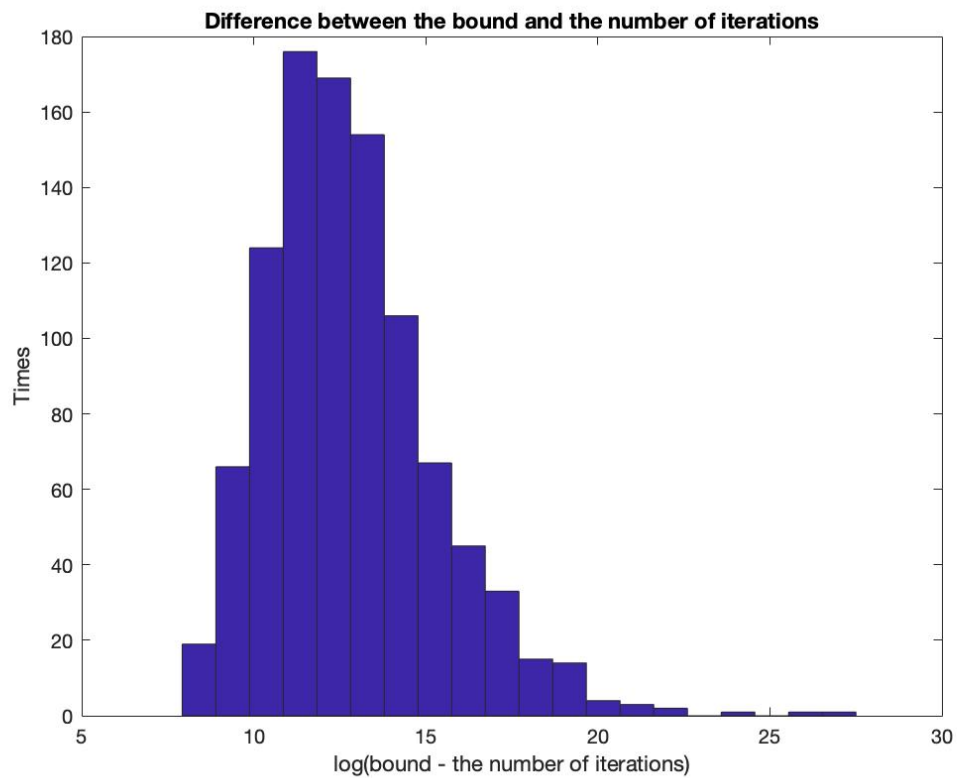
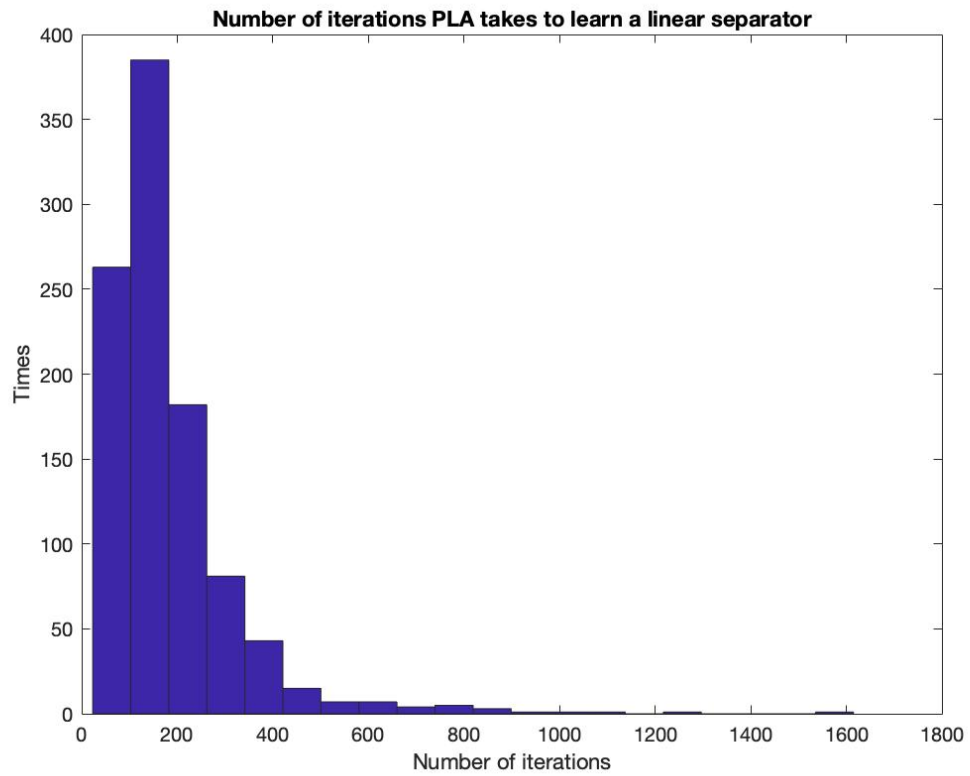


## Perceptron Learning Algorithm MATLAB implementation



As illustrated in the first graph, in most of the times (around 65% in 1000 runs), PLA converges under 200 iterations. Around 30% of the runs converge in between 200 to 400 iterations. Only less than 5% runs converge after 400 iterations. Therefore, we can conclude that most of the time PLA actually converges very quickly. Only in some small number of cases, PLA will converge relatively slowly, using more than 400 iterations.

As illustrated in the second graph, if we take a natural log of the difference between the theoretical bound and the number of actual iterations, in most of the times (around 70% in 1000 runs), the natural log is in between 10 to 15. Only in less than 10% runs, the natural log is less than 10 (i.e.  $8 \sim 10$ ). Around 15% times, the natural log falls in  $15 \sim 20$ . Only in less than 5% runs, the natural log is greater than 20. The distribution is drawn above. From that, we can conclude that the actual times of iteration is actually much smaller than the theoretical bound. In other words, the theoretical bound is a very loose bound. Mostly, the natural log of the difference between the theoretical bound and the number of actual iterations falls into 10 to 15.