Problem Detection

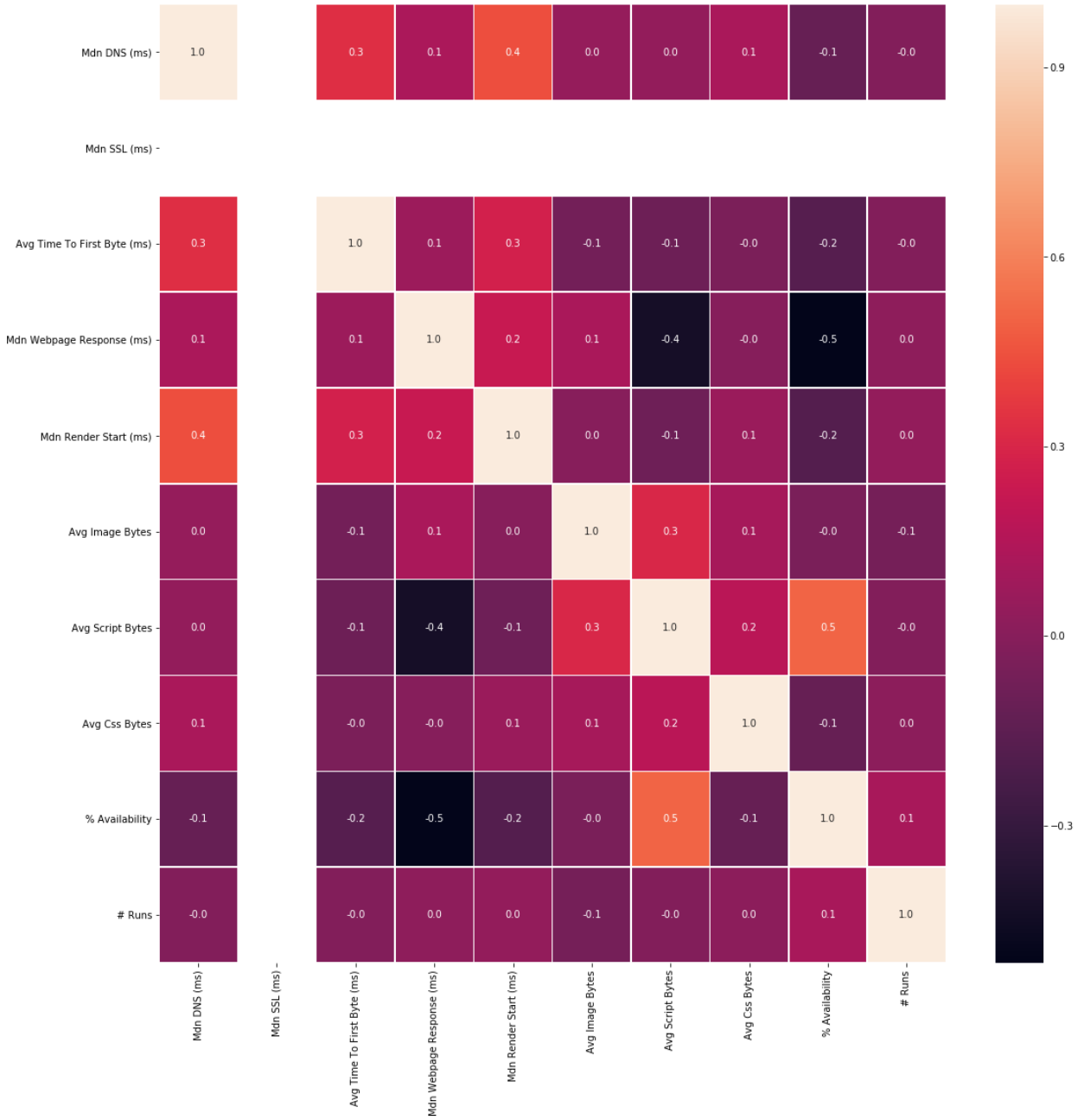
1. Overview of Metrics

This performance test data is generated by performing a website performance test on a Chinese website, Ctrip, which specializes in travel services such as accommodation reservation, transportation ticketing, etc. It contains 360 tests ranging from 2017-11-01 to 2017-11-30. The table below shows an overview of the 12 metrics.

