# MARKET BASKET ANALYSIS

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# WHAT ARE ASSOCIATION RULES ?

## 01
Technique to identify underlying relationships between different items in a large dataset to reveal how seemingly unrelated items have associations among them.

## 02
It works by looking for combinations of items that occur together frequently in transactions. To put it another way, it allows retailers to identify relationships between the items that people buy.

## 03
Primarily used in retail industry to do Market Basket Analysis and recommendation systems for video and music streaming sites.

## 04
Association Rules are generally expressed in an 'if-then' format. We can also use the term 'antecedent' for if and 'consequent' for then.

# WHY WE NEED ASSOCIATION RULES

**01** — **Hidden Patterns**

To find hidden patterns in customer purchase behaviours

**02** — **Promotional Strategy**

Association rules will help us to formulate a promotional strategy for the cafe chain.
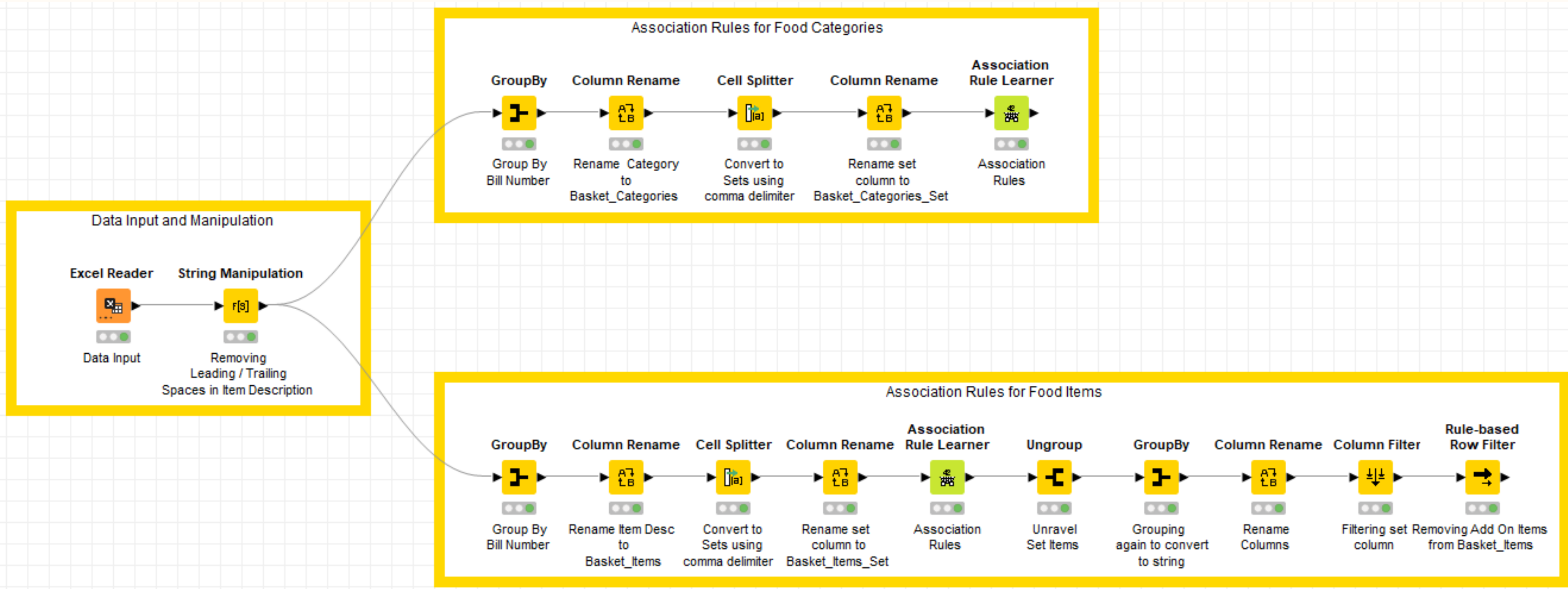
**03** — **Increase Revenue**

With association rules, we can come up with combo offers and other promos which can maximize cafe's revenue.

# SUPPORT
# THRESHOLD VALUES

### Definition

Support refers to items' frequency of occurrence in the given data set.

### Formula

$$Support\ (A) = \frac{Number\ of\ Transaction\ in\ which\ A\ appears}{Total\ Number\ of\ Transactions}$$

### Threshold Value

- Higher the support, more frequently the items appears in the data set.

- Keeping lower support threshold value, enables us to formulate more association rules

### Definition

- This says how likely item B is purchased when item A is purchased.

- This is measured by the proportion of transactions with item A, in which item B also appears

### Formula

$$Confidence\ (A \rightarrow B) = \frac{Support\ (A \cup B)}{Support\ (A)}$$

### Threshold Value

- Higher the confidence value, more often the rule is found to be true.

- Keeping lower confidence threshold, enables us to formulate more association rules.

