Apriori Algorithm Implementation

Midterm Project

CS 634 Data Mining (F2F)

F. Name : Harinarayanan
L. Name : Mohan

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Department of Computer Science

New Jersey Institute of Technology

Implementation of Apriori Algorithm

Algorithm:

Step 1: Read all the transactions from the given input file.

Step 2: Get the minimum support and minimum confidence values as input.

Step 3: Find all combinations of item sets.

Step 4: Find Unique Items by inserting into a Set data structure.

Step 5: Find Support values for all the item sets.

Step 6: Find frequent item sets (i.e.) the item sets that has the support value greater than or equal to the given minimum support value.

Step 7: Generate all the association rules for an item set.

Step 8: Repeat step 7 for all the frequent item sets.

Step 9: Find the support and confidence values for all the association rules and print only those that meet the given minimum support and confidence values.

Step 10: Repeat steps from 1 to 9 for the remaining 4 input files

Programming Language: Python2.7

Methods:

- **<u>getUniqueItems ():</u>**
  This function is used to print all the unique items present in the given input transactions.

- **<u>getFrequentItemSets ():</u>**
  This function is used to find all the item sets meets the minimum support values and print them. Only these frequent items are used in the next step (i.e.) to find the association rules.

- **<u>readTransactions ():</u>**
  This function reads the text line by line in the input files and extracts the items purchased in each transaction which will be used to find the item sets.

- **<u>findItemSets ():</u>**
  This function generates all possible combinations of item sets from the given transactions and then no. of occurrences of the corresponding item sets are also found.

- **<u>findSupportValues ():</u>**
  This function is used to find the support values of all the item sets that are generated in the above function by using the below formula:

$$\text{Support} = \frac{(\text{No. of Occ. of a particular Item set}) * 100}{\text{Total No. of transactions}}$$

- **<u>generateRulesForItemSet ():</u>**

This function is used to generate all the association rules for a given item set by generating all possible combination of items on the left side and right side. EG: (A, B, C) - Item Set

Association Rules:

A -> B, C
B -> A, C
C -> A, B
A, B -> C
A, C -> B
B, C -> A

- **findAllAssociationRules ():**

  This function calls the 'generateRulesForItemSet ()' function for each and every item set and calculates the support and confidence values for every single association rule. At the end it prints all the association rules which meets the minimum support and minimum confidence values.

- **getConfidenceValue ():**

  This function is used to find the confidence value for the given association rule. To find the confidence value of a given association rule, it uses the below formula:

EG:

$$X \rightarrow Y = \frac{(\text{Support of } XY) * 100}{\text{Support of } X}$$

Source Code:

AprioriAlgorithm.py

```
class AssociationRule:

	def __init__(self,left,right,support,confidence):
		self.left=left
		self.right=right
		self.support=support
		self.confidence=confidence

	def printRule(self):
		print str(self.left) + ' -> ' + str(self.right) + '
['+str(self.support)+'%,'+str(self.confidence)+'%]'

class Apriori:

	def __init__(self,fileName,support,confidence):
		self.fileName=fileName
		self.minSupport=support
		self.minConfidence=confidence
		self.transactions={}
		self.itemSets={}
		self.totalNoOfTrans=0
		self.supportValues={}
		self.confidenceValues={}
		self.uniqueItems=set()


	def getUniqueItems(self):
		print '\n Unique Items\n'
		for i in self.uniqueItems:
			print i,

	def getFrequentItemSets(self):
		print '\n Frequent Item Sets\n'
		deleteElements=[]
		for k,v in self.supportValues.items():
			if self.supportValues[k]<self.minSupport:
				deleteElements.append(k)

		for i in deleteElements:
			del self.supportValues[i]

		for k,v in self.supportValues.items():
			print str(k)+' '+str(v)+'%'

	def readTransactions(self):
```

```
        with open(self.fileName) as fp:
          for line in fp:
                transNo=line.split('\t')[0]
                items=line.split('\t')[1][:-1]
                itemList=items.split(';')
                for i in itemList:
                        self.uniqueItems.add(i)
                itemList[len(itemList)-1]=itemList[len(itemList)-1]
                self.transactions[transNo]=itemList

        self.totalNoOfTrans=len(self.transactions.keys())

        print '\n Transactions \n'
        for k,v in sorted(self.transactions.items()):
                print k,v

        for value in self.transactions.values():
                self.findItemSets(value)

        #print '\n Item Sets \n'
        #for k,v in sorted(self.itemSets.items()):
        #       print k,v

def findItemSets(self,items):
        numOfComb = 2**len(items);
        combi=[]
        for i in range(numOfComb):
          itemSet= []
          for j in range(len(items)):
            if i & (2**j):
              itemSet.append(items[j])

          if len(itemSet)>0:
                itemSet.sort()
                temp=tuple(itemSet)
                if temp in self.itemSets.keys():
                        self.itemSets[temp]=self.itemSets[temp]+1
                else:
                        self.itemSets[temp]=1


def findSupportValues(self):
        for k,v in self.itemSets.items():
                self.supportValues[k]=(v*100)/self.totalNoOfTrans

        print '\n Support Values \n'
        for k,v in self.supportValues.items():
                print str(k)+' '+str(v)+'%'
```

```
	def generateRulesForItemSet(self,k,leftList,rightList):
		numOfComb = 2**len(k);
		combi=[]
		for i in range(numOfComb):
			left=[]
			right=[]
			for j in range(len(k)):
				if i & (2**j):
					left.append(k[j])

			if len(left)<len(k) and len(left)>0:
				left.sort()
				leftList.append(left)
				for item in k:
					if item not in left:
						right.append(item)

				right.sort()
				rightList.append(right)

	def findAllAssociationRules(self):
		print '\n Association Rules \n'
		for k,v in self.supportValues.items():
			if len(k)>1 and v>=self.minSupport:
				leftList=[]
				rightList=[]
				self.generateRulesForItemSet(k, leftList, rightList)
				for i in range(len(leftList)):
					left=tuple(leftList[i])
					right=tuple(rightList[i])
					confidence = self.getConfidenceValue(left,v)
					if confidence >= self.minConfidence:
						associationRule = AssociationRule(left, right, v,
confidence)
						associationRule.printRule()
					#self.associationRules.append(associationRule)


	def getConfidenceValue(self,left,fullSuppValue):
		x=float(fullSuppValue)
		y=float(self.supportValues[left])
		return (x/y)*100


def main():
	for i in range(1,6):
		print '\n Running Apriori Algorithm for Database '+str(i)+'\n'
```

```
        support=raw_input('\nEnter the Minimum Support Value : ')
        confidence=raw_input('\nEnter the Minimum Confidence Value: ')
        apriori=Apriori('input'+str(i)+'.txt',int(support),int(confidence))
        apriori.readTransactions()
        apriori.getUniqueItems()
        apriori.findSupportValues()
        apriori.getFrequentItemSets()
        apriori.findAllAssociationRules()

if __name__=="__main__":
    main()
```

Input Files:

Input1.txt

```
T01    diapers;shirts;pants
T02    shirts;pants;iphone
T03    charger;iphone;phonecase
T04    phonecase;iphone
T05    scratchguard;iphone;phonecase
T06    scratchguard;phonecase
T07    headset;laptop
T08    usbcable;laptop
T09    laptop
T10    iphone;usbcable;headset
T11    scratchguard;iphone;usbcable
T12    iphone
T13    charger;usbcable
T14    usbcable
T15    headset
T16    headset;charger
T17    iphone;shirts
T18    shirts;pants
T19    diapers;iphone
T20    pants;diapers
```

Input2.txt

```
T01    broccoli;carrot;garlic;banana;grapes
T02    brinjal;cucumber;avocado;onion;tomato
T03    broccoli;carrot;garlic;cucumber;avocado
T04    broccoli;garlic
T05    garlic;cucumber;avocado
T06    carrot;garlic;tomato;banana;grapes
T07    cucumber;avocado;onion;tomato
T08    brinjal;cucumber;broccoli;carrot
```

T09 carrot;garlic;banana
T10 avocado;onion;tomato
T11 brinjal;onion
T12 banana;grapes;brinjal
T13 carrot;garlic;banana;grapes;brinjal
T14 garlic;banana;grapes
T15 broccoli;garlic;grapes;cucumber;onion
T16 carrot;banana;brinjal;avocado;tomato
T17 garlic;grapes;cucumber;onion
T18 carrot;banana;brinjal
T19 avocado;tomato
T20 banana;brinjal

