How does searching on google work?

Before understanding How searching works let's understand some other terms.

1. Webpage:
   A webpage is basically a text file formatted in such a way that the browser (chrome, firefox) can understand it. The format is known as HTML (Hypertext markup language) These files are stored in computers/servers waiting for someone to need them to deliver them.

2. Servers
   webserver is the one that serves webpages. Other types include application server, database server etc.

3. IP address
   It is a unique numerical identifier assigned to each device connected to a network that uses the Internet protocol for communication. IP address are used to identify and locate devices on networks, enabling the routing of data across the Internet.
   ex:- 192.168.1.1.

4. Protocols
   The two protocols that are used to deliver web pages are

1. TCP (Transmission Control Protocol)
   - Used to deliver static websites
   - It sends the file in small packets of data and along with each packet a confirmation to know that whether the packet is delivered or not.
   - That's why whenever you are downloading something and your internet connection suddenly drops, then when it comes back up it doesn't start over downloading because the server knows how many packets are delivered.
   - It is slow.

2. UDP (User datagram protocol)
   - Used to serve live videos or online games.
   - Faster then TCP
   - It only cares about sending information not about confirmation.
   - That's why whenever the internet connection drops the live video/ online games stops and when the internet connection is up, the current stream / current game situation is visible.

Steps

Whenever we type any url in the web-browser, following steps occur.

1. Browser looks up in its cache to see if the website is visited before and the IP address is known.
2. If it can't find the IP address for the URL requested then it asks your operating system to locate the website. The operating system first checks for the address of the URL in host file. If not found then OS will make a DNS request to find the IP address of the webpage.
3. The first step is to ask the resolver (Internet service provider) server to look up its cache to see if it knows the IP address, If the resolver doesn't know then it asks the root server to ask the .COM TLD (Top level Domain) server. If it ends with .net then TLD server will be of .NET and so on. The TLD server will again check in its cache to see if the requested IP address is there.
4. If not, then it will at least one of the authorative name servers associated with that URL, and after going to the Name server, it will return the IP address associated with the URL.

5. Now, OS has the IP address and gives to the browser, it then makes a GET to said IP address. When the request to is made the browser again makes the request to the OS which then, in turn packs the request in the TCP traffic protocol, and sends to the IP address.

6. On it's way it is checked by the OS and the server's firewall to make sure that there are no security violations. When the server receives a request it sends a response with the IP address of the chosen server along with the SSL (secure sockets layer) certificate to initiate a secure session (HTTPS).

7. At the end, the server sends the HTML, CSS and JS files back to the OS who in turn give it to the browser to interpret it.