# CONFIDENCE
# THRESHOLD
# VALUES

# ASSOCIATIONS IDENTIFIED

**FOOD ITEMS**

**RULES**

| Support | Confide... | Lift | Recommended_Item | implies | Basket_Items |
|---|---|---|---|---|---|
| 6.858906575976679E-4 | 0.151 | 101.891 | BUTTERED TOASTS | <--- | KHEEMA GHOTALA |
| 6.858906575976679E-4 | 0.462 | 101.891 | KHEEMA GHOTALA | <--- | BUTTERED TOASTS |
| 0.0010431253750964535 | 0.178 | 79.364 | ADD HERB ROAST CHICKEN | <--- | LEMON INFUSED CHAR GRILLED VEG |
| 7.287588236975222E-4 | 0.103 | 45.925 | ADD HERB ROAST CHICKEN | <--- | ORANGE ARRABIATA |
| 8.430739332971335E-4 | 0.223 | 20.798 | ADD FRIES | <--- | TRADITIONAL ITALIAN CRUSTINI |
| 9.002314880969392E-4 | 0.192 | 15.257 | MAGGI NDL ARRABIATA | <--- | SAMBUCA, B.M.T. PANINI |
| 6.573118801977651E-4 | 0.13 | 12.093 | ADD FRIES | <--- | CHICKEN SLOUVLAKI WRAP |
| 6.430224914978137E-4 | 0.119 | 11.108 | ADD FRIES | <--- | MEDITER RANEAN PANINO |
| 7.430482123974736E-4 | 0.195 | 11.036 | GARDEN FRESH PANINI | <--- | FRENCH FRIES |
| 9.002314880969392E-4 | 0.36 | 9.671 | B.M.T. PANINI | <--- | MAGGI NDL ARRABIATA, SAMBUCA |
| 6.716012688977166E-4 | 0.176 | 9.318 | COUNTRY ROAST CHICKEN PANINI | <--- | FRENCH FRIES |
| 5.287073818982024E-4 | 0.145 | 8.667 | RED BULL 2+1 | <--- | SAMBUCA, CALCUTTA MINT |
| 6.573118801977651E-4 | 0.535 | 8.463 | SAMBUCA | <--- | QUA MINERAL WATER(1000ML), RED BULL 2+1 |
| 6.573118801977651E-4 | 0.14 | 8.41 | RED BULL 2+1 | <--- | QUA MINERAL WATER(1000ML), SAMBUCA |
| 5.287073818982024E-4 | 0.507 | 8.02 | SAMBUCA | <--- | RED BULL 2+1, GREAT LAKES SHAKE |
| 5.85864936980081E-4 | 0.125 | 7.496 | RED BULL 2+1 | <--- | SAMBUCA, B.M.T. PANINI |
| 9.002314880969392E-4 | 0.47 | 7.439 | SAMBUCA | <--- | MAGGI NDL ARRABIATA, B.M.T. PANINI |
| 0.0010145465976965505 | 0.266 | 7.144 | B.M.T. PANINI | <--- | FRENCH FRIES |
| 5.287073818982024E-4 | 0.116 | 6.977 | RED BULL 2+1 | <--- | SAMBUCA, GREAT LAKES SHAKE |
| 5.85864936980081E-4 | 0.414 | 6.553 | SAMBUCA | <--- | RED BULL 2+1, B.M.T. PANINI |
| 0.0012431768168957732 | 0.412 | 5.924 | GREAT LAKES SHAKE | <--- | VANILLA ICECREAM |
| 0.0014289388699951415 | 0.187 | 5.844 | MASALA CHAI CUTTING | <--- | BUN MASKA & CHAI |
| 0.0010145465976965505 | 0.181 | 5.78 | LEMON ICED TEA | <--- | BLACK CURRANT ICED TEA |
| 5.144179931982509E-4 | 0.364 | 5.754 | SAMBUCA | <--- | RED BULL ENERGY DRINK, GREAT LAKES SHAKE |
| 5.001286044982996E-4 | 0.131 | 5.691 | COTTAGE CHEESE PANINI | <--- | FRENCH FRIES |
| 5.715755479980566E-4 | 0.345 | 5.456 | SAMBUCA | <--- | RED BULL ENERGY DRINK, B.M.T. PANINI |
| 0.001786173587493927 | 0.143 | 4.911 | BERRY BLAST | <--- | COOL CALIFORNICA |
| 8.430739332971335E-4 | 0.18 | 4.832 | B.M.T. PANINI | <--- | QUA MINERAL WATER(1000ML), SAMBUCA |
| 5.287073818982024E-4 | 0.227 | 4.653 | POUTINE WITH FRIES | <--- | PHILLYCREAM CHEESE &CHILLY PAN, SAMBUCA |
| 5.715755479980566E-4 | 0.122 | 4.588 | RED BULL ENERGY DRINK | <--- | SAMBUCA, B.M.T. PANINI |
| 7.57337601097425E-4 | 0.167 | 4.477 | B.M.T. PANINI | <--- | SAMBUCA, GREAT LAKES SHAKE |
| 5.287073818982024E-4 | 0.118 | 4.433 | PHILLYCREAM CHEESE &CHILLY PAN | <--- | POUTINE WITH FRIES, SAMBUCA |
| 0.0015467520219485 | 0.103 | 4.294 | KIT KAT SHAKE | <--- | THE FERROR ROCHER SHAKE |
| 5.144179931982509E-4 | 0.113 | 4.259 | RED BULL ENERGY DRINK | <--- | SAMBUCA, GREAT LAKES SHAKE |
| 9.145208767968907E-4 | 0.201 | 4.232 | QUA MINERAL WATER(1000ML) | <--- | SAMBUCA, GREAT LAKES SHAKE |
| 5.715755479980566E-4 | 0.156 | 4.198 | B.M.T. PANINI | <--- | SAMBUCA, CALCUTTA MINT |
| 0.0019147780857934897 | 0.152 | 4.086 | B.M.T. PANINI | <--- | MAGGI NDL ARRABIATA |
| 5.001286044982996E-4 | 0.15 | 4.018 | B.M.T. PANINI | <--- | POUTINE WITH FRIES, CALCUTTA MINT |