Input3.txt

T01 bandaid;comb;hairdye;basket;hairband
T02 bottle;crayons;axedeo;ink;paper
T03 bandaid;comb;hairdye
T04 bandaid;hairdye;axedeo
T05 hairdye;crayons;axedeo
T06 comb;hairdye;bottle;ink;paper
T07 crayons;axedeo;ink;paper
T08 bottle;crayons;bandaid;comb
T09 comb;hairdye;basket
T10 axedeo;ink;paper
T11 bottle;crayons;axedeo;ink
T12 basket;hairband;bottle
T13 comb;hairdye;basket;hairband;bottle
T14 hairdye;basket;hairband
T15 bandaid;hairdye
T16 comb;basket;bottle;axedeo;paper
T17 hairdye;hairband;crayons;ink
T18 comb;basket;bottle
T19 axedeo;paper
T20 basket;bottle

Input4.txt

T01 avatar;aviator;sherlock;twilight;frozen
T02 batman;godzilla;lincoln;oceans;superman
T03 avatar;aviator;sherlock;godzilla;lincoln
T04 avatar;aviator
T05 sherlock;godzilla;lincoln
T06 aviator;sherlock;batman
T07 godzilla;lincoln;oceans;superman
T08 batman;godzilla;avatar;aviator
T09 aviator;sherlock;twilight

T10 lincoln;oceans;superman
T11 batman;godzilla;lincoln;oceans
T12 twilight;batman;godzilla
T13 aviator;sherlock;twilight;frozen;batman
T14 sherlock;twilight;frozen
T15 avatar;sherlock;frozen;godzilla;oceans
T16 aviator;twilight;batman;superman
T17 sherlock;frozen;godzilla;oceans
T18 aviator;twilight;batman;oceans
T19 lincoln;superman
T20 twilight;batman

Input5.txt

T01 wheat;rice;tamarind;flour;oil
T02 horlicks;bournvita;noodles;chocolate;dhal
T03 wheat;rice;tamarind;bournvita;noodles
T04 wheat;rice
T05 tamarind;bournvita;noodles
T06 rice;tamarind;horlicks;chocolate;dhal;flour;oil
T07 bournvita;noodles;chocolate;dhal
T08 horlicks;bournvita;wheat;rice
T09 rice;tamarind;flour
T10 noodles;chocolate;dhal
T11 horlicks;bournvita;noodles;chocolate
T12 flour;oil;horlicks
T13 rice;tamarind;flour;oil;horlicks
T14 tamarind;flour;oil
T15 wheat;tamarind;oil;bournvita;chocolate
T16 rice;flour;horlicks;noodles;dhal
T17 tamarind;oil;bournvita;chocolate
T18 rice;flour;horlicks
T19 noodles;dhal
T20 flour;horlicks

Command to Execute Program:

>> python AprioriAlgorithm.py

output:

Database 1

```
DataMining — Python AprioriAlgorithm.py — 86×36
Harinarayanan:DataMining Hari$
Harinarayanan:DataMining Hari$ python AprioriAlgorithm.py

 Running Apriori Algorithm for Database 1


Enter the Minimum Support Value : 10

Enter the Minimum Confidence Value: 10

 Transactions

T01 ['diapers', 'shirts', 'pants']
T02 ['shirts', 'pants', 'iphone']
T03 ['charger', 'iphone', 'phonecase']
T04 ['phonecase', 'iphone']
T05 ['scratchguard', 'iphone', 'phonecase']
T06 ['scratchguard', 'phonecase']
T07 ['headset', 'laptop']
T08 ['usbcable', 'laptop']
T09 ['laptop']
T10 ['iphone', 'usbcable', 'headset']
T11 ['scratchguard', 'iphone', 'usbcable']
T12 ['iphone']
T13 ['charger', 'usbcable']
T14 ['usbcable']
T15 ['headset']
T16 ['headset', 'charger']
T17 ['iphone', 'shirts']
T18 ['shirts', 'pants']
T19 ['diapers', 'iphone']
T20 ['pants', 'diapers']

 Unique Items

shirts headset charger laptop diapers scratchguard iphone phonecase usbcable pants
```

DataMining — Python AprioriAlgorithm.py — 86×37

```
 Support Values

('shirts',) 20%
('diapers', 'pants', 'shirts') 5%
('pants',) 20%
('diapers',) 15%
('headset', 'iphone', 'usbcable') 5%
('iphone', 'shirts') 10%
('charger', 'iphone', 'phonecase') 5%
('usbcable',) 25%
('iphone', 'scratchguard', 'usbcable') 5%
('charger', 'phonecase') 5%
('charger', 'usbcable') 5%
('iphone', 'pants') 5%
('scratchguard', 'usbcable') 5%
('laptop', 'usbcable') 5%
('headset', 'iphone') 5%
('charger', 'headset') 5%
('headset',) 20%
('iphone', 'phonecase') 15%
('iphone',) 45%
('iphone', 'usbcable') 10%
('phonecase', 'scratchguard') 10%
('headset', 'laptop') 5%
('scratchguard',) 15%
('diapers', 'pants') 10%
('diapers', 'shirts') 5%
('iphone', 'pants', 'shirts') 5%
('laptop',) 15%
('charger', 'iphone') 5%
('charger',) 15%
('iphone', 'scratchguard') 10%
('iphone', 'phonecase', 'scratchguard') 5%
('headset', 'usbcable') 5%
('pants', 'shirts') 15%
('diapers', 'iphone') 5%
('phonecase',) 20%
```


```
('phonecase', 'scratchguard') 10%
('headset', 'laptop') 5%
('scratchguard',) 15%
('diapers', 'pants') 10%
('diapers', 'shirts') 5%
('iphone', 'pants', 'shirts') 5%
('laptop',) 15%
('charger', 'iphone') 5%
('charger',) 15%
('iphone', 'scratchguard') 10%
('iphone', 'phonecase', 'scratchguard') 5%
('headset', 'usbcable') 5%
('pants', 'shirts') 15%
('diapers', 'iphone') 5%
('phonecase',) 20%
```


```
 Frequent Item Sets

('shirts',) 20%
('pants',) 20%
('diapers',) 15%
('iphone', 'shirts') 10%
('usbcable',) 25%
('headset',) 20%
('iphone', 'phonecase') 15%
('iphone',) 45%
('iphone', 'usbcable') 10%
('phonecase', 'scratchguard') 10%
('scratchguard',) 15%
('diapers', 'pants') 10%
('laptop',) 15%
('charger',) 15%
('iphone', 'scratchguard') 10%
('pants', 'shirts') 15%
('phonecase',) 20%
```

```
 Association Rules

('iphone',) -> ('shirts',)   [10%,22.2222222222%]
('shirts',) -> ('iphone',)   [10%,50.0%]
('iphone',) -> ('phonecase',)   [15%,33.3333333333%]
('phonecase',) -> ('iphone',)   [15%,75.0%]
('iphone',) -> ('usbcable',)   [10%,22.2222222222%]
('usbcable',) -> ('iphone',)   [10%,40.0%]
('phonecase',) -> ('scratchguard',)   [10%,50.0%]
('scratchguard',) -> ('phonecase',)   [10%,66.6666666667%]
('diapers',) -> ('pants',)   [10%,66.6666666667%]
('pants',) -> ('diapers',)   [10%,50.0%]
('iphone',) -> ('scratchguard',)   [10%,22.2222222222%]
('scratchguard',) -> ('iphone',)   [10%,66.6666666667%]
('pants',) -> ('shirts',)   [15%,75.0%]
('shirts',) -> ('pants',)   [15%,75.0%]

 Running Apriori Algorithm for Database 2


Enter the Minimum Support Value :
```

