Tarefa 1: MO433 - Aprendizado não supervisionado

Equipe:

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In [6]:
```
!wget http://fimi.ua.ac.be/data/retail.dat
```

```
--2021-10-19 09:36:22--  http://fimi.ua.ac.be/data/retail.dat
Resolvendo fimi.ua.ac.be (fimi.ua.ac.be)... 143.129.69.1
Conectando-se a fimi.ua.ac.be (fimi.ua.ac.be)|143.129.69.1|:80... conectado.
A requisição HTTP foi enviada, aguardando resposta... 301 Moved Permanently
Localização: http://fimi.uantwerpen.be/data/retail.dat [redirecionando]
--2021-10-19 09:36:29--  http://fimi.uantwerpen.be/data/retail.dat
Resolvendo fimi.uantwerpen.be (fimi.uantwerpen.be)... 143.129.69.1
Reaproveitando a conexão existente para fimi.ua.ac.be:80.
A requisição HTTP foi enviada, aguardando resposta... 200 OK
Tamanho: 4167490 (4,0M)
Salvando em: “retail.dat.1”

retail.dat.1          0%[                    ]  14,78K  --.-KB/s    TED 52m 12s^
C
```

In [90]:
```
# Load the data
transactions = []

for line in open('retail.dat', 'r'):

    # Remove spaces
    items = line.strip()

    # Split and add the items to the transaction
    transactions.append(items.split(' '))
```

1) Algoritmo Apriori from apyori

In [91]:
```
!pip install apyori
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: apyori in /home/iury/.local/lib/python3.8/site-pac
kages (1.1.2)
```

In [92]:
```
from apyori import apriori
import matplotlib.pyplot as plt
import pandas as pd
```

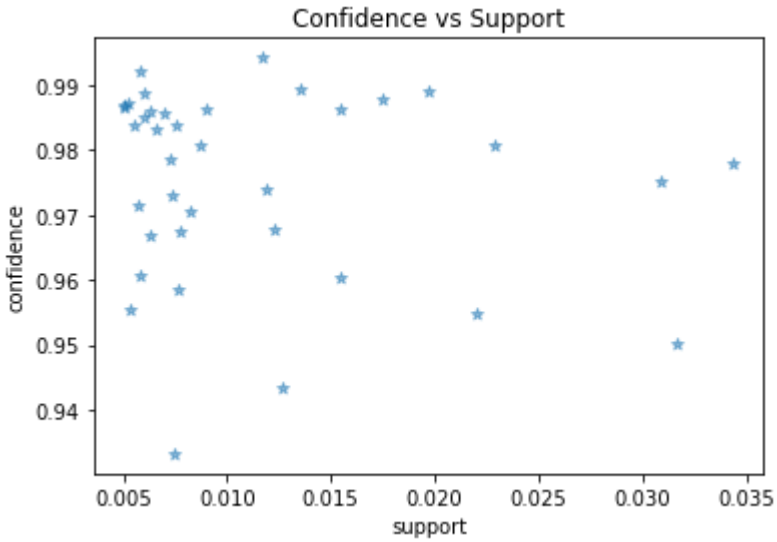
In [94]:
```
# Create the apyory generator
results_generator = apriori(transactions, min_support=0.005, min_confidence=0.9)

# Show the rules with support, confidence and lift
rules_df = pd.DataFrame(columns=['rule', 'support', 'confidence', 'lift'])

supports = []
confidences = []
lifts = []
```

```
for i in results_generator:

    items_base = list(i.ordered_statistics[0].items_base)
    items_add = list(i.ordered_statistics[0].items_add)

    # Collect metrics
    supports.append(i.support)
    confidences.append(i.ordered_statistics[0].confidence)
    lifts.append(i.ordered_statistics[0].lift)

    new_row = {'rule': ', '.join(items_base) + ' => ' + ','.join(items_add),
               'support': round(i.support, 3),
               'confidence': round(i.ordered_statistics[0].confidence, 3),
               'lift': round(i.ordered_statistics[0].lift, 3)}

    rules_df = rules_df.append(new_row, ignore_index=True)

# Sort by lift
rules_df = rules_df.sort_values('lift', ascending=False)

print(rules_df.to_string(index=False))
```