ID	Metrics	Values/Descriptive statistics
1	Test	[204709] - ctrip.cn
2	Time*	2017-11-01 ~ 2017-11-30
3	Mdn DNS (ms)	mean 280.076389 std 70.513539 min 108.500000 max 531.500000
4	Mdn SSL (ms)	null
5	Avg Time To First Byte (ms)	mean 593.206944 std 286.766903 min 209.750000 max 1957.580000
6	Mdn Webpage Response (ms)	mean 9593.341667 std 1461.569220 min 7535.500000 max 30094.000000
7	Mdn Render Start (ms)	mean 1255.504167 std 192.891979 min 807.000000 max 2194.500000
8	Avg Image Bytes	mean 731153.379056 std 61567.944565 min 566819.580000 max 908992.580000
9	Avg Script Bytes	mean 573567.277056 std 19237.706558 min 388817.400000 max 610802.170000

10	Avg Css Bytes	mean 10767.403389 std 25.517700 min 10755.750000 max 11081.250000
11	% Availability	mean 95.262775 std 6.689858 min 25.000000 max 100.000000
12	# Runs	10 - 13

*The time metric changes to a different format in the middle of the rows. There are two kinds of datetime format in the dataset. I am not sure if this is the problem of the website performance test system. This might cause problems for web analyzers to derive insights from the data since they have to spend some time on data cleaning to have a consistent format.

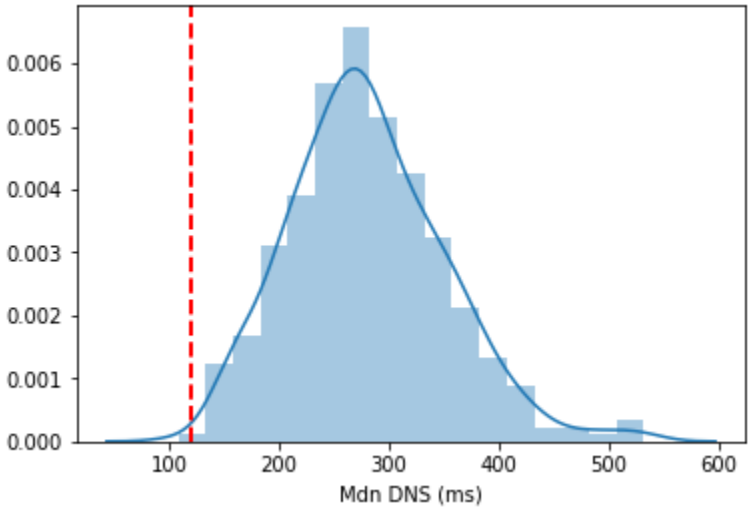


The graph above gives an overview of the possible correlations of the metrics. Two pairs of them slightly more correlated, which are (Avg Script Bytes, % Availability) and (% Availability, Mdn Webpage Response (ms)). A Pearson correlation test suggests that the correlation of these two pairs of metrics are found to be significantly away from 0. A negative correlation means, when a variable increase, the other variable decrease, and a positive correlation is the opposite, however, it does not suggest a causal relation. A detailed inspection needs to be performed by the web developers.

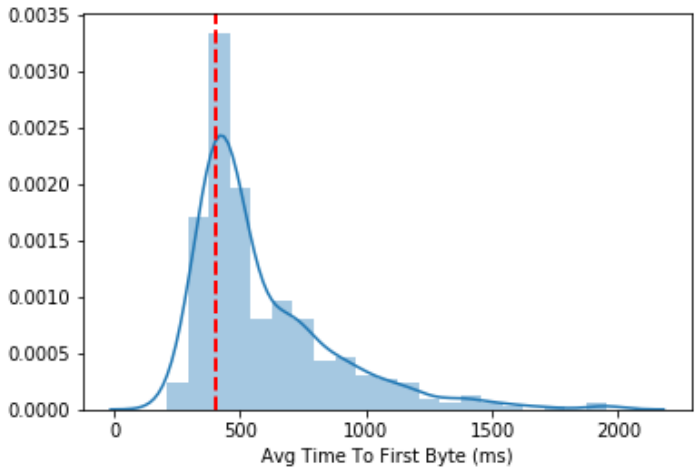
2. Website Speed Metrics Analysis

The metrics discussed in this section are mainly related to the speed performance of a website. These metrics can be used to measuring how fast is the website. The detailed explanation and discussion are provided in each subsection.