Database 2

```
 Running Apriori Algorithm for Database 2

Enter the Minimum Support Value : 20

Enter the Minimum Confidence Value: 40

 Transactions

T01 ['broccoli', 'carrot', 'garlic', 'banana', 'grapes']
T02 ['brinjal', 'cucumber', 'avocado', 'onion', 'tomato']
T03 ['broccoli', 'carrot', 'garlic', 'cucumber', 'avocado']
T04 ['broccoli', 'garlic']
T05 ['garlic', 'cucumber', 'avocado']
T06 ['carrot', 'garlic', 'tomato', 'banana', 'grapes']
T07 ['cucumber', 'avocado', 'onion', 'tomato']
T08 ['brinjal', 'cucumber', 'broccoli', 'carrot']
T09 ['carrot', 'garlic', 'banana']
T10 ['avocado', 'onion', 'tomato']
T11 ['brinjal', 'onion']
T12 ['banana', 'grapes', 'brinjal']
T13 ['carrot', 'garlic', 'banana', 'grapes', 'brinjal']
T14 ['garlic', 'banana', 'grapes']
T15 ['broccoli', 'garlic', 'grapes', 'cucumber', 'onion']
T16 ['carrot', 'banana', 'brinjal', 'avocado', 'tomato']
T17 ['garlic', 'grapes', 'cucumber', 'onion']
T18 ['carrot', 'banana', 'brinjal']
T19 ['avocado', 'tomato']
T20 ['banana', 'brinjal']

 Unique Items

tomato onion avocado banana carrot garlic brinjal grapes cucumber broccoli
 Support Values

('banana', 'brinjal', 'grapes') 10%
('avocado', 'brinjal', 'onion') 5%
('avocado', 'brinjal', 'cucumber') 5%
('banana',) 45%
('banana', 'carrot', 'garlic', 'grapes', 'tomato') 5%
('banana', 'broccoli', 'carrot') 5%
('avocado', 'onion', 'tomato') 15%
```

```
('banana', 'broccoli', 'carrot') 5%
('avocado', 'onion', 'tomato') 15%
('banana', 'broccoli', 'carrot', 'grapes') 5%
('garlic', 'grapes', 'tomato') 5%
('carrot', 'garlic') 25%
('brinjal', 'cucumber') 10%
('avocado', 'tomato') 25%
('banana', 'brinjal') 25%
('carrot', 'garlic', 'grapes') 15%
('banana', 'broccoli', 'carrot', 'garlic', 'grapes') 5%
('brinjal', 'carrot', 'garlic') 5%
('banana', 'garlic', 'grapes') 20%
('banana', 'brinjal', 'garlic', 'grapes') 5%
('avocado', 'banana', 'tomato') 5%
('cucumber', 'onion', 'tomato') 10%
('avocado', 'broccoli', 'garlic') 5%
('banana', 'brinjal', 'carrot', 'grapes') 5%
('carrot', 'grapes') 15%
('avocado', 'brinjal', 'tomato') 10%
('brinjal', 'broccoli', 'cucumber') 5%
('banana', 'brinjal', 'carrot', 'garlic', 'grapes') 5%
('broccoli', 'garlic', 'onion') 5%
('broccoli', 'cucumber', 'onion') 5%
('banana', 'broccoli', 'carrot', 'garlic') 5%
('avocado', 'onion') 15%
('avocado', 'cucumber', 'tomato') 10%
('broccoli', 'cucumber', 'garlic', 'onion') 5%
('garlic', 'onion') 10%
('broccoli', 'onion') 5%
('avocado', 'carrot', 'tomato') 5%
('grapes',) 35%
('broccoli', 'carrot', 'garlic') 10%
('onion', 'tomato') 15%
('avocado', 'brinjal', 'cucumber', 'onion', 'tomato') 5%
('avocado', 'broccoli', 'carrot', 'garlic') 5%
('cucumber', 'grapes', 'onion') 10%
('broccoli', 'garlic', 'grapes') 10%
('carrot', 'grapes', 'tomato') 5%
('cucumber', 'grapes') 10%
('avocado', 'brinjal') 10%
('cucumber', 'garlic', 'onion') 10%
('avocado', 'banana', 'brinjal', 'carrot', 'tomato') 5%
```

```
('avocado', 'banana', 'brinjal', 'carrot', 'tomato') 5%
('banana', 'carrot') 30%
('carrot', 'cucumber') 10%
('banana', 'carrot', 'garlic') 20%
('broccoli', 'cucumber', 'garlic', 'grapes') 5%
('cucumber', 'garlic', 'grapes') 10%
('brinjal', 'cucumber', 'onion', 'tomato') 5%
('banana', 'carrot', 'garlic', 'tomato') 5%
('broccoli', 'grapes', 'onion') 5%
('grapes', 'onion') 10%
('banana', 'garlic', 'tomato') 5%
('broccoli', 'garlic') 20%
('garlic', 'grapes', 'onion') 10%
('banana', 'brinjal', 'carrot') 15%
('carrot', 'cucumber', 'garlic') 5%
('carrot', 'garlic', 'tomato') 5%
('banana', 'carrot', 'garlic', 'grapes') 15%
('banana', 'brinjal', 'tomato') 5%
('avocado', 'brinjal', 'cucumber', 'onion') 5%
('onion',) 30%
('cucumber', 'tomato') 10%
('broccoli', 'cucumber', 'grapes', 'onion') 5%
('banana', 'broccoli', 'garlic') 5%
('avocado', 'banana', 'carrot') 5%
('banana', 'grapes', 'tomato') 5%
('tomato',) 30%
('avocado', 'brinjal', 'onion', 'tomato') 5%
('broccoli', 'cucumber', 'garlic', 'grapes', 'onion') 5%
('avocado',) 35%
('garlic',) 50%
('brinjal', 'broccoli', 'carrot') 5%
('avocado', 'carrot') 10%
('banana', 'grapes') 25%
('avocado', 'cucumber') 20%
('cucumber', 'onion') 20%
('avocado', 'broccoli', 'cucumber', 'garlic') 5%
('brinjal', 'onion', 'tomato') 5%
('brinjal', 'carrot', 'grapes') 5%
('broccoli',) 25%
('cucumber', 'garlic', 'grapes', 'onion') 10%
('avocado', 'banana', 'brinjal') 5%
('avocado', 'broccoli') 5%
```

```
('avocado', 'broccoli') 5%
('banana', 'garlic', 'grapes', 'tomato') 5%
('brinjal', 'garlic', 'grapes') 5%
('avocado', 'brinjal', 'carrot') 5%
('broccoli', 'carrot', 'cucumber') 10%
('broccoli', 'carrot') 15%
