7.87 |
| ROVENUSE | 3.49 | 3.74 | 2.45 | **5.17** | 4.23 | 3.61 |
| COOKTOPUSE | 8.34 | 7.55 | 6.75 | **10.44** | 9.37 | 8.3 |
| OVENUSE | 3.89 | 4.24 | 2.85 | **5.47** | 4.81 | 3.94 |
| AMTMICRO | 13.17 | 14.43 | **10.67** | **17.99** | 15.52 | 13.6 |
| DISHWASH | 0.92 | 0.62 | **0.53** | 0.88 | 0.95 | 0.95 |
| DWASHUSE | 3.45 | 2.35 | **1.27** | **5.93** | 4.51 | 3.52 |
| WASHLOAD | 3.9 | 3.57 | 1.95 | **11.85** | 4.78 | 4.32 |
| DRYER |  |  |  |  |  |  |
| DRYRUSE | 3.93 | 3.68 | 1.91 | **12.03** | 4.84 | 4.32 |
| TVCOLOR |  |  |  |  |  |  |
| TVUSE1 |  |  |  |  |  |  |
| TVONWD1 | 5.67 | **11.39** | 6.0 | 6.93 | 5.64 | 6.04 |
| TVONWE1 | 6.58 | **12.11** | 6.69 | 8.17 | 6.75 | 6.93 |
| TVONWD2 |  |  |  |  |  |  |
| TVUSE3 |  |  |  |  |  |  |
| TVONWD3 |  |  |  |  |  |  |
| COMBODVR |  |  |  |  |  |  |
| INTSTREAM |  |  |  |  |  |  |
| DESKTOP |  |  |  |  |  |  |
| NUMLAPTOP |  |  |  |  |  |  |
| NUMSMPHONE |  |  |  |  |  |  |
| TELLDAYS |  |  |  |  |  |  |
| TLDESKTOP |  |  |  |  |  |  |
| TLLAPTOP |  |  |  |  |  |  |
| ONLNEDUC |  |  |  |  |  |  |
| SMARTSPK |  |  |  |  |  |  |
| SSTEMP |  |  |  |  |  |  |
| HEATAPT |  |  |  |  |  |  |
| EQUIPAUXTYPE |  |  |  |  |  |  |
| COOLAPT |  |  |  |  |  |  |
| ACEQUIPM\_PUB |  |  |  |  |  |  |
| NUMDLHPAC |  |  |  |  |  |  |
| NUMCFAN |  |  |  |  |  |  |
| USECFAN |  |  |  |  |  |  |
| DEHUMTYPE |  |  |  |  |  |  |
| TEMPNITE |  |  |  |  |  |  |
| TEMPHOMEAC |  |  |  |  |  |  |
| TEMPGONEAC |  |  |  |  |  |  |
| LGTIN1TO4 | 5.35 | 3.97 | 3.18 | 7.19 | **15.44** | 6.31 |
| LGTIN4TO8 | 3.33 | 3.27 | 2.08 | 4.68 | **12.04** | 4.19 |
| LGTINMORE8 | 1.21 | 2.07 | 1.07 | 2.33 | **7.34** | 1.74 |
| LGTINLED |  |  |  |  |  |  |
| LGTOUTNITE |  |  |  |  |  |  |
| POWEROUT |  |  |  |  |  |  |
| WHYPOWEROUT |  |  |  |  |  |  |
| BACKUP |  |  |  |  |  |  |
| EMPLOYHH | 1.99 | **2.36** | 2.21 | 1.96 | 1.9 | 1.99 |
| EDUCATION | 3.52 | 2.82 | 3.15 | 3.38 | 3.86 | 3.48 |
| SDESCENT | 0.06 | 0.09 | **0.12** | 0.06 | 0.05 | 0.05 |
| NHSLDMEM | 2.46 | 2.75 | 1.85 | **3.56** | 3.0 | 2.77 |
| NUMCHILD | 0.47 | 0.57 | **0.26** | **1.15** | 0.84 | 0.59 |
| NUMADULT1 | 1.42 | 1.48 | **1.08** | **1.95** | 1.64 | 1.6 |
| NUMADULT2 | 0.57 | **0.7** | 0.5 | 0.46 | 0.51 | 0.58 |
| MONEYPY | 12.6 | 10.04 | **9.89** | 13.0 | **13.77** | **13.68** |
| NOHEATBROKE |  |  |  |  |  |  |
| NOHEATDAYS | 32.23 | 23.4 | **37.93** | 22.25 | **5.56** | 25.4 |
| NOHEATHELP | 0.11 | **0.22** | 0.16 | 0.09 | 0.12 | 0.13 |
| NOACDAYS | 35.45 | 32.14 | **45.21** | **19.63** | 20.03 | 43.52 |
| TOTSQFT\_EN | 2101.44 | 1742.11 | **1424.47** | 2249.33 | **2581.48** | **2670.81** |