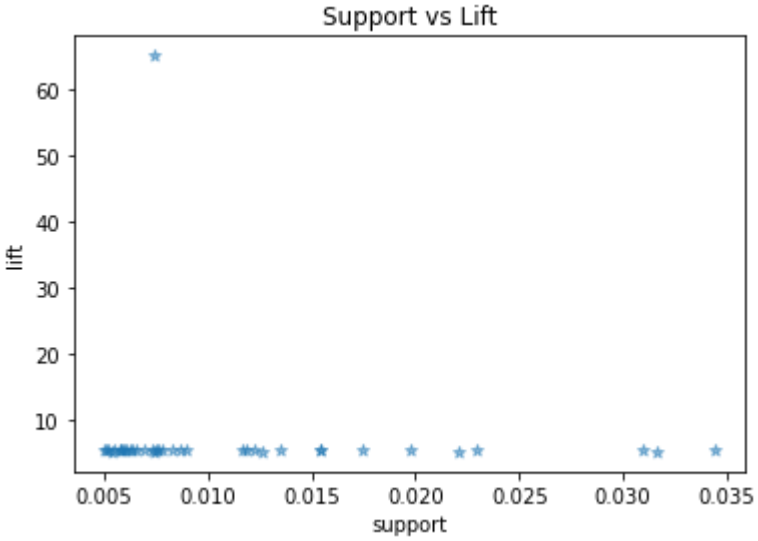
```
             rule  support  confidence    lift
    16011 => 16010    0.007       0.973  65.190
39, 48, 110 => 38    0.012       0.994   5.620
39, 41, 110 => 38    0.006       0.992   5.609
    39, 110 => 38    0.020       0.989   5.592
48, 170, 39 => 38    0.014       0.989   5.592
    371, 39 => 38    0.006       0.989   5.589
    48, 170 => 38    0.017       0.988   5.584
39, 48, 286 => 38    0.005       0.987   5.580
    105, 39 => 38    0.005       0.987   5.578
    32, 110 => 38    0.005       0.987   5.577
    170, 41 => 38    0.009       0.986   5.576
    48, 110 => 38    0.015       0.986   5.575
     48, 37 => 38    0.006       0.986   5.573
41, 170, 39 => 38    0.007       0.986   5.571
    32, 170 => 38    0.006       0.985   5.569
48, 170, 41 => 38    0.005       0.984   5.561
    41, 110 => 38    0.008       0.984   5.561
    48, 286 => 38    0.007       0.983   5.557
        371 => 38    0.009       0.981   5.544
    170, 39 => 38    0.023       0.981   5.543
        105 => 38    0.007       0.979   5.532
        170 => 38    0.034       0.978   5.529
        110 => 38    0.031       0.975   5.513
         37 => 38    0.012       0.974   5.505
        790 => 38    0.006       0.971   5.491
    39, 286 => 38    0.008       0.971   5.487
 36, 48, 39 => 38    0.012       0.968   5.471
     37, 39 => 38    0.008       0.967   5.469
 36, 41, 39 => 38    0.006       0.967   5.465
         56 => 38    0.006       0.961   5.431
     36, 48 => 38    0.015       0.960   5.429
     36, 41 => 38    0.008       0.959   5.419
     36, 32 => 38    0.005       0.955   5.401
     36, 39 => 38    0.022       0.955   5.398
        36 => 38    0.032       0.950   5.372
```

```
286 => 38     0.013        0.943    5.333
 55 => 38     0.007        0.933    5.275
```

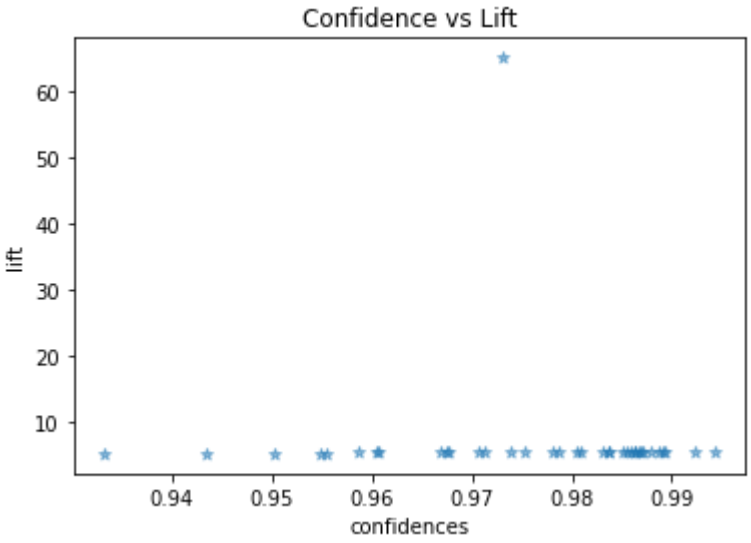
In [95]:
```
# Plots
plt.title("Confidence vs Support")
plt.scatter(supports, confidences, alpha=0.5, marker="*")
plt.xlabel('support')
plt.ylabel('confidence')
plt.show()
```



In [96]:
```
plt.title("Support vs Lift")
plt.scatter(supports, lifts, alpha=0.5, marker="*")
plt.xlabel('support')
plt.ylabel('lift')
plt.show()
```



In [97]:
```
plt.title("Confidence vs Lift")
plt.scatter(confidences, lifts, alpha=0.5, marker="*")
plt.xlabel('confidences')
plt.ylabel('lift')
plt.show()
```