('banana', 'garlic') 25%
('brinjal', 'cucumber', 'onion') 5%
('avocado', 'banana') 5%
('broccoli', 'garlic', 'grapes', 'onion') 5%
('brinjal', 'broccoli', 'carrot', 'cucumber') 5%
('brinjal', 'carrot', 'tomato') 5%
('brinjal', 'grapes') 10%
('banana', 'carrot', 'grapes', 'tomato') 5%
('avocado', 'broccoli', 'carrot', 'cucumber') 5%
('carrot', 'tomato') 10%
('carrot',) 40%
('broccoli', 'carrot', 'grapes') 5%
('brinjal', 'carrot') 20%
('avocado', 'garlic') 10%
('broccoli', 'cucumber', 'grapes') 5%
('avocado', 'broccoli', 'carrot') 5%
('avocado', 'banana', 'brinjal', 'carrot') 5%
('cucumber', 'garlic') 20%
('banana', 'tomato') 10%
('avocado', 'cucumber', 'onion', 'tomato') 10%
('avocado', 'brinjal', 'carrot', 'tomato') 5%
('avocado', 'broccoli', 'carrot', 'cucumber', 'garlic') 5%
('banana', 'carrot', 'grapes') 15%
('avocado', 'banana', 'carrot', 'tomato') 5%
('brinjal', 'garlic') 5%
('broccoli', 'cucumber', 'garlic') 10%
('avocado', 'cucumber', 'garlic') 10%
('broccoli', 'carrot', 'garlic', 'grapes') 5%
('banana', 'brinjal', 'carrot', 'tomato') 5%
('banana', 'brinjal', 'garlic') 5%
('broccoli', 'grapes') 10%
('brinjal', 'carrot', 'cucumber') 5%
('brinjal', 'carrot', 'garlic', 'grapes') 5%
('brinjal', 'onion') 10%
('avocado', 'brinjal', 'cucumber', 'tomato') 5%
('brinjal', 'cucumber', 'tomato') 5%
```

```
('brinjal', 'cucumber', 'tomato') 5%
('brinjal',) 40%
('banana', 'broccoli', 'garlic', 'grapes') 5%
('garlic', 'grapes') 30%
('avocado', 'cucumber', 'onion') 10%
('banana', 'brinjal', 'carrot', 'garlic') 5%
('garlic', 'tomato') 5%
('avocado', 'carrot', 'garlic') 5%
('avocado', 'broccoli', 'cucumber') 5%
('avocado', 'banana', 'brinjal', 'tomato') 5%
('avocado', 'carrot', 'cucumber', 'garlic') 5%
('banana', 'carrot', 'tomato') 10%
('brinjal', 'tomato') 10%
('banana', 'broccoli') 5%
('broccoli', 'cucumber') 15%
('carrot', 'garlic', 'grapes', 'tomato') 5%
('brinjal', 'broccoli') 5%
('banana', 'broccoli', 'grapes') 5%
('avocado', 'carrot', 'cucumber') 5%
('cucumber',) 35%
('grapes', 'tomato') 5%
('broccoli', 'carrot', 'cucumber', 'garlic') 5%

 Frequent Item Sets

('banana',) 45%
('carrot', 'garlic') 25%
('avocado', 'tomato') 25%
('banana', 'brinjal') 25%
('banana', 'garlic', 'grapes') 20%
('grapes',) 35%
('banana', 'carrot') 30%
('banana', 'carrot', 'garlic') 20%
('broccoli', 'garlic') 20%
('onion',) 30%
('tomato',) 30%
('avocado',) 35%
('garlic',) 50%
('banana', 'grapes') 25%
('avocado', 'cucumber') 20%
('cucumber', 'onion') 20%
('broccoli',) 25%
```

```
('broccoli',) 25%
('banana', 'garlic') 25%
('carrot',) 40%
('brinjal', 'carrot') 20%
('cucumber', 'garlic') 20%
('brinjal',) 40%
('garlic', 'grapes') 30%
('cucumber',) 35%

 Association Rules

('carrot',) -> ('garlic',)    [25%,62.5%]
('garlic',) -> ('carrot',)    [25%,50.0%]
('avocado',) -> ('tomato',)    [25%,71.4285714286%]
('tomato',) -> ('avocado',)    [25%,83.3333333333%]
('banana',) -> ('brinjal',)    [25%,55.5555555556%]
('brinjal',) -> ('banana',)    [25%,62.5%]
('banana',) -> ('garlic', 'grapes')    [20%,44.4444444444%]
('garlic',) -> ('banana', 'grapes')    [20%,40.0%]
('banana', 'garlic') -> ('grapes',)    [20%,80.0%]
('grapes',) -> ('banana', 'garlic')    [20%,57.1428571429%]
('banana', 'grapes') -> ('garlic',)    [20%,80.0%]
('garlic', 'grapes') -> ('banana',)    [20%,66.6666666667%]
('banana',) -> ('carrot',)    [30%,66.6666666667%]
('carrot',) -> ('banana',)    [30%,75.0%]
('banana',) -> ('carrot', 'garlic')    [20%,44.4444444444%]
('carrot',) -> ('banana', 'garlic')    [20%,50.0%]
('banana', 'carrot') -> ('garlic',)    [20%,66.6666666667%]
('garlic',) -> ('banana', 'carrot')    [20%,40.0%]
('banana', 'garlic') -> ('carrot',)    [20%,80.0%]
('carrot', 'garlic') -> ('banana',)    [20%,80.0%]
```

```
('broccoli',) -> ('garlic',)    [20%,80.0%]
('garlic',) -> ('broccoli',)    [20%,40.0%]
('banana',) -> ('grapes',)    [25%,55.5555555556%]
('grapes',) -> ('banana',)    [25%,71.4285714286%]
('avocado',) -> ('cucumber',)    [20%,57.1428571429%]
('cucumber',) -> ('avocado',)    [20%,57.1428571429%]
('cucumber',) -> ('onion',)    [20%,57.1428571429%]
('onion',) -> ('cucumber',)    [20%,66.6666666667%]
('banana',) -> ('garlic',)    [25%,55.5555555556%]
('garlic',) -> ('banana',)    [25%,50.0%]
('brinjal',) -> ('carrot',)    [20%,50.0%]
('carrot',) -> ('brinjal',)    [20%,50.0%]
('cucumber',) -> ('garlic',)    [20%,57.1428571429%]
('garlic',) -> ('cucumber',)    [20%,40.0%]
('garlic',) -> ('grapes',)    [30%,60.0%]
('grapes',) -> ('garlic',)    [30%,85.7142857143%]

 Running Apriori Algorithm for Database 3


Enter the Minimum Support Value :
```

