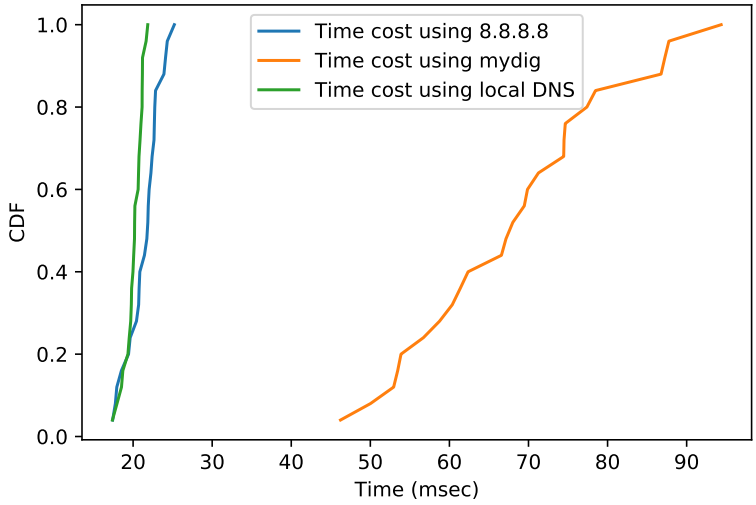

Figure 1: DNS resolution time

This figure shows the CDF of DNS resolution time for Experiment 1 (mydig), Expeiment 2 (local DNS server) and Expeiment 3 ("8.8.8.8"). The local DNS server is "114.114.114.114". It is a public DNS server located in Nanjing, Jiangsu Province operated by China Telecom. The python script run for the experiment is "C.ipynb". I find an interesting thing that DNS resolution is much faster when the program is run in jupyter notebook environment compared with pycharm or other IDEs. According to the figure, "mydig" has the worst performance. The best case costs at least 46 milliseconds and the slowest resolution costs about 95 miliseconds. In comparison, "8.8.8.8" and "114.114.114.114" response the query within 25 milisecons.

In fact, "mydig" has an acceptable performance. This program starts multiple threads to query all DNS servers in a list simultaneously rather than waiting for a DNS server to response and move to the next DNS server if the previous server fails. However, "mydig" still needs to query from the root DNS server and then the servers in lower levels in an iterative manner. Local DNS server or "8.8.8.8" can directly retrieve the answer of the 25 top websites from the cache. Which means "mydig" needs serveral rounds of queries while the other two approaches only need 1 round of query. Thus the disparity between time efficiency is so distinctive. DNS resolution time is determined not only by the number of queries but also the network RTT. Top 25 websites have significant difference on DNS query rounds using "mydig" so the CDF curve spans over 50 milliseconds. "8.8.8.8" and "114.114.114.114" only need 1 round of query but each round may have different network latency. Usually local DNS server is closer to the client so "114.114.114.114" has a weak advantage over "8.8.8.8".