

Task1:以下三图按 x=189 x=190 x=188 的顺序排列:

```
Group 1: Average: 0.4944909127160056 Median: 0.4861554876393145 Range: 0.9753982635
630447 Variance: 0.07876226304260087 Standard Deviation: 0.2806461527308024 Mode: M
odeResult(mode=0.023124927641925974, count=1)
Group 2: Average: 0.43494279411767023 Median: 0.4042139027492764 Range: 0.956455955
0305278 Variance: 0.07235643635303492 Standard Deviation: 0.2689915172510741 Mode:
ModeResult(mode=0.00041707642030719416, count=1)
Group 3: Average: 0.5334735284580776 Median: 0.5710675092990358 Range: 0.9896902725
064864 Variance: 0.09259490796337488 Standard Deviation: 0.3042941142437278 Mode: M
odeResult(mode=0.004386441745833913, count=1)
Covariance: [[ 0.07955784 -0.00687978]
[-0.00687978 0.07308731]]
Correlation Coefficient: [[ 1. -0.09022186]
[-0.09022186 1. ]]

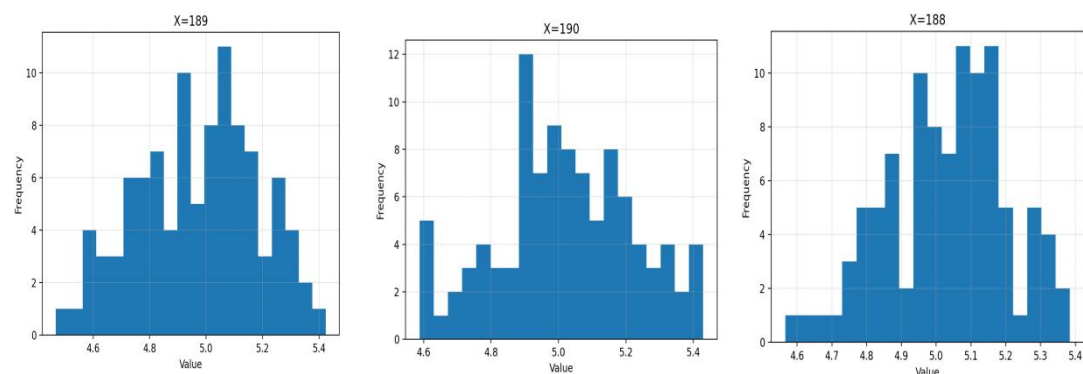
Group 1: Average: 0.5044285798182995 Median: 0.5120554040730505 Range: 0.9816535679
770977 Variance: 0.082405117671562 Standard Deviation: 0.28706291587657573 Mode: Mo
deResult(mode=0.0010336922578804142, count=1)
Group 2: Average: 0.4522067367551113 Median: 0.477506303402746 Range: 0.98768266452
50478 Variance: 0.07318055230226315 Standard Deviation: 0.27051904240231067 Mode: M
odeResult(mode=0.011603958660413416, count=1)
Group 3: Average: 0.49158422259985957 Median: 0.5013199547168734 Range: 0.983797622
8809425 Variance: 0.08510400644357072 Standard Deviation: 0.29172590979131546 Mode:
ModeResult(mode=0.006533597863333518, count=1)
Covariance: [[ 0.08323749 -0.01096577]
[-0.01096577 0.07391975]]
Correlation Coefficient: [[ 1. -0.13979755]
[-0.13979755 1. ]]

Group 1: Average: 0.5114987832701412 Median: 0.5486614091247399 Range: 0.9870740319
177835 Variance: 0.09075765966694518 Standard Deviation: 0.30126011960919286 Mode:
ModeResult(mode=0.0012334984470510069, count=1)
Group 2: Average: 0.5028839720966988 Median: 0.4868834035337539 Range: 0.9836020586
384021 Variance: 0.08856898800812955 Standard Deviation: 0.2976054233513387 Mode: M
odeResult(mode=0.009264188132301232, count=1)
Group 3: Average: 0.4729432027051589 Median: 0.4122013083340217 Range: 0.9737901851
252051 Variance: 0.09274269578858398 Standard Deviation: 0.3045368545653941 Mode: M
odeResult(mode=0.006900517832863717, count=1)
Covariance: [[ 0.0916744 -0.01639818]
[-0.01639818 0.08946362]]
Correlation Coefficient: [[ 1. -0.18107075]
[-0.18107075 1. ]]
```