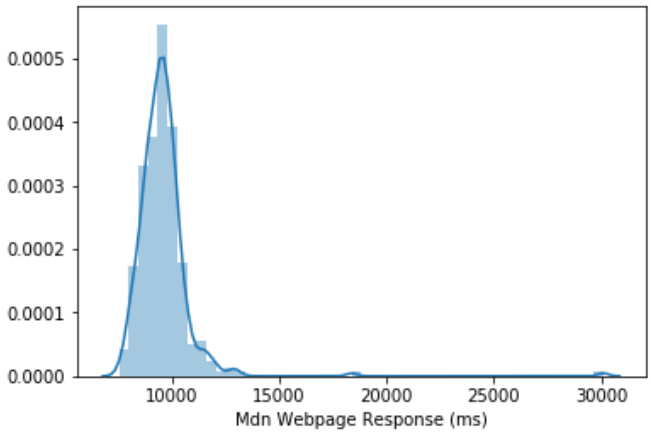
2.1. **Mdn DNS (ms):** A DNS lookup is the process of finding which IP the domain name belongs to. According to YSlow, the average DNS lookups time take 20-120 ms (as the dashed line) to complete. Based on the dataset provided, the average DNS lookups time is around 280.08 ms, which is much higher than the suggested value. Most of the lookups time located between 200~400 ms. This might be a problem for website speed since the browser needs to wait until the lookup process complete to proceed any other actions.



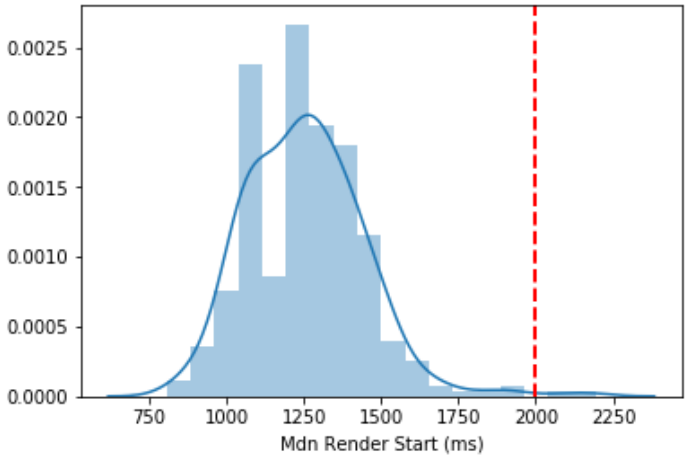
2.2. **Avg Time To First Byte (ms):** The average time it takes from the users to send a request to the server until the server sends back the first byte of response to the client. According to keycdn, a proper TTFB would be suggested to less than 400 ms (as the dashed line). In Ctrip's case, the average is around 593.21 ms, which is also slightly higher than the acceptable time. The responsible person might have to look into the performance of the server to make improvements.



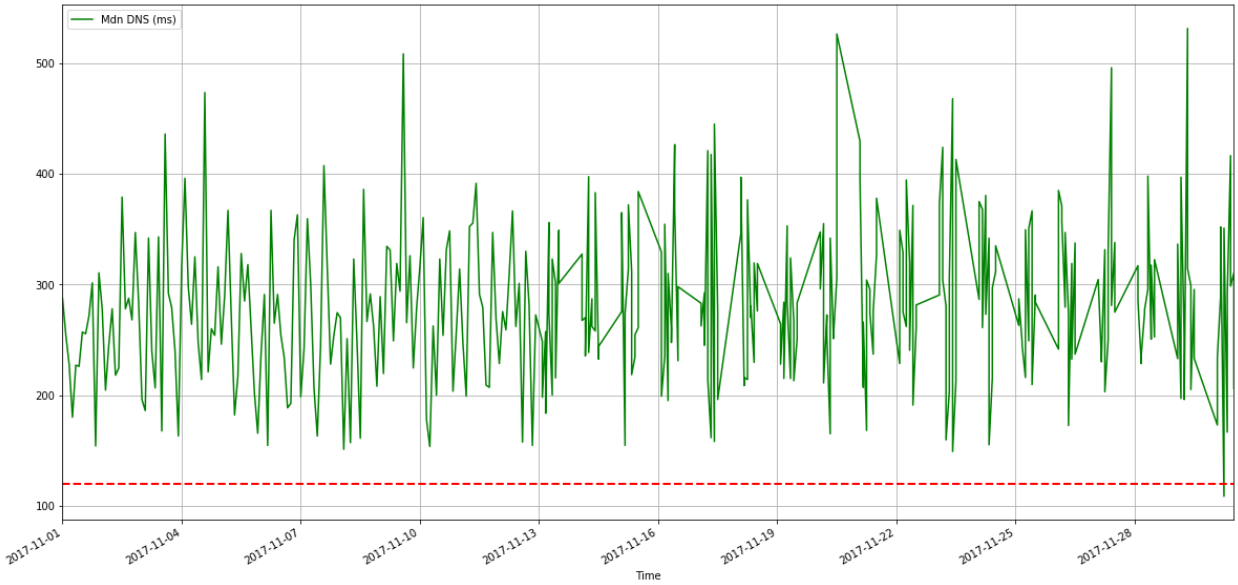
2.3. **Mdn Webpage Response (ms):** The response time of a website is a crucial index not only for customer satisfaction but also for SEO. The faster the website response. The more likely the website would appear on top of the search results of the search engines. In the case here, the average is around 9593 ms, which is almost 9.6 seconds. In the dataset, there is some outlier that takes around 30 seconds to response. That is far too slow than expected.



