Report : Project2
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Retail:

1. All Rules

There are total 36193 Rules in the dataset.

2.Filtered Rules

There are 11387 rules with the constraint with Support = ".01" and Confidence='0.9' . Following are 20 rules out of those.

```
 lhs                           rhs              support confidence lift
1  {Drink=1}                  => {PersonalCare=1} 0.2921  0.9675389  1.671340
2  {Drink=1,Vegetable=0}      => {PersonalCare=1} 0.0545  0.9749553  1.684151
3  {Bread=0,Drink=1}          => {PersonalCare=1} 0.0511  0.9678030  1.671797
4  {Drink=1,Fruit=0}          => {PersonalCare=1} 0.0588  0.9735099  1.681655
5  {Drink=1,Dry_BakingGoods=1} => {PersonalCare=1} 0.0577  0.9730185  1.680806
6  {Cleaner=1,Drink=1}        => {PersonalCare=1} 0.0595  0.9659091  1.668525
7  {Dairy=0,Drink=1}          => {PersonalCare=1} 0.0885  0.9640523  1.665317
8  {CannedGoods=1,Drink=1}    => {PersonalCare=1} 0.0948  0.9653768  1.667605
9  {Drink=1,Tobacco=1}        => {PersonalCare=1} 0.2361  0.9672265  1.670801
10 {Drink=1,PaperGoods=1}     => {PersonalCare=1} 0.1223  0.9729515  1.680690
11 {Drink=1,FrozenFood=0}     => {PersonalCare=1} 0.1477  0.9685246  1.673043
12 {Drink=1,FrozenFood=1}     => {PersonalCare=1} 0.1444  0.9665328  1.669602
13 {Drink=1,PaperGoods=0}     => {PersonalCare=1} 0.1698  0.9636776  1.664670
14 {Drink=1,Tobacco=0}        => {PersonalCare=1} 0.0560  0.9688581  1.673619
15 {CannedGoods=0,Drink=1}    => {PersonalCare=1} 0.1973  0.9685812  1.673141
16 {Dairy=1,Drink=1}          => {PersonalCare=1} 0.2036  0.9690624  1.673972
17 {Cleaner=0,Drink=1}        => {PersonalCare=1} 0.2326  0.9679567  1.672062
18 {Drink=1,Dry_BakingGoods=0} => {PersonalCare=1} 0.2344  0.9661995  1.669027
19 {Drink=1,Fruit=1}          => {PersonalCare=1} 0.2333  0.9660455  1.668761
20 {Bread=1,Drink=1}          => {PersonalCare=1} 0.2410  0.9674829  1.671244
```

3. Remove the redundant Rules

Total # 210 unique rules after removing the redundant rules.

```
Following are top 10 unique rules.
1   {Drink=1}                                  => {PersonalCare=1}  0.2921  0.9675389 1.671340
2   {CannedGoods=1, Fruit=0, Vegetable=0}       => {Meat=0}          0.0343  0.9026316 1.374078
3   {CannedGoods=1, PaperGoods=1, Vegetable=0}  => {Meat=0}          0.0244  0.9138577 1.391167
4   {FrozenFood=1, PaperGoods=1, Vegetable=0}   => {Meat=0}          0.0369  0.9066339 1.380170
5   {Bread=0, Cleaner=1, CannedGoods=1}         => {Meat=0}          0.0111  0.9098361 1.385045
6   {Bread=0, CannedGoods=1, Dairy=0}           => {Meat=0}          0.0181  0.9187817 1.398663
7   {Bread=0, CannedGoods=1, PaperGoods=1}      => {Meat=0}          0.0245  0.9007353 1.371191
8   {Bread=0, CannedGoods=1, Drink=0}           => {Meat=0}          0.0403  0.9076577 1.381729
9   {Bread=0, CannedGoods=1, Dry_BakingGoods=0} => {Meat=0}          0.0230  0.9019608 1.373056
10  {Bread=0, FrozenFood=1, PaperGoods=1}       => {Meat=0}          0.0360  0.9022556 1.373505
```

