**In-Class Activity: Computing Confidence, Support, and Lift**

Here are the baskets from eight shoppers:

|  |  |
| --- | --- |
| **Basket** | **Items** |
| 1 | Coke, Pop-Tarts, Donuts  |
| 2 | Cheerios, Coke, Donuts, Napkins |
| 3 | Waffles, Cheerios, Coke, Napkins |
| 4 | Bread, Milk, Coke, Napkins |
| 5 | Coffee, Bread, Waffles |
| 6 | Coke, Bread, Pop-Tarts |
| 7 | Milk, Waffles, Pop-Tarts |
| 8 | Coke, Pop-Tarts, Donuts, Napkins |

Compute the support, confidence, and lift for the following rules:

|  |  |  |  |
| --- | --- | --- | --- |
| **Rule** | **Support** | **Confidence** | **Lift** |
| 1 | {Coke, Pop-Tarts} 🡪{Donuts} | **2/8 = 0.25** | **0.25/0.375 = 0.67** | $$\frac{0.25}{0.375\*0.375}=1.78$$ |
| 2 | {Coke} 🡪 {Pop-Tarts, Donuts} | **2/8 = 0.25** | **0.25/0.75 = 0.33** | $$\frac{0.25}{0.75\*0.25}=1.33$$ |
| 3 | {Coffee} 🡪 {Bread, Waffles} | **1/8 = 0.125** | **0.125/0.125 = 1.00** | $$\frac{0.125}{0.125\*0.125}=8.0$$ |
| 4 | {Coke} 🡪 {Donuts} | **3/8 = 0.375** | **0.375/0.75 = 0.50** | $$\frac{0.375}{0.75\*0.375}=1.33$$ |

1. Which rule has the strongest association? How do you know?

**Rule 3: {Coffee} 🡪 {Bread, Waffles}
It has the highest lift (8.0) and the highest confidence (1.00).**

1. Consider a customer who is walking through the store with only a bottle of coke in their shopping cart. You then see them put pop-tarts in their cart. Do you become more or less sure than you were before that they will buy donuts? Explain.

**You become more sure because the lift value goes up.
{Coke} 🡪 {Donuts} has a lift of 1.33
{Coke, Pop-Tarts} 🡪 {Donuts} has a lift of 1.78**

***Computing lift based on aggregate purchase numbers***

1. Consider two products, the Squishee and the Peanut Butter Bowl. Here’s a profile of 18,500 customers:

|  |  |  |
| --- | --- | --- |
|  | Squishee |  |
| Peanut Butter Bowl |  | No | Yes |  |
| No | 10000 | 2000 |  |
| Yes | 1500 | 5000 |  |
|  |  |  |  | 18500 |

What is the lift for the rule {Peanut Butter Bowl} 🡪 {Squishee}?
(Are people who bought a Peanut Butter Bowl more likely than chance to buy a Squishee too?)

**Support(Peanut Butter Bowl, Squishee) = 5000/18500 = 0.270
Support(Peanut Butter Bowl) = 6500/18500 = 0.351
Support(Squishee) = 7000/18500 = 0.378**

$$Lift= \frac{s(Peanut Butter Bowl, Squishee)}{s\left(Peanut Butter Bowl\right)\*s(Squishee)}=\frac{0.27}{0.351\*0.378}=2.03$$

**So these products are strongly associated – they appear in the same basket more often than what you’d expect by chance (i.e., Lift > 1). If a customer buys a Peanut Butter Bowl, they are likely to also buy a Squishee.**

*The numbers may be off very slightly due to rounding.*

1. Consider two products, Potato Chips and Krusty-O’s. Here’s a profile of 10,500 customers:

|  |  |  |
| --- | --- | --- |
|  | Krusty-O’s |  |
| Potato Chips |  | No | Yes |  |
| No | 5000 | 1000 |  |
| Yes | 4000 | 500 |  |
|  |  |  |  | 10500 |

What is the lift for the rule {Potato Chips} 🡪 {Krusty-O’s}?
(Are people who bought Potato Chips more likely than chance to buy Krusty-O’s too?)

**Support(Potato Chips, Krusty-O’s) = 500/10500 = 0.048
Support(Potato Chips) = 4500/10500 = 0.429
Support(Krusty-O’s) = 1500/10500 = 0.143**

$$Lift= \frac{s(Potato Chips, KrustyOs)}{s\left(Potato Chips\right)\*s(KrustyOs)}=\frac{0.048}{0.429\*0.143}=0.782$$

**So these products have a negative association – they appear in the same basket less often than what you’d expect by chance (i.e., Lift < 1). If a customer buys Potato Chips, they are unlikely to also buy Krusty-O’s.**

***The numbers may be off very slightly due to rounding.***