

Quiz 8. Performance of a single classifier

Classifier is evaluated on a test dataset of size $N=1000$ records. It predicted the correct class for 800 records. What is the interval for this classifier's accuracy on the real dataset for the confidence level 90%?

1. Compute mean $m=p=800/1000=0.8$

2. Compute variance of a sample:

$$s^2=(800*(1-0.8)^2+200*(0-0.8)^2)/(1000-1)=0.16$$

3. Estimate standard deviation of a real distribution:

$$\sigma=\text{sqrt}(s^2)=0.4$$

4. Find z-value for cumulative probability: $0.90/2+0.50=0.95$: $z=1.64$

5. Interval with 90% confidence:

$$\mu=m \pm z * \sigma/\text{sqrt}(N)=0.8 \pm 1.64 * 0.4/\text{sqrt}(1000)=0.8 \pm 0.02$$

or

$$[0.8-0.02, 0.8+0.02]$$

$$[0.78, 0.82]$$

Answer: the performance of this classifier is between 78% and 82% with 90% confidence.

How we can make this interval narrower without decreasing the confidence level?

We need to increase sample size N , because we cannot change z (the same confidence level)

$$\mu=m \pm z * \sigma/\text{sqrt}(N)$$

Z-table

| z | 0.0 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0.0 | .500 | .504 | .508 | .512 | .516 | .520 | .524 | .528 | .532 | .536 |
| 0.1 | .540 | .544 | .548 | .552 | .556 | .560 | .564 | .568 | .571 | .575 |
| 0.2 | .580 | .583 | .587 | .591 | .595 | .599 | .603 | .606 | .610 | .614 |
| 0.3 | .618 | .622 | .626 | .630 | .633 | .637 | .641 | .644 | .648 | .652 |
| 0.4 | .655 | .659 | .663 | .666 | .670 | .674 | .677 | .681 | .684 | .688 |
| 0.5 | .692 | .695 | .699 | .702 | .705 | .709 | .712 | .716 | .719 | .722 |
| 0.6 | .726 | .729 | .732 | .736 | .740 | .742 | .745 | .749 | .752 | .755 |
| 0.7 | .758 | .761 | .764 | .767 | .770 | .773 | .776 | .779 | .782 | .785 |
| 0.8 | .788 | .791 | .794 | .797 | .800 | .802 | .805 | .808 | .811 | .813 |
| 0.9 | .816 | .819 | .821 | .824 | .826 | .829 | .832 | .834 | .837 | .839 |
| 1.0 | .841 | .844 | .846 | .849 | .851 | .853 | .855 | .858 | .850 | .862 |
| 1.1 | .864 | .867 | .869 | .871 | .873 | .875 | .877 | .879 | .881 | .883 |
| 1.2 | .885 | .887 | .889 | .891 | .893 | .894 | .896 | .898 | .900 | .902 |
| 1.3 | .903 | .905 | .907 | .908 | .910 | .912 | .913 | .915 | .916 | .918 |
| 1.4 | .919 | .921 | .922 | .924 | .925 | .927 | .928 | .929 | .931 | .932 |
| 1.5 | .933 | .935 | .936 | .937 | .938 | .939 | .941 | .942 | .943 | .944 |
| 1.6 | .945 | .946 | .947 | .948 | .950 | .951 | .952 | .953 | .954 | .955 |
| 1.7 | .955 | .956 | .957 | .958 | .959 | .960 | .961 | .962 | .963 | .963 |
| 1.8 | .964 | .965 | .966 | .966 | .967 | .968 | .969 | .969 | .970 | .971 |