# ASSOCIATIONS IDENTIFIED

FOOD ITEMS

RULES

| Support | Confide... | ▼ Lift | Recommended_Item | implies | Basket_Items |
|---|---|---|---|---|---|
| 7.716269897973765E-4 | 0.114 | 4 | OREO COOKIE SHAKE | <--- | LINDT CHOCOLATE SHAKE |
| 0.00414392272298591 | 0.249 | 3.932 | SAMBUCA | <--- | RED BULL 2+1 |
| 9.716784315966963E-4 | 0.186 | 3.907 | QUA MINERAL WATER(1000ML) | <--- | CHAI LATTE |
| 5.001286044982996E-4 | 0.11 | 3.86 | OREO COOKIE SHAKE | <--- | COOKIE MONSTER |
| 7.00180046297619E-4 | 0.12 | 3.823 | LEMON ICED TEA | <--- | STRAWBERRY ICED TEA |
| 5.858649366980081E-4 | 0.141 | 3.798 | B.M.T. PANINI | <--- | RED BULL 2+1, SAMBUCA |
| 5.715755479980566E-4 | 0.141 | 3.797 | B.M.T. PANINI | <--- | RED BULL ENERGY DRINK, SAMBUCA |
| 8.430739332971335E-4 | 0.18 | 3.783 | QUA MINERAL WATER(1000ML) | <--- | SAMBUCA, B.M.T. PANINI |
| 6.287331027978623E-4 | 0.14 | 3.764 | B.M.T. PANINI | <--- | POUTINE WITH FRIES, SAMBUCA |
| 7.287588236975222E-4 | 0.176 | 3.698 | QUA MINERAL WATER(1000ML) | <--- | SCRAMBLED EGGS |
| 9.28810265496842E-4 | 0.107 | 3.678 | BERRY BLAST | <--- | TROPICAL SMOOTHIE |
| 8.430739332971335E-4 | 0.23 | 3.632 | SAMBUCA | <--- | QUA MINERAL WATER(1000ML), B.M.T. PANINI |
| 5.429967705981538E-4 | 0.135 | 3.62 | B.M.T. PANINI | <--- | QUA MINERAL WATER(1000ML), GREAT LAKES SHAKE |
| 7.144694349975708E-4 | 0.105 | 3.619 | BERRY BLAST | <--- | CURRANT COOLER |
| 6.001543253979594E-4 | 0.115 | 3.595 | MASALA CHAI CUTTING | <--- | CHAI LATTE |
| 9.145208767968907E-4 | 0.227 | 3.591 | SAMBUCA | <--- | QUA MINERAL WATER(1000ML), GREAT LAKES SHAKE |
| 5.287073818982024E-4 | 0.223 | 3.527 | SAMBUCA | <--- | RED BULL 2+1, CALCUTTA MINT |
| 7.859163784973279E-4 | 0.105 | 3.506 | CAFFE LATTE | <--- | DOPPIO |
| 5.001286044982996E-4 | 0.166 | 3.4 | POUTINE WITH FRIES | <--- | B.M.T. PANINI, CALCUTTA MINT |
| 5.858649366980081E-4 | 0.16 | 3.368 | QUA MINERAL WATER(1000ML) | <--- | SAMBUCA, CALCUTTA MINT |
| 6.57311880197651E-4 | 0.159 | 3.336 | QUA MINERAL WATER(1000ML) | <--- | RED BULL 2+1, SAMBUCA |
| 5.858649366980081E-4 | 0.156 | 3.291 | QUA MINERAL WATER(1000ML) | <--- | HASH BROWN OMELETTE |
| 5.858649366980081E-4 | 0.207 | 3.276 | SAMBUCA | <--- | QUA MINERAL WATER(1000ML), CALCUTTA MINT |
| 0.0025006430224914977 | 0.199 | 3.143 | SAMBUCA | <--- | MAGGI NDL ARRABIATA |
| 7.43048212397436E-4 | 0.147 | 3.098 | QUA MINERAL WATER(1000ML) | <--- | SPANISH OMELETTE BREAKFAST |
| 0.002372038524191935 | 0.142 | 3.01 | CALCUTTA MINT | <--- | RED BULL 2+1 |
| 5.715755479980566E-4 | 0.19 | 2.999 | SAMBUCA | <--- | B.M.T. PANINI, CALCUTTA MINT |
| 7.57337601097425E-4 | 0.187 | 2.963 | SAMBUCA | <--- | B.M.T. PANINI, GREAT LAKES SHAKE |
| 5.287073818982024E-4 | 0.183 | 2.898 | SAMBUCA | <--- | PHILLYCREAM CHEESE &CHILLY PAN, POUTINE WITH FRIES |
| 5.144179931982509E-4 | 0.141 | 2.883 | POUTINE WITH FRIES | <--- | SAMBUCA, CALCUTTA MINT |
| 5.144179931982509E-4 | 0.136 | 2.857 | QUA MINERAL WATER(1000ML) | <--- | NIRVANA HOOKAH SINGLE, MOROCCAN MINT TEA |
| 5.429967705981538E-4 | 0.134 | 2.824 | QUA MINERAL WATER(1000ML) | <--- | B.M.T. PANINI, GREAT LAKES SHAKE |
| 9.145208767968907E-4 | 0.195 | 2.803 | GREAT LAKES SHAKE | <--- | QUA MINERAL WATER(1000ML), SAMBUCA |
| 5.001286044982996E-4 | 0.132 | 2.784 | CALCUTTA MINT | <--- | POUTINE WITH FRIES, B.M.T. PANINI |
| 5.144179931982509E-4 | 0.132 | 2.773 | QUA MINERAL WATER(1000ML) | <--- | CHUNKY CHOCO CHIP COOKIES |
| 0.0011002829298962591 | 0.135 | 2.764 | POUTINE WITH FRIES | <--- | VEG. CLUB WRAP |
| 6.287331027978623E-4 | 0.134 | 2.75 | POUTINE WITH FRIES | <--- | SAMBUCA, B.M.T. PANINI |
| 0.0011574404846960648 | 0.13 | 2.734 | QUA MINERAL WATER(1000ML) | <--- | MEZE PLATTER |