2) Algoritmo Apriori from Efficient_Apriori

In [26]:
```
!pip install efficient_apriori
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: efficient_apriori in /home/iury/.local/lib/python3.
8/site-packages (2.0.0)
```

In [98]:
```
from efficient_apriori import apriori as efficient_apriori

# Initialize the apriori
itemsets, rules = efficient_apriori(transactions, min_support=0.005, min_confidence

# Print rules
for rule in reversed(sorted(rules, key=lambda rule: rule.lift)):
  print(rule)
```

```
{16011} -> {16010} (conf: 0.973, supp: 0.007, lift: 65.190, conv: 36.612)
{110, 39, 48} -> {38} (conf: 0.994, supp: 0.012, lift: 5.620, conv: 142.259)
{110, 39, 41} -> {38} (conf: 0.992, supp: 0.006, lift: 5.609, conv: 105.974)
{170, 39, 48} -> {38} (conf: 0.989, supp: 0.014, lift: 5.592, conv: 76.358)
{110, 39} -> {38} (conf: 0.989, supp: 0.020, lift: 5.592, conv: 76.202)
{371, 39} -> {38} (conf: 0.989, supp: 0.006, lift: 5.589, conv: 72.981)
{170, 48} -> {38} (conf: 0.988, supp: 0.017, lift: 5.584, conv: 67.451)
{286, 39, 48} -> {38} (conf: 0.987, supp: 0.005, lift: 5.580, conv: 63.653)
{105, 39} -> {38} (conf: 0.987, supp: 0.005, lift: 5.578, conv: 62.418)
{110, 32} -> {38} (conf: 0.987, supp: 0.005, lift: 5.577, conv: 61.595)
{170, 41} -> {38} (conf: 0.986, supp: 0.009, lift: 5.576, conv: 60.236)
{110, 48} -> {38} (conf: 0.986, supp: 0.015, lift: 5.575, conv: 59.783)
{37, 48} -> {38} (conf: 0.986, supp: 0.006, lift: 5.573, conv: 58.131)
{170, 39, 41} -> {38} (conf: 0.986, supp: 0.007, lift: 5.571, conv: 57.068)
{170, 32} -> {38} (conf: 0.985, supp: 0.006, lift: 5.569, conv: 55.559)
{110, 41} -> {38} (conf: 0.984, supp: 0.008, lift: 5.561, conv: 50.658)
{170, 41, 48} -> {38} (conf: 0.984, supp: 0.005, lift: 5.561, conv: 50.621)
{286, 48} -> {38} (conf: 0.983, supp: 0.007, lift: 5.557, conv: 48.645)
{371} -> {38} (conf: 0.981, supp: 0.009, lift: 5.544, conv: 42.911)
{170, 39} -> {38} (conf: 0.981, supp: 0.023, lift: 5.543, conv: 42.369)
{105} -> {38} (conf: 0.979, supp: 0.007, lift: 5.532, conv: 38.627)
{170} -> {38} (conf: 0.978, supp: 0.034, lift: 5.529, conv: 37.511)
{110} -> {38} (conf: 0.975, supp: 0.031, lift: 5.513, conv: 33.330)
{37} -> {38} (conf: 0.974, supp: 0.012, lift: 5.505, conv: 31.572)
{790} -> {38} (conf: 0.971, supp: 0.006, lift: 5.491, conv: 28.699)
```

{286, 39} -> {38} (conf: 0.971, supp: 0.008, lift: 5.487, conv: 28.060)
{36, 39, 48} -> {38} (conf: 0.968, supp: 0.012, lift: 5.471, conv: 25.516)
{37, 39} -> {38} (conf: 0.967, supp: 0.008, lift: 5.469, conv: 25.301)
{36, 39, 41} -> {38} (conf: 0.967, supp: 0.006, lift: 5.465, conv: 24.780)
{56} -> {38} (conf: 0.961, supp: 0.006, lift: 5.431, conv: 20.969)
{36, 48} -> {38} (conf: 0.960, supp: 0.015, lift: 5.429, conv: 20.813)
{36, 41} -> {38} (conf: 0.959, supp: 0.008, lift: 5.419, conv: 19.868)
{32, 36} -> {38} (conf: 0.955, supp: 0.005, lift: 5.401, conv: 18.482)
{36, 39} -> {38} (conf: 0.955, supp: 0.022, lift: 5.398, conv: 18.224)
{36} -> {38} (conf: 0.950, supp: 0.032, lift: 5.372, conv: 16.552)
{286} -> {38} (conf: 0.943, supp: 0.013, lift: 5.333, conv: 14.533)
{55} -> {38} (conf: 0.933, supp: 0.007, lift: 5.275, conv: 12.329)