* Cluster 0 :
* Cluster 1 : Beaucoup de retraités, utilisent beaucoup la TV toute la journée
* Cluster 2 : Les ménages les plus modestes, vivant dans de petits logements
* Cluster 3 : Les familles avec enfants, utilisant beaucoup les appareils de cuisine et l’électroménager
* Cluster 4 : Les ménages aisés, utilisent beaucoup les lumieres
* Cluster 5 : Les ménages aisés, 11% habitent en Floride, utilise beaucoup la piscine

Analyse Clustering

K-means 3clusters

| **Variables** | **Cluster 0** | **Cluster 1** | **Cluster 2** |
| --- | --- | --- | --- |
| REGIONC |  |  |  |
| DIVISION | South Atlantic et WEST | South Atlantic, Middle Atlantic, Mountain South, New England | Middle Atlantic, Pacific, South Atlantic, West North Central |
| state\_name |  | Floride |  |
| BA\_climate |  |  |  |
| UATYP10 |  |  |  |
| HDD65 | 4508.32 | **3344.99** | 4348.5 |
| CDD65 | 1406.88 | **2108.34** | 1477.21 |
| TYPEHUQ |  |  |  |
| CELLAR |  |  |  |
| YEARMADERANGE |  |  |  |
| BEDROOMS | 3.42 | 3.54 | **2.78** |
| NCOMBATH | 2.13 | 2.26 | **1.74** |
| TOTROOMS | 7.71 | **8.03** | **6.29** |
| WINDOWS | 4.47 | 4.67 | **3.77** |
| ADQINSUL |  |  |  |
| MONPOOL | 3.09 | **5.16** | **0.22** |
| RECBATH | 0.07 | 0.23 | 0.06 |
| MONTUB |  |  |  |
| NUMFRIG |  |  |  |
| NUMFREEZ |  |  |  |
| COOKTOP |  |  |  |
| OVEN |  |  |  |
| RCOOKUSE | **10.09** | 7.99 | 7.6 |
| ROVENUSE | **5.03** | 3.65 | 3.18 |
| COOKTOPUSE | **10.0** | 8.47 | 8.0 |
| OVENUSE |  |  |  |
| AMTMICRO |  |  |  |
| DISHWASH |  |  |  |
| DWASHUSE |  |  |  |
| WASHLOAD |  |  |  |
| DRYER |  |  |  |
| DRYRUSE |  |  |  |
| TVCOLOR |  |  |  |
| TVUSE1 |  |  |  |
| TVONWD1 |  |  |  |
| TVONWE1 |  |  |  |
| TVONWD2 |  |  |  |
| TVUSE3 |  |  |  |
| TVONWD3 |  |  |  |
| COMBODVR |  |  |  |
| INTSTREAM |  |  |  |
| DESKTOP |  |  |  |
| NUMLAPTOP |  |  |  |
| NUMSMPHONE |  |  |  |
| TELLDAYS |  |  |  |
| TLDESKTOP |  |  |  |
| TLLAPTOP |  |  |  |
| ONLNEDUC |  |  |  |
| SMARTSPK | 1.04 | 1.0 | 0.63 |
| SSTEMP |  |  |  |
| HEATAPT |  |  |  |
| EQUIPAUXTYPE |  |  |  |
| COOLAPT |  |  |  |
| ACEQUIPM\_PUB |  |  |  |
| NUMDLHPAC |  |  |  |
| NUMCFAN |  |  |  |
| USECFAN |  |  |  |
| DEHUMTYPE |  |  |  |
| TEMPNITE |  |  |  |
| TEMPHOMEAC |  |  |  |
| TEMPGONEAC |  |  |  |
| LGTIN1TO4 |  |  |  |
| LGTIN4TO8 |  |  |  |
| LGTINMORE8 |  |  |  |
| LGTINLED |  |  |  |
| LGTOUTNITE |  |  |  |
| POWEROUT |  |  |  |
| WHYPOWEROUT |  |  |  |
| BACKUP | 0.18 | 0.27 | 0.14 |
| EMPLOYHH |  |  |  |
| EDUCATION |  |  |  |
| SDESCENT |  |  |  |
| NHSLDMEM | **3.52** | 2.81 | 2.3 |
| NUMCHILD | **1.15** | 0.61 | 0.43 |
| NUMADULT1 | 1.89 | 1.62 | 1.32 |
| NUMADULT2 | 0.48 | 0.57 | 0.55 |
| MONEYPY | 12.93 | 13.71 | 11.45 |
| NOHEATBROKE |  |  |  |
| NOHEATDAYS |  |  |  |
| NOHEATHELP |  |  |  |
| NOACDAYS |  |  |  |
| TOTSQFT\_EN | 2415.39 | 2668.5 | **1845.54** |