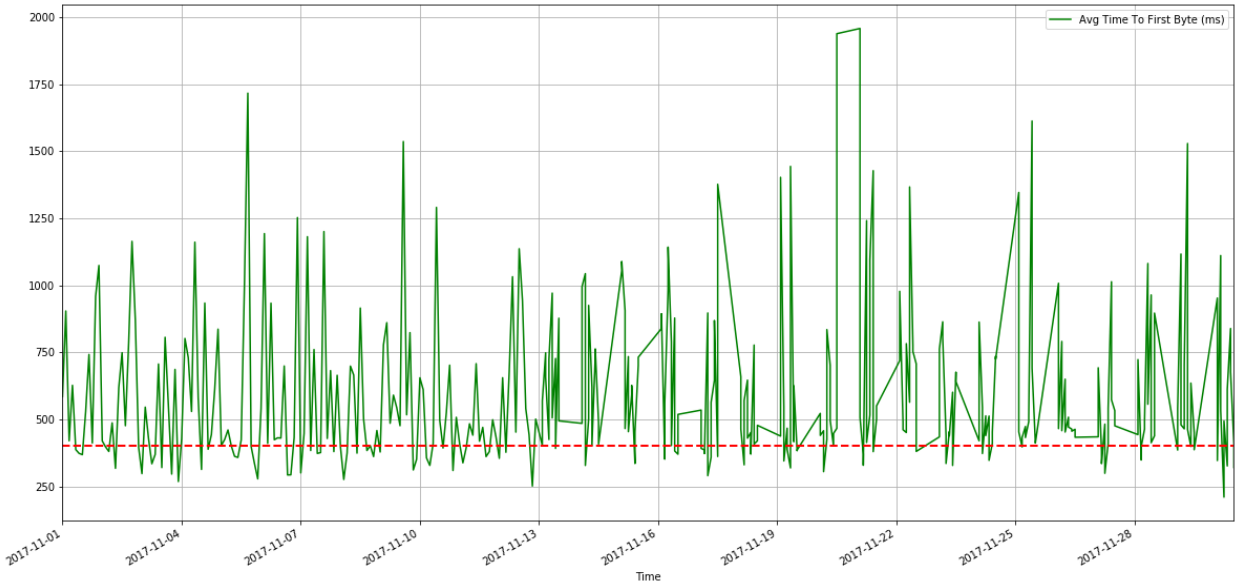
2.4. **Mdn Render Start (ms)**: The time it takes from the client sends a request until the first content appears on the client's browser. This interval of time is also important since the appearance of the first content can give the users the feedback indicating that the website is working and thus the users are more patient to wait until the complete contents are shown. The start of render time is suggested to be within 2 seconds. The average of Ctrip is 1255.50 ms, which is way below the suggested value. Even the maximum, 2194.50 ms can be considered as acceptable.