# ASSOCIATIONS IDENTIFIED

FOOD ITEMS

RULES

| D Support | D Confide... | D ▼ Lift | S Recommended_Item | S implies | S Basket_Items |
|-----------|--------------|----------|--------------------|-----------|----------------|
| 5.287073818982024E-4 | 0.128 | 2.7 | CALCUTTA MINT | <--- | RED BULL 2+1, SAMBUCA |
| 5.858649366980081E-4 | 0.125 | 2.645 | CALCUTTA MINT | <--- | QUA MINERAL WATER(1000ML), SAMBUCA |
| 6.287331027978623E-4 | 0.165 | 2.617 | SAMBUCA | <--- | POUTINE WITH FRIES, B.M.T. PANINI |
| 5.715755479980566E-4 | 0.122 | 2.581 | CALCUTTA MINT | <--- | SAMBUCA, B.M.T. PANINI |
| 5.715755479980566E-4 | 0.124 | 2.546 | POUTINE WITH FRIES | <--- | NIRVANA HOOKAH SINGLE, B.M.T. PANINI |
| 5.144179931982509E-4 | 0.154 | 2.434 | SAMBUCA | <--- | POUTINE WITH FRIES, CALCUTTA MINT |
| 5.144179931982509E-4 | 0.115 | 2.426 | CALCUTTA MINT | <--- | POUTINE WITH FRIES, SAMBUCA |
| 0.004043897002086251 | 0.152 | 2.407 | SAMBUCA | <--- | RED BULL ENERGY DRINK |
| 7.144694349975708E-4 | 0.183 | 2.344 | CAPPUCCINO | <--- | CHUNKY CHOCO CHIP COOKIES |
| 5.001286044982996E-4 | 0.11 | 2.322 | QUA MINERAL WATER(1000ML) | <--- | KHEEMA GHOTALA |
| 7.57337601097425E-4 | 0.162 | 2.322 | GREAT LAKES SHAKE | <--- | SAMBUCA, B.M.T. PANINI |
| 8.144951558972307E-4 | 0.11 | 2.314 | QUA MINERAL WATER(1000ML) | <--- | ESPRESSO |
| 5.858649366980081E-4 | 0.11 | 2.311 | QUA MINERAL WATER(1000ML) | <--- | MONSOON MALABAR (REG) |
| 0.0028435883512903317 | 0.107 | 2.264 | CALCUTTA MINT | <--- | RED BULL ENERGY DRINK |
| 8.002057671972794E-4 | 0.107 | 2.247 | QUA MINERAL WATER(1000ML) | <--- | DOPPIO |
| 5.429967705981538E-4 | 0.109 | 2.232 | POUTINE WITH FRIES | <--- | SMOKED CHICK & PESTO CREAM CRO |
| 0.00288456517390186 | 0.109 | 2.226 | POUTINE WITH FRIES | <--- | PHILLYCREAM CHEESE &CHILLY PAN |
| 5.001286044982996E-4 | 0.108 | 2.221 | POUTINE WITH FRIES | <--- | THE AFTER EIGHT SHAKE |
| 6.287331027978623E-4 | 0.105 | 2.203 | QUA MINERAL WATER(1000ML) | <--- | POUTINE WITH WEDGES |
| 5.144179931982509E-4 | 0.102 | 2.138 | QUA MINERAL WATER(1000ML) | <--- | CHICKEN SLOUVLAKI WRAP |
| 0.0012288874281958218 | 0.166 | 2.125 | CAPPUCCINO | <--- | ESPRESSO |
| 5.429967705981538E-4 | 0.148 | 2.124 | GREAT LAKES SHAKE | <--- | QUA MINERAL WATER(1000ML), B.M.T. PANINI |
| 5.001286044982996E-4 | 0.165 | 2.113 | CAPPUCCINO | <--- | APPLE CINNAMON MUFFIN |
| 0.0023577491354919836 | 0.102 | 2.098 | POUTINE WITH FRIES | <--- | COTTAGE CHEESE PANINI |
| 0.0038009773941870767 | 0.102 | 2.093 | POUTINE WITH FRIES | <--- | B.M.T. PANINI |
| 0.001857620530993684 | 0.102 | 2.092 | POUTINE WITH FRIES | <--- | MAGGI NDLCREAM/ CHEE/GARLIC |
| 0.0019147780857934897 | 0.101 | 2.078 | POUTINE WITH FRIES | <--- | COUNTRY ROAST CHICKEN PANINI |
| 9.28810265496842E-4 | 0.131 | 2.078 | SAMBUCA | <--- | ORANGE ARRABIATA |
| 5.858649366980081E-4 | 0.1 | 2.055 | POUTINE WITH FRIES | <--- | STRAWBERRY ICED TEA |
| 5.858649366980081E-4 | 0.141 | 2.031 | GREAT LAKES SHAKE | <--- | SCRAMBLED EGGS |
| 0.004686919493584065 | 0.126 | 1.992 | SAMBUCA | <--- | B.M.T. PANINI |
| 6.573118801977651E-4 | 0.153 | 1.962 | CAPPUCCINO | <--- | GREAT LAKES FLOATS W CHOC |
| 0.0011145723185962105 | 0.149 | 1.905 | CAPPUCCINO | <--- | DOPPIO |
| 0.0022863021919922264 | 0.13 | 1.861 | GREAT LAKES SHAKE | <--- | GARDEN FRESH PANINI |
| 5.287073818982024E-4 | 0.128 | 1.833 | GREAT LAKES SHAKE | <--- | RED BULL 2+1, SAMBUCA |
| 6.858906575976679E-4 | 0.127 | 1.829 | GREAT LAKES SHAKE | <--- | MEDITER RANEAN PANINO |
| 5.144179931982509E-4 | 0.127 | 1.828 | GREAT LAKES SHAKE | <--- | RED BULL ENERGY DRINK, SAMBUCA |
| 0.004243948443885571 | 0.142 | 1.814 | CAPPUCCINO | <--- | CAFFE LATTE |