Which items (or lack thereof) would result in purchasing (or forgoing) such items.

```
Following is analysis on
There are 171 rules which says that Meat=0; and 0 rules which says that Meat=1.
There are 38 Rules when Beverage=1 and Drink=0; and there is no rule when both are purchased.
There are 35 rules when Fruit=1  and 35 Rules when Fruit=0.
There are 78 rules when CannedGoods=1 and 28 rules when CannedGoods=0.
There are 49 rules when Dry_BakingGoods=1 and 27 rules when Dry_BakingGoods=0.
There is only one rule when PersonalCare=1 and Drink=1. So, PersonalCare will result in Drink
Purchase.
If a person purchases Beverage He will purchase Tobacco also.
```

Game Of Thrones:

1. All Rules
Total # 699 Rule present with Support = “.01” and Confidence='0.9'

2.Filtered Rules
Total # 697 Rule present with Support = “.01” and Confidence='0.9' with Survives on RHS.
Top 20 Rules with Survives on RHS.

	lhs		rhs	support	confidence	lift
1	{House=HouseTyrell}	=>	{Survives=1}	0.01090513	0.9090909	1.362151
2	{House=HouseMartell}	=>	{Survives=1}	0.01199564	0.9166667	1.373502
3	{House=Tyrell}	=>	{Survives=1}	0.01526718	0.9333333	1.398475
4	{House=Martell}	=>	{Survives=1}	0.02508179	0.9200000	1.378497
5	{House=HouseTyrell,Book1=0}	=>	{Survives=1}	0.01090513	0.9090909	1.362151
6	{House=HouseMartell,Book4=1}	=>	{Survives=1}	0.01199564	1.0000000	1.498366
7	{House=HouseMartell,Book3=0}	=>	{Survives=1}	0.01199564	1.0000000	1.498366
8	{House=HouseMartell,Book2=0}	=>	{Survives=1}	0.01199564	0.9166667	1.373502
9	{House=HouseMartell,Book1=0}	=>	{Survives=1}	0.01199564	0.9166667	1.373502
10	{House=Tyrell,Book4=1}	=>	{Survives=1}	0.01308615	0.9230769	1.383107
11	{House=Tyrell,Nobility=1}	=>	{Survives=1}	0.01526718	0.9333333	1.398475
12	{House=Tyrell,Book5=0}	=>	{Survives=1}	0.01417666	0.9285714	1.391340
13	{House=Tyrell,Book1=0}	=>	{Survives=1}	0.01199564	0.9166667	1.373502
14	{House=Targaryen,Book5=1}	=>	{Survives=1}	0.01308615	0.9230769	1.383107
15	{House=Arryn,Book4=1}	=>	{Survives=1}	0.01635769	0.9375000	1.404718
16	{House=Arryn,Nobility=1}	=>	{Survives=1}	0.01853871	0.9444444	1.415123
17	{House=Arryn,Book3=0}	=>	{Survives=1}	0.01962923	0.9473684	1.419505
18	{House=Arryn,Book1=0}	=>	{Survives=1}	0.01199564	1.0000000	1.498366
19	{House=Martell,Book3=1}	=>	{Survives=1}	0.01526718	1.0000000	1.498366
20	{House=Martell,Nobility=1}	=>	{Survives=1}	0.02071974	0.9500000	1.423448