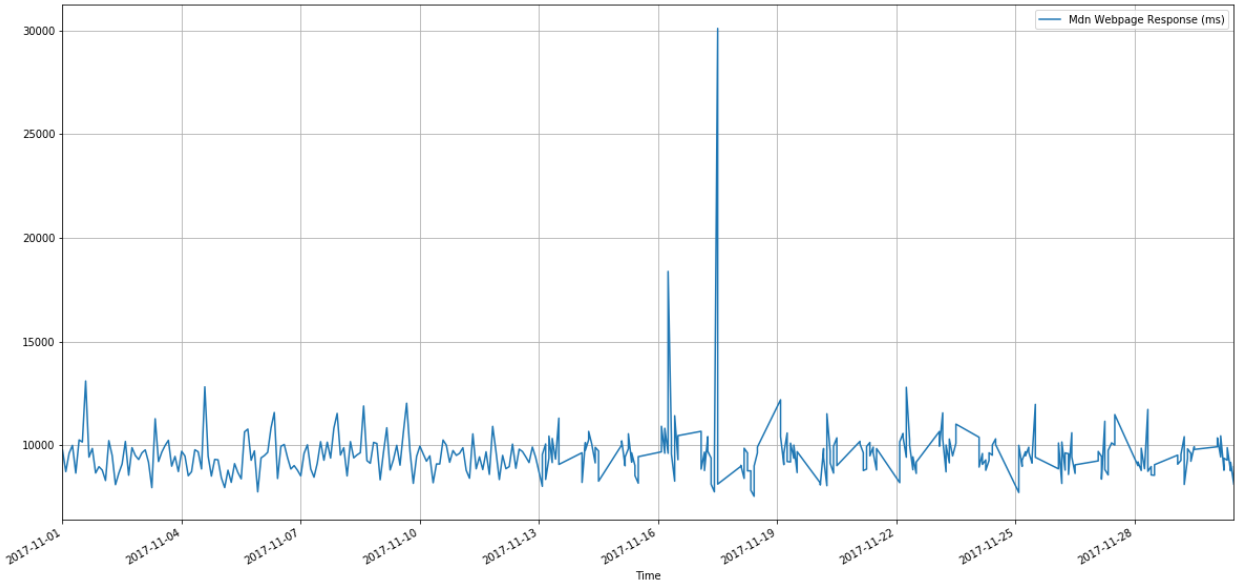
- **Mdn DNS (ms) With Datetime:** As mentioned above, the overall DNS lookups time is too high that none of the lookup time is below 120 ms. In addition, at some points in time, the lookup times are significantly higher than others, they might worth to be checked. In this case, the time larger than 500 ms are pointed out, which are 2017-11-09 14:00:00, 2017-11-20 12:00:00, 2017-11-29 08:00:00.



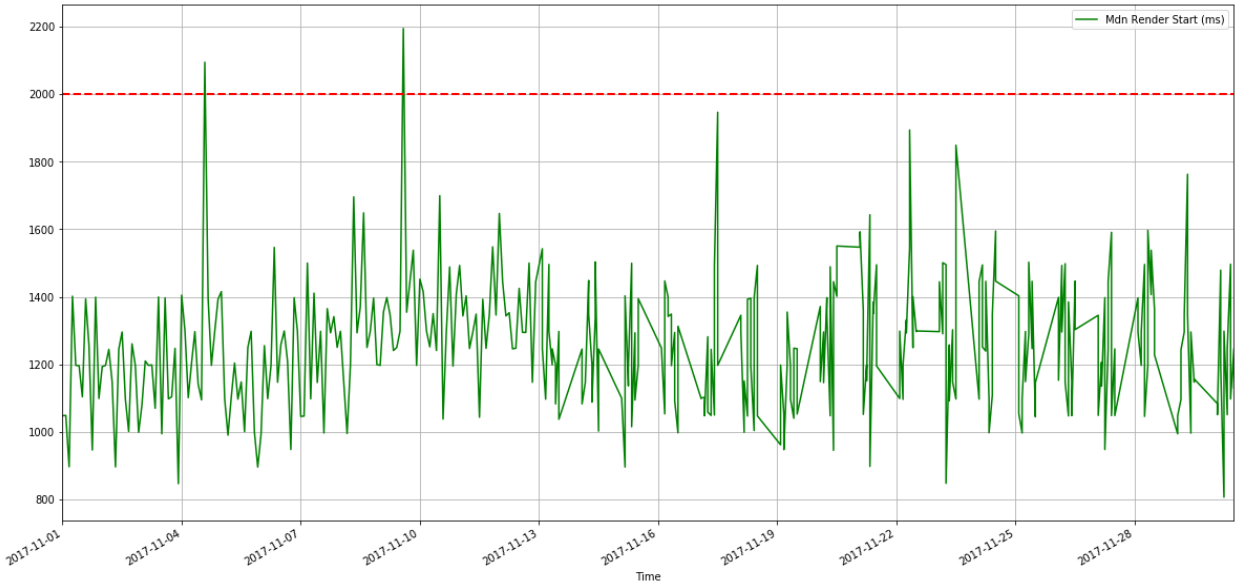
- **Avg Time To First Byte (ms) With Datetime:** The performance of Avg Time To First Byte (ms) is slightly better than the former. However, the overall TTFB is still higher than expected. Two outliers are 2017-11-20 12:00:00 and 2017-11-21 02:00:00 when the TTFB is higher than 1750 ms.