其中最后的 Covariance 和 Correlation Coefficient 矩阵中的[1,2](或[2,1])分别是协方差和关系数。

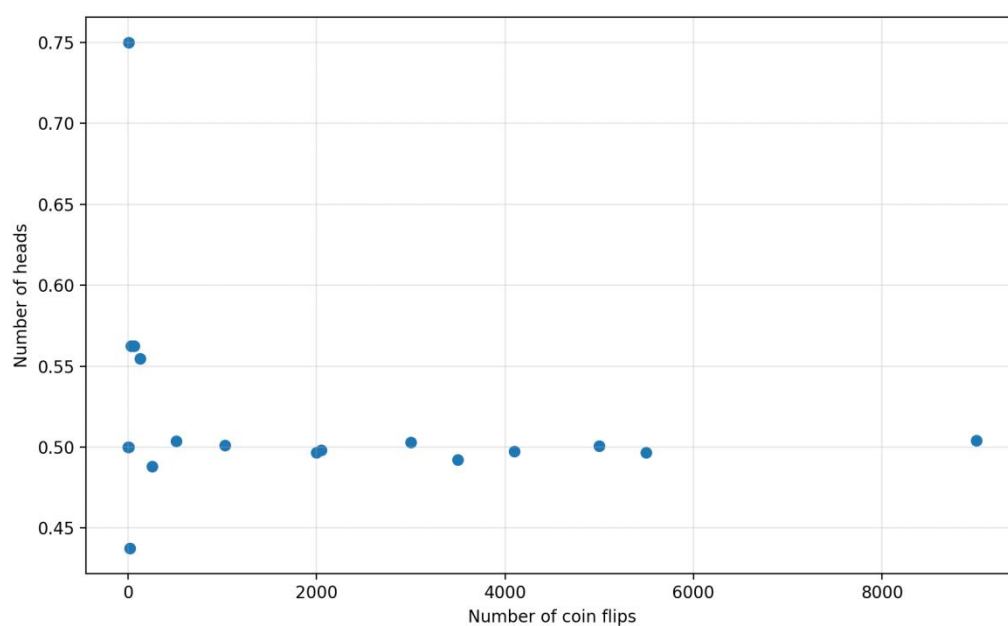
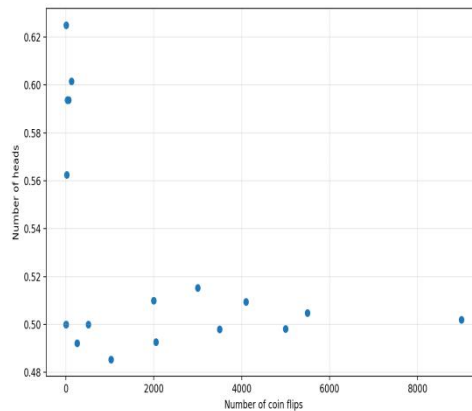
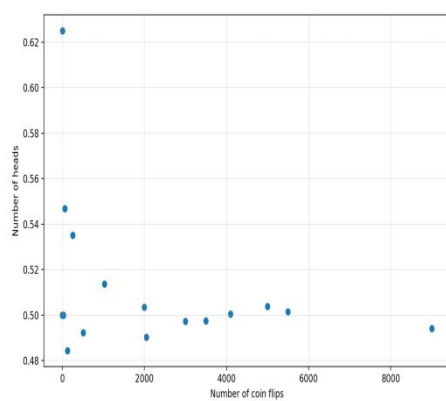
Task2:

代码非常简单, 根据 vscode 的提示, 我发现了 xlable 和 ylable 还有 grid 等函数的用法, 更加具体的了解了引用 matplotlib 来绘制直方图的步骤, 三组 seed 的直方图见下方:



1. 在这个过程中我发现了几个问题: 1.当我在 x/ylable 中输入中文时, 最后生成的图片的中文变成框框了, copilot 回答说可以通过导入中文字体, 并设置默认字体为支持中文字体来解决。
2. 到底生成柱是向上取整还是向下取整, 经过实验, 我发现: 应该是向下取整, 但是如果到了数据集的上界, 最后一个柱会向上取整。

Task3:三图按 189 190 188 的顺序排列



感悟：随着抛掷次数（ n ）的增加，实验中出现正面的比例会越来越接近理论概率 0.5 ，这就是为什么当 n 很大时，散点图中的点会更加集中在 0.5 附近，而当 n 较小时，结果会有较大的波动。这反映了大数定理所描述的：随机事件的频率会随着试验次数的增加而趋近于事件的理论概率。