# ASSOCIATIONS IDENTIFIED

**FOOD ITEMS**

**RULES**

| Support | Confide... | ▼ Lift | Recommended_Item | implies | Basket_Items |
|---|---|---|---|---|---|
| 5.715755479980566E-4 | 0.125 | 1.802 | GREAT LAKES SHAKE | <--- | COOKIE MONSTER |
| 0.0010145465976965505 | 0.124 | 1.786 | GREAT LAKES SHAKE | <--- | VEG. CLUB WRAP |
| 0.0013432025377954331 | 0.113 | 1.785 | SAMBUCA | <--- | QUA MINERAL WATER(500ML) |
| 7.430482123974736E-4 | 0.21 | 1.749 | NIRVANA HOOKAH SINGLE | <--- | 3 RED BULL |
| 9.28810265496842E-4 | 0.121 | 1.742 | GREAT LAKES SHAKE | <--- | BLUEBERRY BRAIN FREEZER SHAKE |
| 0.0015003858134948987 | 0.119 | 1.712 | GREAT LAKES SHAKE | <--- | MAGGI NDL ARRABIATA |
| 0.0024006173015918377 | 0.202 | 1.682 | NIRVANA HOOKAH SINGLE | <--- | QUA MINERAL WATER(500ML) |
| 5.144179931982509E-4 | 0.128 | 1.634 | CAPPUCCINO | <--- | GREAT LAKES FLOAT W VANILLA |
| 6.430224914978137E-4 | 0.127 | 1.627 | CAPPUCCINO | <--- | IRISH COFFEE |
| 5.715755479980566E-4 | 0.113 | 1.623 | GREAT LAKES SHAKE | <--- | CHICKEN SLOUVLAKI WRAP |
| 0.0040438970020862251 | 0.109 | 1.561 | GREAT LAKES SHAKE | <--- | B.M.T. PANINI |
| 5.001286044982996E-4 | 0.121 | 1.545 | CAPPUCCINO | <--- | SCRAMBLED EGGS |
| 0.0030865079591895060 | 0.185 | 1.544 | NIRVANA HOOKAH SINGLE | <--- | RED BULL 2+1 |
| 0.0024720642450091595 | 0.107 | 1.542 | GREAT LAKES SHAKE | <--- | COTTAGE CHEESE PANINI |
| 6.287331027978623E-4 | 0.107 | 1.542 | GREAT LAKES SHAKE | <--- | LEMON INFUSED CHAR GRILLED VEG |
| 7.57337601097425E-4 | 0.107 | 1.538 | GREAT LAKES SHAKE | <--- | ORANGE ARRABIATA |
| 5.429967705981538E-4 | 0.107 | 1.538 | GREAT LAKES SHAKE | <--- | BAILEYS IRISH SHAKE |
| 0.0048869709353833845 | 0.184 | 1.534 | NIRVANA HOOKAH SINGLE | <--- | RED BULL ENERGY DRINK |
| 5.144179931982509E-4 | 0.183 | 1.524 | NIRVANA HOOKAH SINGLE | <--- | QUA MINERAL WATER(1000ML), MOROCCAN MINT TEA |
| 0.0019147780857934897 | 0.105 | 1.511 | GREAT LAKES SHAKE | <--- | MAGGI NDLCREAM/ CHEE/GARLIC |
