Metodo de la Trasformada Inversa

Curso: Temas Selectos I: O25 LAT4032 1
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Índice

Overview 2

Distribución Uniforme (a, b) 3

Distribución Discreta 4

a) 4

b) 4

Overview

This document is a minimal example using EB Garamond for prose and libertinust1math for formulas. Links lik are active.

[1]:
```
import math
import random
from collections import Counter

import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
color = sns.color_palette("muted")
np.random.shuffle(color)
sns.set(style="whitegrid", context="paper", palette=color)
sns.color_palette()
```

[2]:
```
[(0.5843137254901961, 0.4235294117647059, 0.7058823529411765),
 (0.5490196078431373, 0.3803921568627451, 0.23529411764705882),
 (0.8627450980392157, 0.49411764705882355, 0.7529411764705882),
 (0.2823529411764706, 0.47058823529411764, 0.8156862745098039),
 (0.41568627450980394, 0.8, 0.39215686274509803),
 (0.4745098039215686, 0.4745098039215686, 0.4745098039215686),
 (0.8392156862745098, 0.37254901960784315, 0.37254901960784315),
 (0.9333333333333333, 0.5215686274509804, 0.2901960784313726),
 (0.8352941176470589, 0.7333333333333333, 0.403921568627451),
 (0.5098039215686274, 0.7764705882352941, 0.8862745098039215)]
```

Distribución Uniforme (a, b)

Sea $U \sim \text{Unif}(0, 1)$. Si $X \sim \text{Unif}(a, b)$, entonces su funcion de distribucion acumulada es:

$$F_X(x) = \frac{x-a}{b-a}\,\mathbf{1}_{[a,b]}(x) + \mathbf{1}_{(b,\infty)}(x)$$

Encontrando la inversa:

$$\begin{aligned} F_X(x) = u \quad &\iff \quad \frac{x-a}{b-a} = u, \\ &\iff \quad x - a = (b-a)\,u, \\ &\iff \quad x = a + (b-a)\,u. \end{aligned}$$

Entonces:

$$F_X^{-1}(u) = a + (b-a)\,u.$$

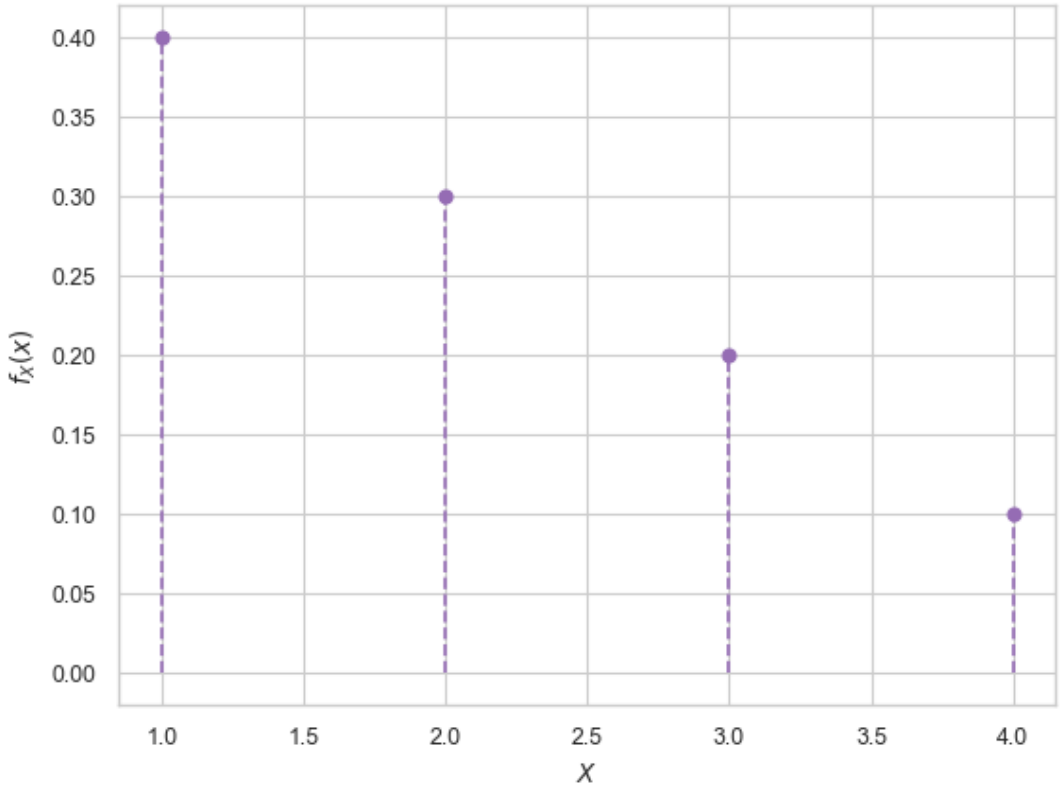
Distribución Discreta

a)

$$f_X(x) = \mathbb{P}(X = x) = \begin{cases} 0.4, & x = 1, \\ 0.3, & x = 2, \\ 0.2, & x = 3, \\ 0.1, & x = 4, \\ 0, & \text{en otro caso} \end{cases}$$

[3]:
```
x_vals = [1, 2, 3, 4]
pmf = [0.4, 0.3, 0.2, 0.1]

plt.vlines(x_vals, 0, pmf, linestyles='--')
plt.plot(x_vals, pmf, 'o')
plt.xlabel('$X$')
plt.ylabel('$f_X(x)$')
plt.show()
```



b)

$$F_X(x) = \mathbb{P}(X \text{ w } x) = \begin{cases} 0, & x < 1, \\ 0.4, & 1 \text{ w } x < 2, \\ 0.7, & 2 \text{ w } x < 3, \\ 0.9, & 3 \text{ w } x < 4, \\ 1, & x \text{ x } 4. \end{cases}$$