Database 3

```
 Running Apriori Algorithm for Database 3


Enter the Minimum Support Value : 19

Enter the Minimum Confidence Value: 55

 Transactions

T01 ['bandaid', 'comb', 'hairdye', 'basket', 'hairband']
T02 ['bottle', 'crayons', 'axedeo', 'ink', 'paper']
T03 ['bandaid', 'comb', 'hairdye']
T04 ['bandaid', 'hairdye', 'axedeo']
T05 ['hairdye', 'crayons', 'axedeo']
T06 ['comb', 'hairdye', 'bottle', 'ink', 'paper']
T07 ['crayons', 'axedeo', 'ink', 'paper']
T08 ['bottle', 'crayons', 'bandaid', 'comb']
T09 ['comb', 'hairdye', 'basket']
T10 ['axedeo', 'ink', 'paper']
T11 ['bottle', 'crayons', 'axedeo', 'ink']
T12 ['basket', 'hairband', 'bottle']
T13 ['comb', 'hairdye', 'basket', 'hairband', 'bottle']
T14 ['hairdye', 'basket', 'hairband']
T15 ['bandaid', 'hairdye']
T16 ['comb', 'basket', 'bottle', 'axedeo', 'paper']
T17 ['hairdye', 'hairband', 'crayons', 'ink']
T18 ['comb', 'basket', 'bottle']
T19 ['axedeo', 'paper']
T20 ['basket', 'bottle']

 Unique Items

crayons hairband axedeo hairdye paper bottle ink basket bandaid comb
 Support Values

('bottle', 'comb', 'crayons') 5%
('bandaid',) 25%
('bottle', 'comb', 'hairband', 'hairdye') 5%
('basket', 'bottle', 'comb') 15%
('bandaid', 'comb', 'hairband', 'hairdye') 5%
('comb', 'ink') 5%
('bandaid', 'basket', 'hairband', 'hairdye') 5%
```

```
('comb', 'ink') 5%
('bandaid', 'basket', 'hairband', 'hairdye') 5%
('bottle', 'hairband') 10%
('axedeo', 'basket', 'bottle') 5%
('axedeo', 'comb', 'paper') 5%
('bottle', 'comb', 'hairdye', 'paper') 5%
('crayons', 'hairband', 'hairdye', 'ink') 5%
('bandaid', 'hairband', 'hairdye') 5%
('hairdye', 'ink') 10%
('axedeo', 'basket', 'comb', 'paper') 5%
('hairdye', 'paper') 5%
('bandaid', 'bottle') 5%
('bandaid', 'crayons') 5%
('axedeo', 'paper') 25%
('basket', 'bottle', 'comb', 'hairband') 5%
('comb', 'hairdye', 'paper') 5%
('axedeo', 'bottle', 'ink') 10%
('bandaid', 'hairband') 5%
('bandaid', 'bottle', 'crayons') 5%
('basket', 'bottle', 'comb', 'paper') 5%
('bandaid', 'basket', 'comb') 5%
('axedeo', 'bandaid') 5%
('hairdye',) 50%
('basket', 'bottle') 25%
('axedeo', 'crayons') 20%
('bandaid', 'comb', 'hairband') 5%
('crayons', 'hairdye', 'ink') 5%
('axedeo', 'bottle', 'crayons', 'ink') 10%
('basket', 'comb', 'hairband', 'hairdye') 10%
('comb', 'hairdye') 25%
('bandaid', 'comb', 'crayons') 5%
('axedeo', 'basket', 'bottle', 'comb') 5%
('bottle', 'hairdye', 'ink') 5%
('ink',) 30%
('axedeo', 'bottle', 'paper') 10%
('bottle', 'hairband', 'hairdye') 5%
('comb', 'crayons') 5%
('bandaid', 'comb', 'hairdye') 10%
('bottle', 'comb') 25%
('axedeo', 'ink', 'paper') 15%
('bottle', 'comb', 'hairdye', 'ink', 'paper') 5%
('axedeo', 'bottle', 'comb') 5%
```

```
('axedeo', 'bottle', 'comb') 5%
('bottle', 'comb', 'ink') 5%
('crayons', 'hairdye') 10%
('bandaid', 'basket') 5%
('comb', 'hairdye', 'ink') 5%
('axedeo', 'basket', 'paper') 5%
('basket', 'comb') 25%
('comb', 'hairband', 'hairdye') 10%
('axedeo', 'basket', 'comb') 5%
('basket', 'bottle', 'hairband', 'hairdye') 5%
('bandaid', 'basket', 'comb', 'hairband', 'hairdye') 5%
('bottle', 'comb', 'paper') 10%
('ink', 'paper') 20%
('axedeo', 'hairdye') 10%
('crayons', 'paper') 10%
('bottle', 'comb', 'hairdye') 10%
('bottle', 'crayons', 'ink', 'paper') 5%
('crayons', 'ink') 20%
('bottle', 'comb', 'ink', 'paper') 5%
('bottle', 'comb', 'hairband') 5%
('axedeo', 'crayons', 'ink') 15%
('paper',) 30%
('comb', 'ink', 'paper') 5%
('basket', 'hairband') 20%
('comb', 'paper') 10%
('bottle', 'crayons', 'ink') 10%
('bandaid', 'basket', 'hairdye') 5%
('axedeo',) 40%
('basket', 'bottle', 'hairband') 10%
('crayons', 'hairband', 'ink') 5%
('basket', 'paper') 5%
('bottle',) 45%
('basket', 'hairband', 'hairdye') 15%
('axedeo', 'crayons', 'ink', 'paper') 10%
('bottle', 'hairdye', 'ink', 'paper') 5%
('bottle', 'crayons') 15%
('bandaid', 'bottle', 'comb', 'crayons') 5%
('axedeo', 'bottle', 'crayons', 'paper') 5%
('basket', 'comb', 'paper') 5%
('basket', 'bottle', 'paper') 5%
('basket', 'comb', 'hairdye') 15%
('axedeo', 'bottle', 'crayons', 'ink', 'paper') 5%
```

```
('axedeo', 'bottle', 'crayons', 'ink', 'paper') 5%
('hairband', 'ink') 5%
('basket', 'bottle', 'hairdye') 5%
('hairdye', 'ink', 'paper') 5%
('bandaid', 'bottle', 'comb') 5%
('basket', 'bottle', 'comb', 'hairdye') 5%
('axedeo', 'basket', 'bottle', 'comb', 'paper') 5%
('basket',) 40%
('hairband', 'hairdye') 20%
('bandaid', 'basket', 'comb', 'hairdye') 5%
('bandaid', 'comb') 15%
('axedeo', 'crayons', 'paper') 10%
('axedeo', 'bandaid', 'hairdye') 5%
('basket', 'comb', 'hairband') 10%
('hairband',) 25%
('basket', 'bottle', 'comb', 'hairband', 'hairdye') 5%
('bandaid', 'basket', 'comb', 'hairband') 5%
('comb',) 40%
('crayons',) 30%
('crayons', 'hairband', 'hairdye') 5%
('axedeo', 'basket') 5%
('bottle', 'crayons', 'paper') 5%
('axedeo', 'comb') 5%
('comb', 'hairband') 10%
('hairband', 'hairdye', 'ink') 5%
('axedeo', 'bottle', 'ink', 'paper') 5%
('axedeo', 'bottle', 'comb', 'paper') 5%
('axedeo', 'crayons', 'hairdye') 5%
('basket', 'hairdye') 20%
('bottle', 'hairdye') 10%
('crayons', 'ink', 'paper') 10%
('bandaid', 'basket', 'hairband') 5%
('bottle', 'hairdye', 'paper') 5%
('bottle', 'ink') 15%
('axedeo', 'ink') 20%
('bottle', 'ink', 'paper') 10%
('bottle', 'comb', 'hairdye', 'ink') 5%
('bottle', 'paper') 15%
('axedeo', 'basket', 'bottle', 'paper') 5%
('bandaid', 'hairdye') 20%
('axedeo', 'bottle', 'crayons') 10%
('comb', 'hairdye', 'ink', 'paper') 5%
```

```
('comb', 'hairdye', 'ink', 'paper') 5%
('crayons', 'hairband') 5%
('axedeo', 'bottle') 15%

 Frequent Item Sets

('bandaid',) 25%
('axedeo', 'paper') 25%
('hairdye',) 50%
('basket', 'bottle') 25%
('axedeo', 'crayons') 20%
('comb', 'hairdye') 25%
('ink',) 30%
('bottle', 'comb') 25%
('basket', 'comb') 25%
('ink', 'paper') 20%
('crayons', 'ink') 20%
('paper',) 30%
('basket', 'hairband') 20%
('axedeo',) 40%
('bottle',) 45%
('basket',) 40%
('hairband', 'hairdye') 20%
('hairband',) 25%
('comb',) 40%
('crayons',) 30%
('basket', 'hairdye') 20%
('axedeo', 'ink') 20%
('bandaid', 'hairdye') 20%
```

```
 Association Rules

('axedeo',) -> ('paper',)   [25%,62.5%]
('paper',) -> ('axedeo',)   [25%,83.3333333333%]
('basket',) -> ('bottle',)   [25%,62.5%]
('bottle',) -> ('basket',)   [25%,55.5555555556%]
('crayons',) -> ('axedeo',)   [20%,66.6666666667%]
('comb',) -> ('hairdye',)   [25%,62.5%]
('bottle',) -> ('comb',)   [25%,55.5555555556%]
('comb',) -> ('bottle',)   [25%,62.5%]
('basket',) -> ('comb',)   [25%,62.5%]
('comb',) -> ('basket',)   [25%,62.5%]
('ink',) -> ('paper',)   [20%,66.6666666667%]
('paper',) -> ('ink',)   [20%,66.6666666667%]
('crayons',) -> ('ink',)   [20%,66.6666666667%]
('ink',) -> ('crayons',)   [20%,66.6666666667%]
('hairband',) -> ('basket',)   [20%,80.0%]
('hairband',) -> ('hairdye',)   [20%,80.0%]
('ink',) -> ('axedeo',)   [20%,66.6666666667%]
('bandaid',) -> ('hairdye',)   [20%,80.0%]

 Running Apriori Algorithm for Database 4


Enter the Minimum Support Value :
```

