CSE534 HOMEWORK 1:
PART C

We used 25 of the most visited domains which are listed on https://www.alexa.com/topsites and averaged the DNS resolution time for each site over 10 iterations. The sample set of the website domains are as follows:

'Google.com', 'Youtube.com', 'Tmall.com', 'Twitter.com', 'Weibo.com', 'Ebay.com', 'Facebook.com', 'Taobao.com', 'Linkedin.com', 'Gmail.com', 'Amazon.com', 'Yahoo.com', 'Wikipedia.org', 'Bing.com', 'Outlook.com', 'Zoom.us', 'Twitch.tv', 'Live.com', 'Netflix.com', 'Reddit.com', 'Microsoft.com','Instagram.com', 'Office.com', 'Google.com.hk', 'Myshopify.com'

We ran the same setup as mentioned above using 3 different stub resolvers to compare the DNS resolution time across them.
1) Using my custom mydig resolver, which runs on the machine executing it (therefore my M1 Mac).
2) The campus Wi-fi network (Wolfie-Secure) restricts access to root servers. Hence to work around this, I had to use a VPN (BetterNet) which set my default local DNS server as the one with 172.31.16.1 IP (from /etc/resolv.conf). This machine will be our second resolver.
3) Using the Google Public DNS resolver (8.8.8.8 or 8.8.4.4)

We get the below results for average resolution time per resolver:
mydig_avg_time: [0.51, 0.36, 0.39, 0.34, 0.47, 0.76, 0.42, 0.58, 0.56, 0.4, 0.44, 0.43, 0.34, 0.33, 0.34, 0.42, 0.37, 0.36, 0.36, 0.62, 0.85, 0.61, 0.5, 0.37, 0.38]
local_dns_avg_time: [0.41, 0.35, 0.36, 0.36, 0.37, 0.4, 0.38, 0.37, 0.39, 0.38, 0.38, 0.37, 0.36, 0.38, 0.37, 0.44, 0.39, 0.39, 0.4, 0.39, 0.38, 0.42, 0.42, 0.44, 0.42]
google_dns_avg_time: [0.42, 0.43, 0.43, 0.43, 0.44, 0.43, 0.44, 0.43, 0.44, 0.42, 0.43, 0.43, 0.44, 0.43, 0.42, 0.44, 0.44, 0.46, 0.43, 0.44, 0.46, 0.49, 0.48, 0.49, 0.49]

Plotting above results as a Cumulative Distribution Function graph, we get the below result

Avg DNS Resolution Comparison CDF with 25 samples.
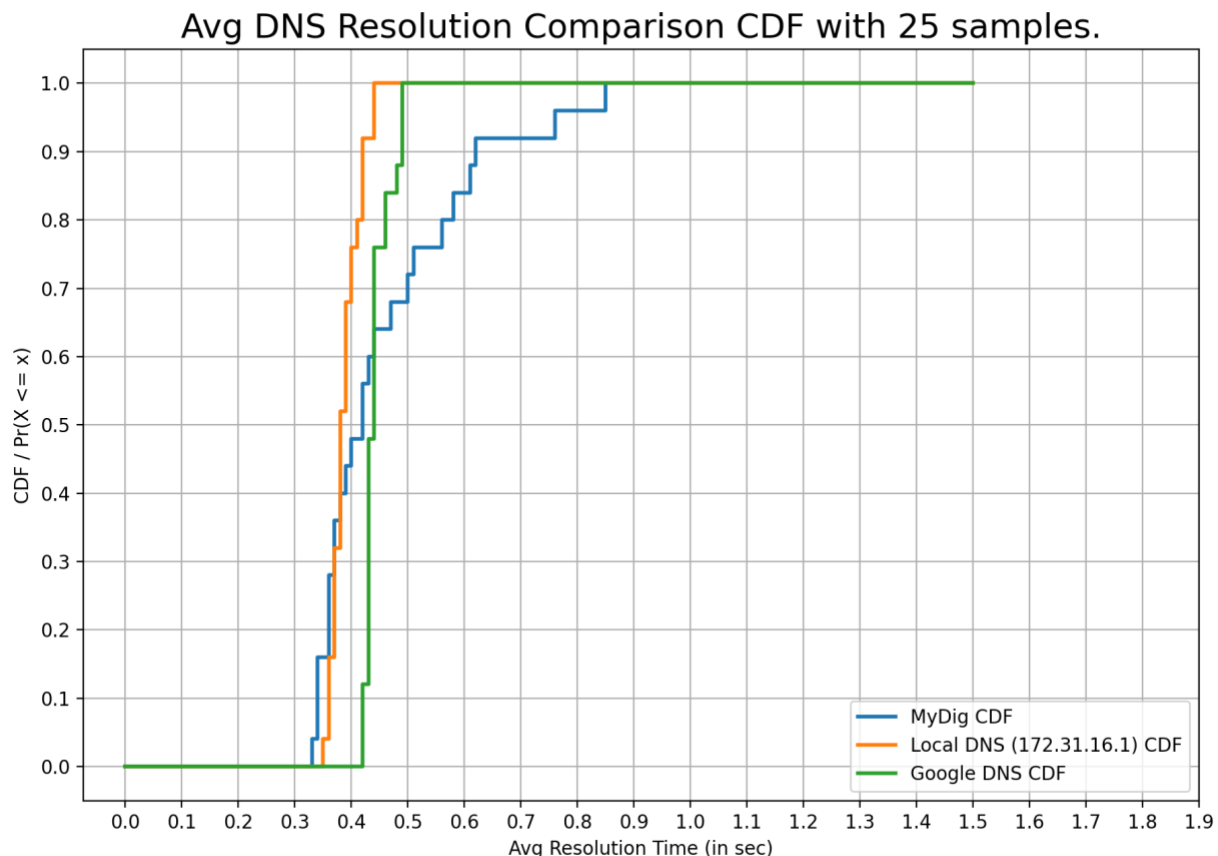
- **Observations and Inferences**

  We can see that the resolution times are comparable across all 3 resolvers for about 70% of the response times, where the max difference is in the range of 100 msec. However, we do see slower resolution times for a few sites with my custom dig implementation, with the maximum avg time reaching 0.85 secs. The local DNS server seems to be performing the best out of the three, albeit marginally, with the Google Resolver coming a close second. The reason for their better response times may be due to the caching mechanisms they use to store popular domain mappings. An improvement may be seen in my custom dig implementation if I use caching as well.