3. Remove the redundant Rules
Total 51 Unique Rules after removing the redundant Rules: Following are 5 Rules out of 51.

	lhs		rhs	support	confidence	lift
18	{House=Arryn,Book1=0}	=>{Survives=1}		0.01199564	1.0000000	1.498366
27	{House=Stark,Book5=1}	=>{Survives=1}		0.02944384	1.0000000	1.498366
29	{House=Lannister,Book5=1}	=>{Survives=1}		0.01199564	1.0000000	1.498366
110	{House=NightsWatch,Book1=1,Book5=1}	=>{Survives=1}		0.01308615	1.0000000	1.498366
125	{Book1=1,Book2=0,Book5=1}	=>{Survives=1}		0.01308615	1.0000000	1.498366
236	{House=Stark,Book1=0,Book2=0,Book3=0}	=>{Survives=1}		0.01962923	1.0000000	1.498366
346	{Nobility=1,Book2=0,Book3=1,Book5=1}	=>{Survives=1}		0.01308615	1.0000000	1.498366
122	{Gender=F,Nobility=1,Book5=1}	=>{Survives=1}		0.03162486	0.9666667	1.448420
107	{House=Lannister,Nobility=1,Book2=0}	=>{Survives=1}		0.02726281	0.9615385	1.440737
30	{Gender=F,Book4=1}	=>{Survives=1}		0.05125409	0.9591837	1.437208
108	{House=Lannister,Book1=0,Book2=0}	=>{Survives=1}		0.02508179	0.9583333	1.435934
235	{House=Stark,Nobility=1,Book1=0,Book2=0}	=>{Survives=1}		0.02290076	0.9545455	1.430258
120	{House=None,Gender=F,Nobility=1}	=>{Survives=1}		0.02181025	0.9523810	1.427015
342	{Nobility=0,Book2=1,Book3=1,Book5=1}	=>{Survives=1}		0.02181025	0.9523810	1.427015
121	{Gender=F,Book3=1,Book5=1}	=>{Survives=1}		0.02071974	0.9500000	1.423448
17	{House=Arryn,Book3=0}	=>{Survives=1}		0.01962923	0.9473684	1.419505
16	{House=Arryn,Nobility=1}	=>{Survives=1}		0.01853871	0.9444444	1.415123
15	{House=Arryn,Book4=1}	=>{Survives=1}		0.01635769	0.9375000	1.404718
312	{Gender=M,Nobility=0,Book1=1,Book5=1}	=>{Survives=1}		0.01635769	0.9375000	1.404718
3	{House=Tyrell}	=>{Survives=1}		0.01526718	0.9333333	1.398475
311	{Nobility=0,Book1=1,Book4=0,Book5=1}	=>{Survives=1}		0.01526718	0.9333333	1.398475
28	{House=Lannister,Book4=1}	=>{Survives=1}		0.04252999	0.9285714	1.391340
25	{House=Greyjoy,Book2=0}	=>{Survives=1}		0.04143948	0.9268293	1.388729
349	{Book1=0,Book2=0,Book3=0,Book5=0}	=>{Survives=1}		0.10905125	0.9259259	1.387376

```
14  {House=Targaryen,Book5=1}                 =>{Survives=1} 0.01308615 0.9230769  1.383107
24  {House=Greyjoy,Book4=1}                   =>{Survives=1} 0.03925845 0.9230769  1.383107
46  {House=Tully,Nobility=1,Book2=0}          =>{Survives=1} 0.01308615 0.9230769  1.383107
47  {House=Tully,Gender=M,Book2=0}            =>{Survives=1} 0.01308615 0.9230769  1.383107
344 {Nobility=0,Book1=0,Book2=1,Book5=1}      =>{Survives=1} 0.01308615 0.9230769  1.383107
4   {House=Martell}                           =>{Survives=1} 0.02508179 0.9200000  1.378497
259 {House=Lannister,Gender=M,Nobility=1,Book3=1} => {Survives=1} 0.02508179 0.9200000
1.378497
31  {Nobility=1,Book4=1}                      =>{Survives=1} 0.14721919 0.9183673  1.376050
123 {Gender=F,Nobility=1,Book2=0}             =>{Survives=1} 0.06106870 0.9180328  1.375549
2   {House=HouseMartell}                      =>{Survives=1} 0.01199564 0.9166667  1.373502
88  {House=Baratheon,Nobility=0,Book1=0}      =>{Survives=1} 0.01199564 0.9166667  1.373502
126 {Book2=1,Book4=1,Book5=1}                 =>{Survives=1} 0.02399128 0.9166667  1.373502
507 {House=None,Gender=F,Book1=0,Book3=0,Book5=0} => {Survives=1} 0.01199564 0.9166667
1.373502
348 {Nobility=1,Book1=0,Book2=0,Book3=0}      =>{Survives=1} 0.12322792 0.9112903  1.365446
1   {House=HouseTyrell}                       =>{Survives=1} 0.01090513 0.9090909  1.362151
343 {Book1=0,Book2=1,Book3=1,Book5=1}         =>{Survives=1} 0.02181025 0.9090909  1.362151
515 {Gender=F,Nobility=0,Book1=0,Book2=1,Book3=0} => {Survives=1} 0.01090513 0.9090909
1.362151
109 {House=Lannister,Gender=M,Book1=0}        =>{Survives=1} 0.04252999 0.9069767  1.358983
32  {Book3=0,Book4=1}                         =>{Survives=1} 0.15703381 0.9056604  1.357011
26  {House=Stark,Gender=F}                    =>{Survives=1} 0.02071974 0.9047619  1.355664
237 {House=Stark,Book1=0,Book2=0,Book4=0}     =>{Survives=1} 0.02071974 0.9047619  1.355664
324 {Book1=0,Book2=1,Book3=1,Book4=1}         =>{Survives=1} 0.02071974 0.9047619  1.355664
347 {Nobility=1,Book1=0,Book3=1,Book5=1}      =>{Survives=1} 0.02071974 0.9047619  1.355664
520 {Gender=F,Nobility=0,Book1=0,Book3=0,Book5=0} => {Survives=1} 0.02071974 0.9047619
1.355664
124 {Book1=1,Book3=1,Book5=1}                 =>{Survives=1} 0.04034896 0.9024390  1.352184
261 {House=Lannister,Nobility=1,Book1=0,Book3=0}  => {Survives=1} 0.01962923 0.9000000
1.348529
345 {Gender=M,Nobility=0,Book2=1,Book5=1}     =>{Survives=1} 0.01962923 0.9000000  1.348529
```