Database 4

```
 Running Apriori Algorithm for Database 4


Enter the Minimum Support Value : 17

Enter the Minimum Confidence Value: 60

 Transactions

T01 ['avatar', 'aviator', 'sherlock', 'twilight', 'frozen']
T02 ['batman', 'godzilla', 'lincoln', 'oceans', 'superman']
T03 ['avatar', 'aviator', 'sherlock', 'godzilla', 'lincoln']
T04 ['avatar', 'aviator']
T05 ['sherlock', 'godzilla', 'lincoln']
T06 ['aviator', 'sherlock', 'batman']
T07 ['godzilla', 'lincoln', 'oceans', 'superman']
T08 ['batman', 'godzilla', 'avatar', 'aviator']
T09 ['aviator', 'sherlock', 'twilight']
T10 ['lincoln', 'oceans', 'superman']
T11 ['batman', 'godzilla', 'lincoln', 'oceans']
T12 ['twilight', 'batman', 'godzilla']
T13 ['aviator', 'sherlock', 'twilight', 'frozen', 'batman']
T14 ['sherlock', 'twilight', 'frozen']
T15 ['avatar', 'sherlock', 'frozen', 'godzilla', 'oceans']
T16 ['aviator', 'twilight', 'batman', 'superman']
T17 ['sherlock', 'frozen', 'godzilla', 'oceans']
T18 ['aviator', 'twilight', 'batman', 'oceans']
T19 ['lincoln', 'superman']
T20 ['twilight', 'batman']

 Unique Items

lincoln godzilla frozen batman oceans sherlock superman twilight aviator avatar
 Support Values

('sherlock',) 45%
('avatar', 'aviator', 'twilight') 5%
('avatar', 'aviator', 'godzilla', 'lincoln', 'sherlock') 5%
('aviator', 'sherlock') 25%
('oceans', 'sherlock') 10%
('avatar', 'lincoln', 'sherlock') 5%
('avatar', 'aviator', 'frozen', 'sherlock', 'twilight') 5%
```

```
('avatar', 'lincoln', 'sherlock') 5%
('avatar', 'aviator', 'frozen', 'sherlock', 'twilight') 5%
('avatar', 'godzilla', 'lincoln', 'sherlock') 5%
('avatar', 'twilight') 5%
('frozen',) 25%
('frozen', 'sherlock') 25%
('avatar', 'frozen') 10%
('avatar', 'godzilla', 'lincoln') 5%
('aviator', 'lincoln') 5%
('frozen', 'twilight') 15%
('avatar', 'godzilla') 15%
('avatar', 'aviator', 'godzilla', 'sherlock') 5%
('godzilla', 'oceans') 25%
('avatar', 'lincoln') 5%
('aviator', 'oceans') 5%
('avatar', 'aviator', 'batman') 5%
('oceans',) 35%
('aviator', 'frozen', 'sherlock', 'twilight') 10%
('frozen', 'godzilla') 10%
('avatar', 'frozen', 'godzilla') 5%
('avatar',) 25%
('avatar', 'aviator', 'godzilla') 10%
('twilight',) 40%
('oceans', 'superman') 15%
('frozen', 'oceans', 'sherlock') 10%
('batman', 'godzilla', 'superman') 5%
('superman',) 25%
('avatar', 'aviator', 'frozen') 5%
('avatar', 'frozen', 'sherlock', 'twilight') 5%
('batman', 'lincoln', 'oceans') 10%
('aviator', 'batman', 'frozen', 'sherlock') 5%
('avatar', 'frozen', 'godzilla', 'sherlock') 5%
('batman', 'lincoln') 10%
('aviator', 'batman') 25%
('aviator', 'batman', 'superman', 'twilight') 5%
('lincoln', 'oceans') 20%
('aviator', 'godzilla', 'sherlock') 5%
('avatar', 'godzilla', 'oceans') 5%
('aviator', 'batman', 'frozen', 'sherlock', 'twilight') 5%
('avatar', 'godzilla', 'sherlock') 10%
('batman', 'godzilla', 'lincoln') 10%
('aviator', 'batman', 'frozen') 5%
```

```
('aviator', 'batman', 'frozen') 5%
('avatar', 'frozen', 'twilight') 5%
('avatar', 'aviator', 'lincoln', 'sherlock') 5%
('aviator', 'superman', 'twilight') 5%
('aviator', 'godzilla', 'lincoln') 5%
('batman', 'frozen', 'twilight') 5%
('batman', 'godzilla', 'oceans') 10%
('lincoln', 'sherlock') 10%
('batman',) 45%
('aviator', 'batman', 'twilight') 15%
('batman', 'frozen', 'sherlock', 'twilight') 5%
('frozen', 'godzilla', 'sherlock') 10%
('godzilla', 'lincoln', 'oceans', 'superman') 10%
('godzilla', 'oceans', 'sherlock') 10%
('frozen', 'sherlock', 'twilight') 15%
('batman', 'lincoln', 'superman') 5%
('avatar', 'sherlock', 'twilight') 5%
('batman', 'sherlock', 'twilight') 5%
('godzilla', 'lincoln') 25%
('avatar', 'oceans') 5%
('godzilla', 'oceans', 'superman') 10%
('aviator', 'sherlock', 'twilight') 15%
('oceans', 'twilight') 5%
('avatar', 'aviator') 20%
('aviator', 'lincoln', 'sherlock') 5%
('aviator', 'frozen', 'twilight') 10%
('batman', 'godzilla', 'twilight') 5%
('avatar', 'aviator', 'godzilla', 'lincoln') 5%
('superman', 'twilight') 5%
('aviator', 'batman', 'frozen', 'twilight') 5%
('batman', 'superman', 'twilight') 5%
('aviator', 'frozen', 'sherlock') 10%
('aviator',) 45%
('batman', 'frozen', 'sherlock') 5%
('godzilla', 'superman') 10%
('avatar', 'batman', 'godzilla') 5%
('avatar', 'batman') 5%
('batman', 'oceans') 15%
('avatar', 'aviator', 'sherlock', 'twilight') 5%
('godzilla',) 45%
('batman', 'oceans', 'superman') 5%
('aviator', 'oceans', 'twilight') 5%
```

```
('batman', 'oceans', 'superman') 5%
('aviator', 'oceans', 'twilight') 5%
('aviator', 'godzilla', 'lincoln', 'sherlock') 5%
('avatar', 'frozen', 'oceans') 5%
('batman', 'lincoln', 'oceans', 'superman') 5%
('aviator', 'batman', 'godzilla') 5%
('godzilla', 'sherlock') 20%
('godzilla', 'lincoln', 'sherlock') 10%
('avatar', 'frozen', 'oceans', 'sherlock') 5%
('batman', 'oceans', 'twilight') 5%
('batman', 'godzilla') 20%
('aviator', 'godzilla') 10%
('avatar', 'sherlock') 15%
('frozen', 'oceans') 10%
('avatar', 'aviator', 'frozen', 'twilight') 5%
('avatar', 'aviator', 'sherlock') 10%
('batman', 'godzilla', 'lincoln', 'superman') 5%
('godzilla', 'lincoln', 'superman') 10%
('frozen', 'godzilla', 'oceans', 'sherlock') 10%
('aviator', 'twilight') 25%
('aviator', 'batman', 'oceans') 5%
('aviator', 'frozen') 10%
('aviator', 'batman', 'sherlock', 'twilight') 5%
('godzilla', 'twilight') 5%
('batman', 'superman') 10%
('aviator', 'batman', 'superman') 5%
('avatar', 'frozen', 'sherlock') 10%
('lincoln', 'superman') 20%
('batman', 'frozen') 5%
('batman', 'twilight') 25%
('avatar', 'aviator', 'batman', 'godzilla') 5%
('avatar', 'oceans', 'sherlock') 5%
('avatar', 'aviator', 'lincoln') 5%
('batman', 'godzilla', 'lincoln', 'oceans') 10%
('avatar', 'aviator', 'frozen', 'sherlock') 5%
('godzilla', 'lincoln', 'oceans') 15%
('lincoln',) 35%
('sherlock', 'twilight') 20%
('aviator', 'batman', 'oceans', 'twilight') 5%
('lincoln', 'oceans', 'superman') 15%
('batman', 'sherlock') 10%
('aviator', 'superman') 5%
```

```
('aviator', 'superman') 5%
('avatar', 'godzilla', 'oceans', 'sherlock') 5%
('aviator', 'batman', 'sherlock') 10%
('batman', 'godzilla', 'lincoln', 'oceans', 'superman') 5%
('frozen', 'godzilla', 'oceans') 10%
('batman', 'godzilla', 'oceans', 'superman') 5%
('avatar', 'frozen', 'godzilla', 'oceans') 5%
('avatar', 'frozen', 'godzilla', 'oceans', 'sherlock') 5%

 Frequent Item Sets

('sherlock',) 45%
('aviator', 'sherlock') 25%
('frozen',) 25%
('frozen', 'sherlock') 25%
('godzilla', 'oceans') 25%
('oceans',) 35%
('avatar',) 25%
('twilight',) 40%
('superman',) 25%
('aviator', 'batman') 25%
('lincoln', 'oceans') 20%
('batman',) 45%
('godzilla', 'lincoln') 25%
('avatar', 'aviator') 20%
('aviator',) 45%
('godzilla',) 45%
('godzilla', 'sherlock') 20%
('batman', 'godzilla') 20%
('aviator', 'twilight') 25%
('lincoln', 'superman') 20%
('batman', 'twilight') 25%
('lincoln',) 35%
('sherlock', 'twilight') 20%
```

```
 Association Rules

('frozen',) -> ('sherlock',)   [25%,100.0%]
('oceans',) -> ('godzilla',)   [25%,71.4285714286%]
('lincoln',) -> ('godzilla',)   [25%,71.4285714286%]
('avatar',) -> ('aviator',)   [20%,80.0%]
('twilight',) -> ('aviator',)   [25%,62.5%]
('superman',) -> ('lincoln',)   [20%,80.0%]
('twilight',) -> ('batman',)   [25%,62.5%]

 Running Apriori Algorithm for Database 5


Enter the Minimum Support Value :
```