- **Mdn Webpage Response (ms) With Datetime**: The performance of website response time is also not very satisfied. It is shown that there was something happened on 2017-11-16 at 6 am and 2017-11-17 at 12 am. This two time points have unusual web response times, which are 18378.5 ms and 30094 ms respectively. The responsible person might have to check what was wrong at that time to prevent the same problems happen again.

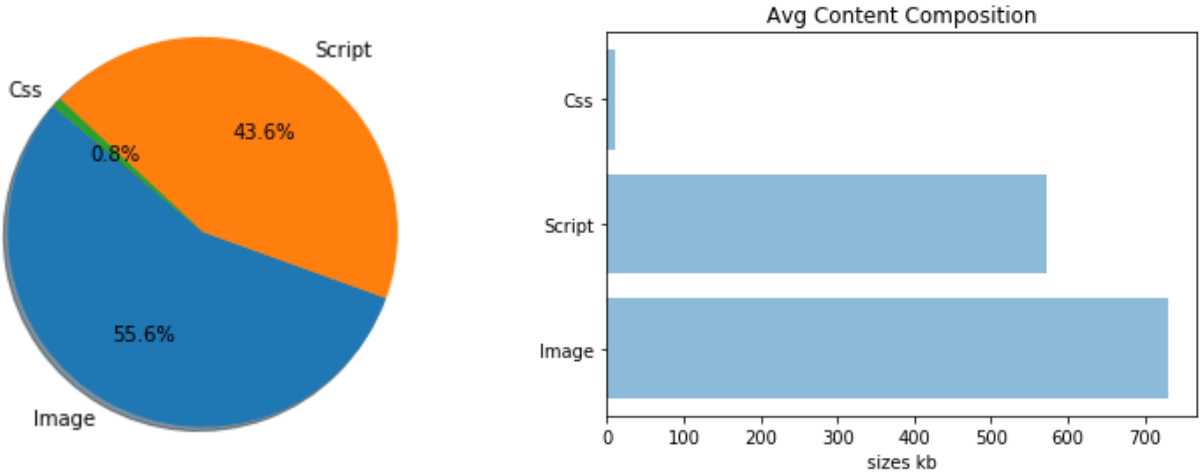


- **Mdn Render Start (ms) With Datetime**: The performance of this metric is probably the best among the four. Most of the Render start times are less than 2000 ms. There are still some outliers, which are 2017-11-04 14:00:00 and 2017-11-09 14:00:00.



3. Website Content Analysis

In this section the three metrics: Avg Image Bytes, Avg Script Bytes, and Avg Css Bytes are evaluated and analyzed together to provide more meaningful analysis. These three metrics can provide information about the main components of a website. Knowing the composition of the website might give web developer insights to improve the website in terms of speed or other performance indexes.



3.1. Avg Content Size by Content Type

The two charts above give us the information about the composition of the website, Ctrip. The average size (KB) of image, script, and css are 731.153 KB, 573.57 KB, 10.77 KB respectively. The contents in total have an average size of 1.3155 MB. In comparison to the German trivago website, which only has 788.1 KB, the size of Ctrip website is relatively higher and almost twice the size of trivago.de. This might be a possible reason for the bad performance of website speed. In terms of the content composition of the website content, images have the most shares of the website size (more than half). Reducing the images displayed might be another direction for improvement.

4. Website Ability

The availability of the website is also a significant metric to check because the users might stop browsing the website if the website is not available. With an average of 95.26% (shown red dashed line), the availability of the website seems to be acceptable. However, there are two significant time points when the website availability is below 70%, which are 2017-11-16 06:00:00 and 2017-11-17 12:00:00. Interestingly, these two time points are correspondent to those when Webpage Response times are unusually higher. As one can see from the two line charts below.