

**TUGAS KONSEP APLIKASI DATA MAINING**  
**ASSOCIATION RULE (MENGHITUNG SUPPORT DAN CONFIDANCE)**  
**MENGGUNAKAN JUPYTER NETBOOK**



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**KEMENTRIAN RISET DAN TEKNOLOGI PENDIDIKAN TINGGI**  
**SEKOLAH TINGGI MANAJEMEN INFORMATIKA KOMPUTER**  
**PRADNYA PARAMITA**  
**MALANG**  
**2020**

Secara sederhana beberapa istilah yang akan sering di gunakan pada *Association Rule* ini adalah:

- **Support** adalah indikasi seberapa sering itemset muncul di dataset.
- **Confidence** adalah indikasi seberapa sering aturan itu terbukti benar.
- **Lift Ratio** adalah rasio dari nilai pengamatan *Support* , diharapkan jika dua aturan itu independen

1. Yang pertama adalah melakukan import library, yang pertama adalah pandas nanti di sebut sebagai pd, matplotlib.pyplot nanti di sebut sebagai plt, Kemudian mlxtend melakukan import fungsi apriori dan association\_rules

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from apyori import apriori
```

2. Pertama-tama adalah membaca file excel menggunakan library pandas. Dimana nama file excel yang di gunakan adalah 'data.xls' file ini di simpan 1 folder dengan lokasi script yang sedang kita jalankan, jika sudah berhasil maka akan muncul head tabel dari data tersebut.

```
df = pd.read_excel('data.xls')
```

```
df.head()
```

Dengan output :

|   | Barang 1 | Barang 2 | Barang 3 | Barang 4 | Barang 5 | Barang 6 |
|---|----------|----------|----------|----------|----------|----------|
| 0 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |
| 1 | Wine     | NaN      | Bread    | Butter   | Milk     | NaN      |
| 2 | NaN      | NaN      | Bread    | Butter   | Milk     | NaN      |
| 3 | NaN      | Chips    | NaN      | NaN      | NaN      | Apple    |
| 4 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |

3. Selanjutnya yaitu menghapus Header yang ada. Dengan script berikut ini :

```
: df = pd.read_excel('data.xls', header = None)
df.head()
```

Dengan output :

|   | 0        | 1        | 2        | 3        | 4        | 5        |
|---|----------|----------|----------|----------|----------|----------|
| 0 | Barang 1 | Barang 2 | Barang 3 | Barang 4 | Barang 5 | Barang 6 |
| 1 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |
| 2 | Wine     | NaN      | Bread    | Butter   | Milk     | NaN      |
| 3 | NaN      | NaN      | Bread    | Butter   | Milk     | NaN      |
| 4 | NaN      | Chips    | NaN      | NaN      | NaN      | Apple    |

4. Selanjutnya, Library Apriori yang akan kita gunakan membutuhkan dataset dalam bentuk list di dalam list, di mana seluruh dataset adalah daftar besar dan setiap transaksi dalam dataset adalah List dalam di dalam List yang besar luar. Saat ini kami memiliki dataset dalam bentuk dataset pandas. Untuk mengonversi dataset dalam pandas kami ke List di dalam list, jalankan skrip berikut:

```
records = []
for i in range(0, 22):
    records.append([str(df.values[i,j]) for j in range(0, 6)])
```

5. Langkah selanjutnya adalah menerapkan algoritma Apriori pada dataset. Untuk melakukannya, kita bisa menggunakan kelas apriori yang kita impor dari perpustakaan apyori. Jalankan skrip berikut :

```
association_rules = apriori(records, min_support=0.10, min_confidence=0.7, min_lift=1.2, min_length=2)
association_results = list(association_rules)
```

6. Pertama mari kita temukan jumlah total aturan yang diexecute oleh Library apriori. Jalankan skrip berikut:

```
print(len(association_results))

24
```

7. Selanjutnya mari menampilkan item pertama di association\_rules untuk melihat apa aturan pertama. Jalankan skrip berikut:

```
association_results[0]
```

Dengan output:

```
RelationRecord(items=frozenset({'Apple', 'Bread', 'Wine'}), support=0.45454545454545453,
ordered_statistics=[OrderedStatistic(items_base=frozenset({'Apple', 'Wine'}), items_add=frozenset({'Bread'}), confidence=0.9090909090909091, lift=1.25)])
```

8. Script untuk menampilkan support, confidence, dan lift, maka jalankan script dibawah ini:

```
results = []
for item in association_results:
    pair = item[0]
    items = [x for x in pair]

    value0 = str(items[0])
    value1 = str(items[1])
    value2 = str(item[1])[:6]
    value3 = str(item[2][0][2])[:6]
    value4 = str(item[2][0][3])[:6]

    rows = (value0, value1, value2, value3, value4)

    results.append(rows)

label = ['title1'], ['title2'], ['support'], ['confidence'], ['lift']

store_suggestion = pd.DataFrame.from_records(results, columns=label)