| 6.287331027978623E-4 | 0.105 | 1.505 | GREAT LAKES SHAKE | <--- | POUTINE WITH WEDGES |
| 7.001800462976194E-4 | 0.103 | 1.482 | GREAT LAKES SHAKE | <--- | LINDT CHOCOLATE SHAKE |
| 9.28810265496842E-4 | 0.1 | 1.443 | GREAT LAKES SHAKE | <--- | CHICKEN SALAMI PANINI |
| 0.0035866365636878055 | 0.112 | 1.438 | CAPPUCCINO | <--- | MASALA CHAI CUTTING |
| 0.0014289388699951415 | 0.112 | 1.435 | CAPPUCCINO | <--- | THE CHOCO LATTE |
| 0.0015718327569946558 | 0.103 | 1.317 | CAPPUCCINO | <--- | ULTIMATE HOT CHOCOLATE |
| 5.429967705981538E-4 | 0.101 | 1.29 | CAPPUCCINO | <--- | MEDITER RANEAN PANINO |
| 5.715755479980566E-4 | 0.15 | 1.254 | NIRVANA HOOKAH SINGLE | <--- | POUTINE WITH FRIES, B.M.T. PANINI |
| 0.0011860192620959675 | 0.133 | 1.111 | NIRVANA HOOKAH SINGLE | <--- | MEZE PLATTER |
| 7.859163784973279E-4 | 0.131 | 1.092 | NIRVANA HOOKAH SINGLE | <--- | POUTINE WITH WEDGES |
| 0.006330199194078477 | 0.13 | 1.082 | NIRVANA HOOKAH SINGLE | <--- | POUTINE WITH FRIES |
| 5.001286044982996E-4 | 0.128 | 1.07 | NIRVANA HOOKAH SINGLE | <--- | CHUNKY CHOCO CHIP COOKIES |
| 9.002314880969392E-4 | 0.127 | 1.062 | NIRVANA HOOKAH SINGLE | <--- | ORANGE ARRABIATA |
| 7.430482123974736E-4 | 0.127 | 1.058 | NIRVANA HOOKAH SINGLE | <--- | LEMON INFUSED CHAR GRILLED VEG |
| 0.004601183161384356 | 0.124 | 1.031 | NIRVANA HOOKAH SINGLE | <--- | B.M.T. PANINI |
| 0.002229144637192421 | 0.122 | 1.021 | NIRVANA HOOKAH SINGLE | <--- | MAGGI NDLCREAM/ CHEE/GARLIC |
| 0.0037866880054871254 | 0.117 | 0.98 | NIRVANA HOOKAH SINGLE | <--- | MOROCCAN MINT TEA |
| 0.005472835872081392 | 0.115 | 0.96 | NIRVANA HOOKAH SINGLE | <--- | QUA MINERAL WATER(1000ML) |
| 0.0025006430224914977 | 0.109 | 0.906 | NIRVANA HOOKAH SINGLE | <--- | COTTAGE CHEESE PANINI |
| 9.716784315966963E-4 | 0.105 | 0.877 | NIRVANA HOOKAH SINGLE | <--- | CHICKEN SALAMI PANINI |
| 0.0024434854676916922 | 0.102 | 0.85 | NIRVANA HOOKAH SINGLE | <--- | KIT KAT SHAKE |

