MSPA 400: Session 4 Python

Reading

Think Python 2nd Edition Chapter 5 (5.1-5.12)

Think Python 3rd Edition Chapter 5 (pages 49-57)

Module 1

(Session 4 Module 1.py)

Objectives:

1. Demonstrate set operations and show their potential for data manipulation.
   (Review the Canopy Doc Manager to learn more about Matplotlib.)

Output from Module 1.py:

    Union of A and B = set([1, 2, 4, 5, 7, 9, 11])
    Intersection of A and B = set([2, 4, 5, 7])

    A complement = set([3, 6, 8, 9, 10, 11])
    B complement = set([8, 1, 10, 3, 6])

    Symmetric difference of A and B = set([1, 9, 11])
    Symmetric difference by union and intersection = set([1, 11, 9])
    Union of Ac, Bc and AB set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11])
    Original set U was set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11])
    Updated version of U = set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14])

    Original version of U = set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11])

    U is now a list. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]

Exercise:

1. Duplicate Examples 6 and 7 from Lial Section 7.1. Compare your code to
   the answers.

Module 2

(Session 4 Module 2.py)

Objectives:

1. Extend set operations presented in Module 1. Probability rules are applied to sets. The rules
   are presented in Lial Sections 7.2-7.6.

MSPA 400: Session 4 Python

Output from Module 2.py

> The universe U is set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26])
>
> A is set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13])
> B is set([14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26])
> C is set([8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20])
>
> Probability of null intersection 0.0
>
> Intersection of A and C is set([8, 9, 10, 11, 12, 13])
>
> Union of A and C set([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20])
>
> Probability of A union C = 0.769
>
> Result of Union Rule Summation = 0.769
>
> Complement of C is set([1, 2, 3, 4, 5, 6, 7, 21, 22, 23, 24, 25, 26])
>
> Odds of C are 1.0
>
> Complement of A intersection C is set([1, 2, 3, 4, 5, 6, 7, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26])
>
> Odds of A intersection C are 0.3
>
> Conditional probability of A given C is 0.462
> Probability of A and C intersection is 0.231
> Probability of C is 0.5
> Product rule result for A and C intersection is 0.231

Exercise:

1. Refer to Section 7.6 of Lial. Using the sets defined above and set operations, apply Bayes' Theorem. Calculate the conditional probability of A given C, and the probability of C given A.