**Problem 4 - Bloom Filter**

**Bloom Filter Implementation**

**False positive = 14.693500387660418 %**

**Graphical user interface, text, application, email

Description automatically generated**

**Table to find optimal k:**

|  |  |  |  |
| --- | --- | --- | --- |
| **n/m** | **k** | **e^(-km/n)** | **FPR = (1 – e^(-km/n))^k** |
| 2 | 1 | 0.60653066 | 0.39346934 |
| 2 | 2 | 0.36787944 | 0.399576401 |
| 2 | 3 | 0.22313016 | 0.468861728 |
| 2 | 4 | 0.13533528 | 0.558973154 |
| 2 | 5 | 0.082085 | 0.651646906 |
| 2 | 6 | 0.04978707 | 0.736081019 |
| 2 | 7 | 0.03019738 | 0.806832643 |
| 2 | 8 | 0.01831564 | 0.86253153 |
| 2 | 9 | 0.011109 | 0.904348521 |
| 2 | 10 | 0.00673795 | 0.934627248 |
| 4 | 1 | 0.77880078 | 0.221199217 |
| 4 | 2 | 0.60653066 | 0.154818122 |
| **4** | **3** | **0.47236655** | **0.146891598** |
| 4 | 4 | 0.36787944 | 0.1596613 |
| 4 | 5 | 0.2865048 | 0.184907824 |
| 4 | 6 | 0.22313016 | 0.21983132 |
| 4 | 7 | 0.17377394 | 0.262840455 |
| 4 | 8 | 0.13533528 | 0.312450987 |
| 4 | 9 | 0.10539922 | 0.366997776 |
| 4 | 10 | 0.082085 | 0.42464369 |
| 8 | 1 | 0.8824969 | 0.117503097 |
| 8 | 2 | 0.77880078 | 0.048929094 |
| 8 | 3 | 0.68728928 | 0.030579354 |
| 8 | 4 | 0.60653066 | 0.023968651 |
| 8 | 5 | 0.53526143 | 0.021679217 |
| 8 | 6 | 0.47236655 | 0.021577141 |
| 8 | 7 | 0.41686202 | 0.022929749 |
| 8 | 8 | 0.36787944 | 0.025491731 |
| 8 | 9 | 0.32465247 | 0.029224417 |
| 8 | 10 | 0.2865048 | 0.034190903 |
| 16 | 1 | 0.93941306 | 0.060586937 |
| 16 | 2 | 0.8824969 | 0.013806978 |
| 16 | 3 | 0.82902912 | 0.004997657 |
| 16 | 4 | 0.77880078 | 0.002394056 |
| 16 | 5 | 0.73161563 | 0.001392471 |
| 16 | 6 | 0.68728928 | 0.000935097 |
| 16 | 7 | 0.64564853 | 0.000701519 |
| 16 | 8 | 0.60653066 | 0.000574496 |
| 16 | 9 | 0.56978282 | 0.000504882 |
| 16 | 10 | 0.53526143 | 0.000469988 |