# ASSOCIATIONS IDENTIFIED

**FOOD CATEGORY**

**RULES**

| D Support | D Confide... | D ▼ Lift | S Conseq... | S implies | [...] Items |
|-----------|--------------|----------|-------------|-----------|-------------|
| 0.225 | 0.487 | 1.108 | BEVERAGE | <--- | [FOOD] |
| 0.225 | 0.514 | 1.108 | FOOD | <--- | [BEVERAGE] |
| 0.069 | 0.448 | 0.967 | FOOD | <--- | [BEVERAGE,TOBACCO] |
| 0.069 | 0.414 | 0.943 | BEVERAGE | <--- | [TOBACCO,FOOD] |
| 0.168 | 0.362 | 0.751 | TOBACCO | <--- | [FOOD] |
| 0.168 | 0.348 | 0.751 | FOOD | <--- | [TOBACCO] |
| 0.155 | 0.321 | 0.732 | BEVERAGE | <--- | [TOBACCO] |
| 0.155 | 0.353 | 0.732 | TOBACCO | <--- | [BEVERAGE] |
| 0.069 | 0.308 | 0.638 | TOBACCO | <--- | [BEVERAGE,FOOD] |

# Support Values

## FOOD ITEM RULES

Various values were tried for support value.
Finally, for food items rules, Support Value was set to **0.0005**

## FOOD CATEGORIES RULES

Various values were tried for support value.
Finally, for food categories rules, Support Value was set to **0.05**

## OPTIMIZE

This was done to optimize the number of association rules. Very low value gave too many records, while a very high value gave too less records.

## COMBO

Higher value of support, led to only single products in the o/p. reducing the support value enabled multiple sets of items in basket. Enabling us to look for various combos.

## CALCULATION

Support is calculated as the number of transaction in which A appears divided by Total Transactions.

$$Support \ (A) = \frac{Number \ of \ Transaction \ in \ which \ A \ appears}{Total \ Number \ of \ Transactions}$$

# Confidence Values

## FOOD ITEM RULES
Various values were tried for confidence value. Finally, for food items rules, Confidence Value was set to **0.1**

## FOOD CATEGORIES RULES
Various values were tried for confidence value. Finally, for food categories rules, Confidence Value was set to **0.2**

## OPTIMIZE
This was done to optimize the number of association rules. Very low value gave too many records, while a very high value gave hardly any records.

## COMBO
Higher value of confidence , led to only single products in the o/p. reducing the confidence value enabled multiple sets of items in basket. Enabling us to look for various combos.

## CALCULATION
Confidence of A implies B is calculated as Support of A union B divided by Support of A

$$Confidence \ (A \rightarrow B) = \frac{Support \ (A \cup B)}{Support \ (A)}$$

# Lift Values

## DEFINITION

This says how likely item B is purchased when item A is purchased, while controlling for how popular item B is.

The lift value is a measure of importance of a rule.

## VALUE

Lift value is auto calculated by the algorithm and we do not populate the value for this variable.

## SORTING

Since lift calculates the effectiveness of the rule, we sorted the generated association rules using Lift. Higer the lift better the rule.

## CALCULATION

Lift value is calculated by dividing "Support of A union B" with the "product of Support of A and Support of B"

$$Lift\,(A) = \frac{Support\,(A \cup B)}{Support\,(A)\,*\,Support\,(B)}$$

# RECOMMENDATIONS

# RECOMMENDATIONS

**1**

## STAR CATEGORY

Given that Tobacco is the highest revenue generator, it makes sense to introduce combos and discount on this category.

**2**

## DISCOUNT

Discount can be given on LIQUOR, MISC, MERCHANDIS & WINE category, as their sales are low and did not even show up in the MBA analysis on food categories.