Q: Does nobility play any role in survival? What about gender?
Yes, Nobility plays important role in Survival. There are 393 out of 697 rules which are base on Nobility.

Yes, Gender also plays important Role in Survival.

Gender=M, There are 249 rules which are base on Male Gender.
Gender=F, There are 128 survivals rules which are base on Female Gender.

When I check Pruned rules similar is the analysis. Which is as follows.
There are 21 Rules out of 51 which are based on Nobility. Nobility=1 are 13 rules and Nobility=0 are 8 rules.
There are 5 rules where Gender=M and 9 rules which are based on Gender=F.

Note: We can check here that the un pruned rules have more rules which are based on the Gender=M while pruned rules shows that there are more rules which are based on Gender=F.

Q:In the first five books, Jon Snow lives. Do you find any rule which says otherwise?
There is no rule which has the Name = “John Snow” on the LHS.
If I check for any Rule containing Name on the LHS, there is no such rule which contains the Name attribute.

I also don't find any Rule with any other name as well.

Titanic:

1. All Rules
Total # 27 Rule present with Support = “.01” and Confidence='0.9'
2.Filtered Rules
Total 4 Rules after which has Survived on rhs.

```
lhs                                rhs            support    confidence lift
1 {Class=2nd,Age=Child}            => {Survived=Yes} 0.01090413 1.0000000  3.095640
2 {Class=1st,Sex=Female}           => {Survived=Yes} 0.06406179 0.9724138  3.010243
3 {Class=2nd,Sex=Male,Age=Adult}   => {Survived=No}  0.06996820 0.9166667  1.354083
4 {Class=1st,Sex=Female,Age=Adult} => {Survived=Yes} 0.06360745 0.9722222  3.009650
```

3. Remove the redundant Rules
There are 3 Rules after removing the Redundant rules.

```
  lhs                                rhs            support    confidence lift
1 {Class=2nd,Age=Child}          => {Survived=Yes} 0.01090413 1.0000000  3.095640
2 {Class=1st,Sex=Female}         => {Survived=Yes} 0.06406179 0.9724138  3.010243
3 {Class=2nd,Sex=Male,Age=Adult} => {Survived=No}  0.06996820 0.9166667  1.354083
```

Conclusion:

There are large number of rules available for each dataset. When we check the rules based on the Confidence and support, we get a better filtering.
Similarly, we remove the redundant records from the above rules. We get a set of rules which gives use the correct relationship between the different attributes.