Database 5

```
 Running Apriori Algorithm for Database 5


Enter the Minimum Support Value : 20

Enter the Minimum Confidence Value: 60

 Transactions

T01 ['wheat', 'rice', 'tamarind', 'flour', 'oil']
T02 ['horlicks', 'bournvita', 'noodles', 'chocolate', 'dhal']
T03 ['wheat', 'rice', 'tamarind', 'bournvita', 'noodles']
T04 ['wheat', 'rice']
T05 ['tamarind', 'bournvita', 'noodles']
T06 ['rice', 'tamarind', 'horlicks', 'chocolate', 'dhal', 'flour', 'oil']
T07 ['bournvita', 'noodles', 'chocolate', 'dhal']
T08 ['horlicks', 'bournvita', 'wheat', 'rice']
T09 ['rice', 'tamarind', 'flour']
T10 ['noodles', 'chocolate', 'dhal']
T11 ['horlicks', 'bournvita', 'noodles', 'chocolate']
T12 ['flour', 'oil', 'horlicks']
T13 ['rice', 'tamarind', 'flour', 'oil', 'horlicks']
T14 ['tamarind', 'flour', 'oil']
T15 ['wheat', 'tamarind', 'oil', 'bournvita', 'chocolate']
T16 ['rice', 'flour', 'horlicks', 'noodles', 'dhal']
T17 ['tamarind', 'oil', 'bournvita', 'chocolate']
T18 ['rice', 'flour', 'horlicks']
T19 ['noodles', 'dhal']
T20 ['flour', 'horlicks']

 Unique Items

oil wheat horlicks flour chocolate noodles bournvita tamarind rice dhal
 Support Values

('chocolate', 'flour', 'horlicks', 'oil', 'rice') 5%
('flour', 'horlicks', 'rice', 'tamarind') 10%
('chocolate', 'oil', 'rice') 5%
('bournvita', 'noodles', 'rice') 5%
('flour', 'horlicks', 'oil', 'rice') 10%
('bournvita', 'horlicks', 'rice', 'wheat') 5%
```

```
('bournvita', 'horlicks', 'rice', 'wheat') 5%
('oil', 'rice', 'wheat') 5%
('dhal', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('dhal', 'flour', 'horlicks', 'noodles', 'rice') 5%
('bournvita', 'tamarind') 20%
('bournvita', 'oil', 'tamarind') 10%
('dhal', 'flour', 'horlicks', 'rice', 'tamarind') 5%
('bournvita', 'noodles', 'tamarind', 'wheat') 5%
('wheat',) 25%
('chocolate', 'flour', 'horlicks', 'oil', 'tamarind') 5%
('flour', 'horlicks', 'noodles', 'rice') 5%
('horlicks', 'noodles', 'rice') 5%
('bournvita', 'dhal', 'horlicks', 'noodles') 5%
('dhal', 'horlicks', 'rice') 10%
('chocolate', 'horlicks', 'oil', 'tamarind') 5%
('chocolate', 'dhal', 'rice') 5%
('noodles', 'rice') 10%
('bournvita', 'noodles', 'rice', 'tamarind') 5%
('horlicks', 'oil') 15%
('chocolate', 'dhal', 'horlicks', 'noodles') 5%
('chocolate', 'rice') 5%
('dhal', 'flour', 'horlicks', 'tamarind') 5%
('noodles', 'rice', 'tamarind') 5%
('dhal', 'flour', 'rice') 10%
('chocolate', 'horlicks', 'rice', 'tamarind') 5%
('bournvita', 'chocolate', 'horlicks') 10%
('bournvita', 'chocolate', 'tamarind') 10%
('bournvita', 'chocolate', 'oil') 10%
('chocolate', 'dhal', 'horlicks', 'rice', 'tamarind') 5%
('noodles', 'tamarind', 'wheat') 5%
('chocolate', 'dhal', 'oil', 'tamarind') 5%
('chocolate',) 35%
('noodles',) 40%
('flour', 'noodles', 'rice') 5%
('chocolate', 'dhal', 'flour', 'oil') 5%
('dhal', 'flour', 'horlicks', 'oil', 'rice') 5%
('chocolate', 'flour', 'oil', 'tamarind') 5%
('chocolate', 'flour', 'horlicks', 'tamarind') 5%
('noodles', 'rice', 'tamarind', 'wheat') 5%
('bournvita', 'chocolate', 'horlicks', 'noodles') 10%
('bournvita', 'noodles', 'rice', 'tamarind', 'wheat') 5%
('bournvita', 'rice') 10%
```

```
('bournvita', 'rice') 10%
('dhal', 'oil', 'rice') 5%
('flour', 'tamarind', 'wheat') 5%
('bournvita', 'chocolate') 25%
('horlicks', 'oil', 'rice', 'tamarind') 10%
('noodles', 'wheat') 5%
('chocolate', 'horlicks', 'tamarind') 5%
('oil', 'wheat') 10%
('flour', 'horlicks', 'oil', 'rice', 'tamarind') 10%
('rice',) 45%
('flour', 'oil', 'rice', 'wheat') 5%
('dhal', 'flour', 'oil', 'tamarind') 5%
('bournvita', 'chocolate', 'wheat') 5%
('chocolate', 'oil', 'rice', 'tamarind') 5%
('dhal', 'horlicks') 15%
('dhal', 'flour', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('chocolate', 'dhal', 'horlicks', 'tamarind') 5%
('chocolate', 'horlicks', 'rice') 5%
('bournvita', 'oil') 10%
('dhal', 'noodles') 25%
('bournvita', 'chocolate', 'dhal', 'horlicks') 5%
('bournvita', 'horlicks', 'wheat') 5%
('chocolate', 'dhal', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('chocolate', 'oil') 15%
('chocolate', 'wheat') 5%
('dhal', 'tamarind') 5%
('dhal', 'flour', 'horlicks', 'rice') 10%
('dhal', 'rice') 10%
('chocolate', 'dhal', 'flour') 5%
('flour', 'oil') 25%
('chocolate', 'dhal', 'flour', 'tamarind') 5%
('chocolate', 'dhal', 'oil', 'rice', 'tamarind') 5%
('chocolate', 'flour', 'horlicks', 'rice', 'tamarind') 5%
('dhal', 'flour', 'horlicks', 'noodles') 5%
('dhal', 'flour', 'horlicks', 'oil', 'tamarind') 5%
('flour', 'horlicks', 'oil') 15%
('noodles', 'rice', 'wheat') 5%
('dhal', 'flour') 10%
('horlicks',) 45%
('chocolate', 'flour', 'rice') 5%
('chocolate', 'flour', 'oil') 5%
('flour', 'oil', 'rice', 'tamarind') 15%
```

```
('flour', 'oil', 'rice', 'tamarind') 15%
('dhal', 'horlicks', 'noodles', 'rice') 5%
('chocolate', 'tamarind') 15%
('dhal', 'flour', 'horlicks', 'oil') 5%
('flour', 'oil', 'tamarind', 'wheat') 5%
('chocolate', 'dhal', 'horlicks', 'rice') 5%
('bournvita', 'chocolate', 'oil', 'wheat') 5%
('dhal', 'flour', 'noodles') 5%
('horlicks', 'oil', 'tamarind') 10%
('chocolate', 'flour', 'horlicks', 'rice') 5%
('chocolate', 'tamarind', 'wheat') 5%
('flour', 'horlicks', 'rice') 20%
('chocolate', 'oil', 'tamarind') 15%
('flour', 'oil', 'rice') 15%
('chocolate', 'flour', 'horlicks', 'oil') 5%
('chocolate', 'dhal', 'noodles') 15%
('chocolate', 'horlicks', 'oil', 'rice') 5%
('horlicks', 'tamarind') 10%
('oil', 'rice', 'tamarind') 15%
('horlicks', 'rice') 25%
('chocolate', 'dhal', 'flour', 'horlicks', 'oil', 'rice') 5%
('dhal', 'flour', 'rice', 'tamarind') 5%
('chocolate', 'oil', 'tamarind', 'wheat') 5%
('tamarind', 'wheat') 15%
('flour', 'wheat') 5%
('bournvita', 'dhal') 10%
('oil', 'tamarind') 30%
('bournvita', 'horlicks') 15%
('dhal', 'horlicks', 'oil', 'tamarind') 5%
('bournvita', 'chocolate', 'dhal') 10%
('dhal', 'horlicks', 'tamarind') 5%
('rice', 'tamarind') 25%
('flour', 'noodles') 5%
('chocolate', 'dhal', 'flour', 'rice', 'tamarind') 5%
('horlicks', 'rice', 'wheat') 5%
('chocolate', 'dhal', 'tamarind') 5%
('chocolate', 'dhal', 'oil', 'rice') 5%
('flour', 'rice', 'tamarind', 'wheat') 5%
('chocolate', 'dhal', 'flour', 'horlicks', 'oil') 5%
('chocolate', 'flour', 'rice', 'tamarind') 5%
('chocolate', 'flour', 'oil', 'rice') 5%
('rice', 'wheat') 20%