**3**

## COMBOS

Various Combo offers can be given looking at the Market basket analysis. Details for such combo offers have been covered later.
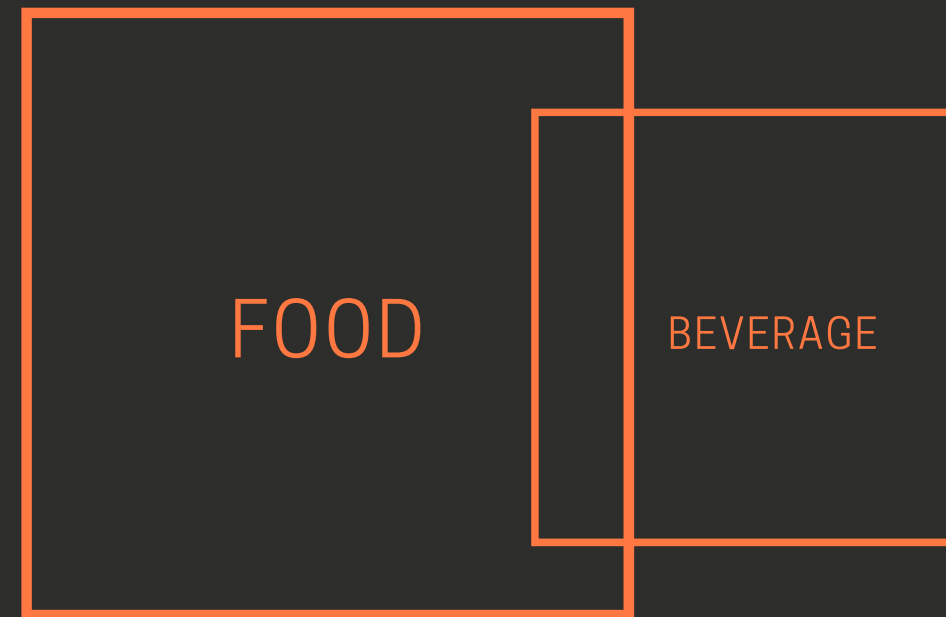
**4**

## HAPPY HOURS

Happy hours offer can be given on Liquor products during day time, as their sales increase only in the evening.

# COMBO OFFERS

**COMBO OFFERS SHOULD BE PROVIDED ON THESE FOOD CATEGORIES BROADLY**

FOOD    BEVERAGE

BEVERAGE & TOBACCO    FOOD

TOBACCO & FOOD    BEVERAGE

FOOD    TOBACCO

- Beverage can be offered in combo with food products.
- Food item can be offered at discount if customer orders at least 1 item from Beverage and Tobacco categories.
- Beverage item can be offered at discount if customer orders at least 1 item from Tobacco and Food categories.
- Tobacco items can be offered in combo with food items, especially late night when sale of tobacco is high.

# COMBO OFFERS

## COMBO OFFERS SHOULD BE PROVIDED ON THESE FOOD ITEMS

KHEEMA GHOTALA — BUTTERED TOASTS

LEMON INFUSED CHAR GRILLED VEG — ADD HERB ROAST CHICKEN

ORANGE ARRABIATA — ADD HERB ROAST CHICKEN

CHICKEN SLOUVLAKI WRAP — ADD FRIES

VANILLA ICECREAM — GREAT LAKES SHAKE

COOL CALIFORNICA — BERRY BLAST

SCRAMBLED EGGS — QUA MINERAL WATER(1000ML)

MEZE PLATTER — QUA MINERAL WATER(1000ML)

VEG. CLUB WRAP — CAPPUCCINO

- Various combo offer shown above can be provided to the customers.
- Item in the big square implies the item in the smaller square.

# Buy 2 Get 1 Free

## BUY 2 GET 1 FREE OFFERS

NIRVANA HOOKAH SINGLE & B.M.T. PANINI

POUTINE WITH FRIES

POUTINE WITH FRIES, & B.M.T. PANINI

SAMBUCA

QUA MINERAL WATER(1000ML) & B.M.T. PANINI

GREAT LAKES SHAKE

SAMBUCA & B.M.T. PANINI

CALCUTTA MINT

RED BULL ENERGY DRINK & SAMBUCA

GREAT LAKES SHAKE

RED BULL 2+1 & SAMBUCA

GREAT LAKES SHAKE

QUA MINERAL WATER(1000 ML) & MOROCCAN MINT TEA

NIRVANA HOOKAH SINGLE

RED BULL 2+1, & SAMBUCA

B.M.T. PANINI

SAMBUCA, B.M.T. & PANINI

MAGGI NDL ARRABIATA

- Buy two get one free offer can be given on above items.
- E.g. Buy 1 NIRVANA HOOKAH SINGLE& 1 B.M.T. PANINI and get 1 POUTINE WITH FRIES free.
- Since these items are often bought together.
- However sales are not as good as some of the other items, hence to make up for the sales 2 of these items need to be bought to get the third item free from the implied category.
- Item in the big square implies the item in the smaller square.

# OFFERS

## COMBO OFFERS

Combo offers listed above can be offered, as one items implies the other item will be bought. Offering the combo will further boost the chances of sale.

## BUY 2 GET 1 FREE

Buy 2 get 1 free offers are a good way to promote sales of multiple items which when bought together imply the sales of a third item. This will maximize the revenue across various categories of items.

## DISCOUNT

Discount can be offered on items which do not make it to the list of items in the association rules, since the sales of such items is low and a discount can help boost sales.

# THANK
## YOU!!