print(store_suggestion)
```

Dengan output :

|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
|---|-----------|-----------|------------|---------------|---------|
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2 | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2 | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3 | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2 | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3 | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4 | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2 | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3 | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4 | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5 | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
|   | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0 | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1 | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2 | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3 | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4 | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |

|    |           |           |            |               |         |
|----|-----------|-----------|------------|---------------|---------|
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |

|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
|----|-----------|-----------|------------|---------------|---------|
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |

|    |           |           |            |               |         |
|----|-----------|-----------|------------|---------------|---------|
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |

|    |           |           |            |               |         |
|----|-----------|-----------|------------|---------------|---------|
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |



|    |           |           |            |               |         |
|----|-----------|-----------|------------|---------------|---------|
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine      | Apple     | 0.0909     | 1.0           | 1.375   |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |

|    |           |           |            |               |         |
|----|-----------|-----------|------------|---------------|---------|
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine      | Apple     | 0.0909     | 1.0           | 1.375   |
| 23 | Milk      | Wine      | 0.2727     | 0.6           | 1.32    |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine      | Apple     | 0.0909     | 1.0           | 1.375   |
| 23 | Milk      | Wine      | 0.2727     | 0.6           | 1.32    |
| 24 | Wine      | Butter    | 0.1363     | 1.0           | 1.375   |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine      | Apple     | 0.0909     | 1.0           | 1.375   |
| 23 | Milk      | Wine      | 0.2727     | 0.6           | 1.32    |

|    |            |            |            |               |         |
|----|------------|------------|------------|---------------|---------|
| 24 | Wine       | Butter     | 0.1363     | 1.0           | 1.375   |
| 25 | Milk       | Wine       | 0.2272     | 0.7142        | 1.2087  |
|    | (tittle1,) | (tittle2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread      | Wine       | 0.4545     | 0.625         | 1.25    |
| 1  | Butter     | Milk       | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips      | Butter     | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter     | Bread      | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter     | Bread      | 0.4545     | 0.625         | 1.25    |
| 5  | Chips      | Butter     | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter     | Bread      | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips      | Bread      | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips      | Bread      | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine       | Bread      | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips      | Butter     | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips      | Butter     | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine       | Butter     | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips      | Butter     | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips      | Butter     | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan        | Chips      | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter     | Bread      | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips      | Bread      | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk       | Butter     | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine       | Butter     | 0.2272     | 0.5           | 1.375   |
| 20 | Wine       | Milk       | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine       | Milk       | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine       | Apple      | 0.0909     | 1.0           | 1.375   |
| 23 | Milk       | Wine       | 0.2727     | 0.6           | 1.32    |
| 24 | Wine       | Butter     | 0.1363     | 1.0           | 1.375   |
| 25 | Milk       | Wine       | 0.2272     | 0.7142        | 1.2087  |
| 26 | Milk       | Wine       | 0.1818     | 0.5           | 1.375   |
|    | (tittle1,) | (tittle2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread      | Wine       | 0.4545     | 0.625         | 1.25    |
| 1  | Butter     | Milk       | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips      | Butter     | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter     | Bread      | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter     | Bread      | 0.4545     | 0.625         | 1.25    |
| 5  | Chips      | Butter     | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter     | Bread      | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips      | Bread      | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips      | Bread      | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine       | Bread      | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips      | Butter     | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips      | Butter     | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine       | Butter     | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips      | Butter     | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips      | Butter     | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan        | Chips      | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter     | Bread      | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips      | Bread      | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk       | Butter     | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine       | Butter     | 0.2272     | 0.5           | 1.375   |
| 20 | Wine       | Milk       | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine       | Milk       | 0.2272     | 0.5           | 1.2222  |
| 22 | Wine       | Apple      | 0.0909     | 1.0           | 1.375   |
| 23 | Milk       | Wine       | 0.2727     | 0.6           | 1.32    |
| 24 | Wine       | Butter     | 0.1363     | 1.0           | 1.375   |
| 25 | Milk       | Wine       | 0.2272     | 0.7142        | 1.2087  |

|    |      |      |        |     |       |
|----|------|------|--------|-----|-------|
| 26 | Milk | Wine | 0.1818 | 0.5 | 1.375 |
| 27 | Milk | Wine | 0.0909 | 1.0 | 1.375 |

9. Selanjutnya jalankan script berikut ini untuk menampilkan kesimpulan

```
store_suggestion.describe()
```

Dengan Output :

|        | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
|--------|-----------|-----------|------------|---------------|---------|
| count  | 28        | 28        | 28         | 28            | 28      |
| unique | 6         | 6         | 10         | 13            | 13      |
| top    | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| freq   | 9         | 10        | 6          | 6             | 6       |

10. Selanjutnya meneksport hasilnya ke bentuk excel dengan menggunakan script berikut ini :

```
store_suggestion.to_excel('C:/Users/Aminurachma Aisyah/outputs.xls')
```

### Kesimpulan

Algoritma Association rule mining seperti Apriori sangat berguna untuk menemukan asosiasi sederhana. Mereka mudah diimplementasikan dan memiliki kemampuan menjelaskan yang tinggi. Pada tugas ini saya mencoba ( min\_support=0.09, min\_confidence=0.5, min\_lift=1.2, min\_length=2 ) dan mendapatkan 28 list dan yang tertinggi adalah Chips biasanya terbeli bersamaan dengan Butter dengan Support 0,3181 dan Confidence 0,5.