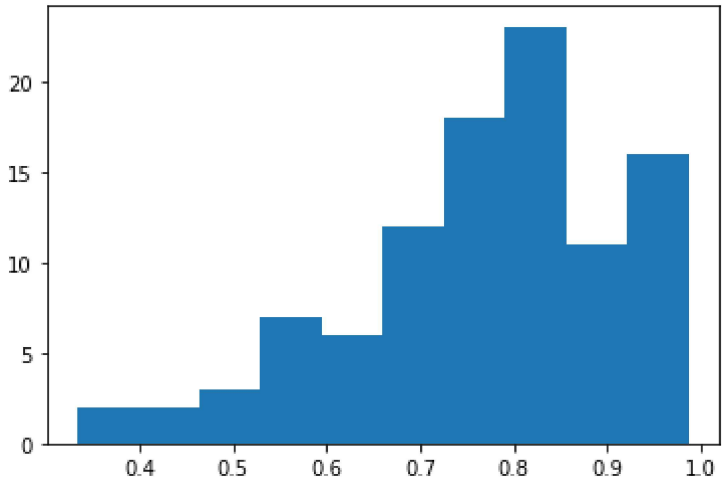
In [14]:

```
import pandas as pd
import numpy as np

h = [576, 635, 558, 578, 666, 580, 555, 661, 651, 605, 653, 575, 545, 572, 593]
w = [3.39, 3.30, 2.81, 3.03, 3.44, 3.07, 3.00, 3.43, 3.36, 3.13, 3.12, 2.74, 2.76, 2.88, 2.96]


def bootstrap(h,w, n):
    rd = list(n * np.random.rand(n))
    index = []
    xb = []
    for a in rd:
        index.append(int(a))
        xh = np.array(h)[index]
        xw =np.array(w)[index]
    return xh,xw


Nr = 100
corr_Nr = []
n = len(h)
for i in range(Nr):
    xh,xw = bootstrap(h,w,n)
    corr_Nr_i = np.corrcoef(xh, xw)[1][0]
    corr_Nr.append(corr_Nr_i)
seb = np.std(corr_Nr)
print("bootstrap estimate of standard error for the correlation co-efficient is:",seb)

from matplotlib import pyplot as plt
plt.hist(corr_Nr)
```

```
bootstrap estimate of standard error for the correlation co-efficient is: 0.14152372
591465334
```

Out[14]:

```
(array([ 2.,  2.,  3.,  7.,  6., 12., 18., 23., 11., 16.]),
 array([0.3339443 , 0.39914527, 0.46434624, 0.5295472 , 0.59474817,
        0.65994914, 0.72515011, 0.79035108, 0.85555205, 0.92075301,
        0.98595398]),
 <a list of 10 Patch objects>)
```



由于是自助抽样原因，每次自助抽样产生的相关系数组估计标准误都不同，但与书上的值（Table6.1）接近，且直方图与Figure6.2相似