```

```
('rice', 'wheat') 20%
('bournvita',) 40%
('dhal', 'flour', 'horlicks') 10%
('chocolate', 'horlicks', 'noodles') 10%
('rice', 'tamarind', 'wheat') 10%
('flour', 'oil', 'rice', 'tamarind', 'wheat') 5%
('chocolate', 'flour', 'oil', 'rice', 'tamarind') 5%
('flour', 'tamarind') 25%
('flour', 'rice') 30%
('chocolate', 'dhal', 'horlicks') 10%
('chocolate', 'dhal', 'flour', 'oil', 'rice', 'tamarind') 5%
('bournvita', 'tamarind', 'wheat') 10%
('flour', 'horlicks', 'tamarind') 10%
('chocolate', 'dhal', 'flour', 'horlicks', 'oil', 'tamarind') 5%
('chocolate', 'horlicks', 'oil') 5%
('bournvita', 'chocolate', 'tamarind', 'wheat') 5%
('chocolate', 'dhal', 'flour', 'horlicks', 'rice') 5%
('flour', 'horlicks', 'noodles') 5%
('chocolate', 'dhal', 'flour', 'rice') 5%
('chocolate', 'dhal') 20%
('bournvita', 'noodles', 'rice', 'wheat') 5%
('dhal', 'rice', 'tamarind') 5%
('chocolate', 'dhal', 'flour', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('dhal', 'oil', 'rice', 'tamarind') 5%
('dhal', 'horlicks', 'rice', 'tamarind') 5%
('chocolate', 'horlicks') 15%
('horlicks', 'noodles') 15%
('dhal', 'flour', 'tamarind') 5%
('dhal', 'flour', 'oil') 5%
('bournvita', 'horlicks', 'noodles') 10%
('chocolate', 'dhal', 'flour', 'horlicks', 'tamarind') 5%
('noodles', 'tamarind') 10%
('bournvita', 'rice', 'wheat') 10%
('chocolate', 'dhal', 'oil') 5%
('oil',) 35%
('chocolate', 'dhal', 'horlicks', 'oil', 'rice') 5%
('dhal', 'noodles', 'rice') 5%
('flour', 'oil', 'wheat') 5%
('flour', 'horlicks', 'oil', 'tamarind') 10%
('bournvita', 'noodles') 25%
('flour', 'oil', 'tamarind') 20%
('dhal', 'horlicks', 'noodles') 10%
```

```
('dhal', 'horlicks', 'rice', 'tamarind') 5%
('chocolate', 'horlicks') 15%
('horlicks', 'noodles') 15%
('dhal', 'flour', 'tamarind') 5%
('dhal', 'flour', 'oil') 5%
('bournvita', 'horlicks', 'noodles') 10%
('chocolate', 'dhal', 'flour', 'horlicks', 'tamarind') 5%
('noodles', 'tamarind') 10%
('bournvita', 'rice', 'wheat') 10%
('chocolate', 'dhal', 'oil') 5%
('oil',) 35%
('chocolate', 'dhal', 'horlicks', 'oil', 'rice') 5%
('dhal', 'noodles', 'rice') 5%
('flour', 'oil', 'wheat') 5%
('flour', 'horlicks', 'oil', 'tamarind') 10%
('bournvita', 'noodles') 25%
('flour', 'oil', 'tamarind') 20%
('dhal', 'horlicks', 'noodles') 10%
('chocolate', 'dhal', 'flour', 'oil', 'rice') 5%
('dhal', 'oil', 'tamarind') 5%
('bournvita', 'rice', 'tamarind') 5%
('flour', 'horlicks') 30%
('tamarind',) 45%
('oil', 'tamarind', 'wheat') 10%
('bournvita', 'chocolate', 'oil', 'tamarind', 'wheat') 5%
('bournvita', 'noodles', 'tamarind') 10%
('dhal', 'oil') 5%
('chocolate', 'dhal', 'flour', 'oil', 'tamarind') 5%
('bournvita', 'chocolate', 'dhal', 'noodles') 10%
('dhal', 'horlicks', 'oil') 5%
('chocolate', 'dhal', 'horlicks', 'oil') 5%
('bournvita', 'dhal', 'noodles') 10%
('chocolate', 'rice', 'tamarind') 5%
('chocolate', 'flour', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('horlicks', 'rice', 'tamarind') 10%
('bournvita', 'chocolate', 'dhal', 'horlicks', 'noodles') 5%
('bournvita', 'horlicks', 'rice') 5%
('chocolate', 'horlicks', 'oil', 'rice', 'tamarind') 5%
('dhal',) 30%
('chocolate', 'noodles') 20%
('chocolate', 'dhal', 'flour', 'horlicks', 'rice', 'tamarind') 5%
('oil', 'rice', 'tamarind', 'wheat') 5%
```

```
('oil', 'rice', 'tamarind', 'wheat') 5%
('flour', 'rice', 'wheat') 5%
('horlicks', 'oil', 'rice') 10%
('bournvita', 'rice', 'tamarind', 'wheat') 5%
('flour',) 45%
('bournvita', 'chocolate', 'noodles') 15%
('dhal', 'flour', 'oil', 'rice', 'tamarind') 5%
('chocolate', 'flour', 'horlicks') 5%
('chocolate', 'flour', 'tamarind') 5%
('oil', 'rice') 15%
('dhal', 'horlicks', 'oil', 'rice') 5%
('horlicks', 'wheat') 5%
('dhal', 'flour', 'noodles', 'rice') 5%
('bournvita', 'wheat') 15%
('bournvita', 'noodles', 'wheat') 5%
('dhal', 'flour', 'oil', 'rice') 5%
('chocolate', 'oil', 'wheat') 5%
('bournvita', 'chocolate', 'oil', 'tamarind') 10%
('chocolate', 'dhal', 'flour', 'horlicks') 5%
('chocolate', 'dhal', 'rice', 'tamarind') 5%
('flour', 'rice', 'tamarind') 20%
('chocolate', 'flour') 5%
('chocolate', 'dhal', 'horlicks', 'oil', 'tamarind') 5%
('bournvita', 'oil', 'tamarind', 'wheat') 5%
('bournvita', 'dhal', 'horlicks') 5%
('bournvita', 'oil', 'wheat') 5%

 Frequent Item Sets

('bournvita', 'tamarind') 20%
('wheat',) 25%
('chocolate',) 35%
('noodles',) 40%
('bournvita', 'chocolate') 25%
('rice',) 45%
('dhal', 'noodles') 25%
('flour', 'oil') 25%
('horlicks',) 45%
('flour', 'horlicks', 'rice') 20%
('horlicks', 'rice') 25%
('oil', 'tamarind') 30%
('rice', 'tamarind') 25%
```

```
('rice', 'wheat') 20%
('bournvita',) 40%
('flour', 'tamarind') 25%
('flour', 'rice') 30%
('chocolate', 'dhal') 20%
('oil',) 35%
('bournvita', 'noodles') 25%
('flour', 'oil', 'tamarind') 20%
('flour', 'horlicks') 30%
('tamarind',) 45%
('dhal',) 30%
('chocolate', 'noodles') 20%
('flour',) 45%
('flour', 'rice', 'tamarind') 20%

 Association Rules

('bournvita',) -> ('chocolate',)   [25%,62.5%]
('chocolate',) -> ('bournvita',)   [25%,71.4285714286%]
('dhal',) -> ('noodles',)   [25%,83.3333333333%]
('noodles',) -> ('dhal',)   [25%,62.5%]
('oil',) -> ('flour',)   [25%,71.4285714286%]
('flour', 'horlicks') -> ('rice',)   [20%,66.6666666667%]
('flour', 'rice') -> ('horlicks',)   [20%,66.6666666667%]
('horlicks', 'rice') -> ('flour',)   [20%,80.0%]
('oil',) -> ('tamarind',)   [30%,85.7142857143%]
('tamarind',) -> ('oil',)   [30%,66.6666666667%]
('wheat',) -> ('rice',)   [20%,80.0%]
('flour',) -> ('rice',)   [30%,66.6666666667%]
('rice',) -> ('flour',)   [30%,66.6666666667%]
('dhal',) -> ('chocolate',)   [20%,66.6666666667%]
('bournvita',) -> ('noodles',)   [25%,62.5%]
('noodles',) -> ('bournvita',)   [25%,62.5%]
('flour', 'oil') -> ('tamarind',)   [20%,80.0%]
('flour', 'tamarind') -> ('oil',)   [20%,80.0%]
('oil', 'tamarind') -> ('flour',)   [20%,66.6666666667%]
('flour',) -> ('horlicks',)   [30%,66.6666666667%]
('horlicks',) -> ('flour',)   [30%,66.6666666667%]
('flour', 'rice') -> ('tamarind',)   [20%,66.6666666667%]
('flour', 'tamarind') -> ('rice',)   [20%,80.0%]
('rice', 'tamarind') -> ('flour',)   [20%,80.0%]
Harinarayanan:DataMining Hari$
```

Setup Used:

Programming Language: Python 2.7
Editor: Sublime
OS: Mac OS
RAM: 16 GB
Processor: Intel Core i7