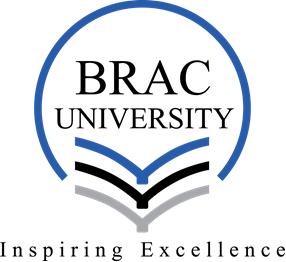
**Pre-thesis -I Report**



Deep learning based predictive analytics for efficient content caching in edge network

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**Date of Submission: 10/1/2021**

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**Abstract**

Content centric network is a state-of-the-art networking architecture for content distribution and content caching. However, it is inefficient to cache every content in each network devices. The modern edge computing technology opens the door for content caching in the edge of the network. However, still we have to decide which contents we should cache and which content we should replace from the cache. The deep learning based predictive analytics can play an important role in selecting contents for caching purpose. In this research, we will use LSTM based Recurrent Neural Network for predictive content caching at the edge of the network.

1. **Introduction**

Soon after the invention of the first computer ENIAC in 1946, one of the most significant lacking it had was networking. People could do many things with the computer. But, it was impossible to share their works with others who were miles away. From this hunger of sharing, people started to think about making a system by which they could share their works with others. From this consequence, in 1960 ARPANET (The Advanced Research Projects Agency Network) was built in order to create a network with thousands of computers. And, thus the journey of networking had started.

In the very first era of networking, it was just a connection between computers for sharing mostly research data or important files. Only some of the sophisticated researchers and high-level people got to have the benefit of networking. But, in modern time, the concept of networking has changed a lot. Nowadays, there are thousands of fields in networking. People from every stage in the society get help of networking in their day to day life. In this context, content has become the most powerful weapon in the networking field. People use contents to get their job done in their daily life. Starting from media streaming sites, social networking sites, online news portals and many others are spreading digital wellbeing to the human beings through contents.

Content centric network is getting richer day by day with the help of thousands of content providing sites and its users. However, this won’t have been this rich, if it wouldn’t have been efficient. Efficiently caching the contents are so much important in networking. Caching a content means fetching the content from the server. It might be any server all over the world. But, that might be problematic as the server from which the files are being cached, might be far away from the user. That’s where efficient content caching comes in handy. In efficient content caching, files get fetched from the closest server. As a result, lots of time gets saved.

However, there is a significant issue when deciding which content we should cache and which we should replace from the cache because of limited cache memory. We need to cache contents that are more important to the users. But, it is harder to decide which content is more important to the user. To make the purpose easier, we can use deep learning based predictive analytics. Predictive analytics can help us to decide which file to cache and which file to replace from the cache depending on its importance.

1. **Research Problem**

With the mass availability of devices like mobile phones, computers etc., the user of internet is increasing rapidly day by day. And, content providing sites like YouTube, Netflix, Prime Video etc. are becoming so popular among the users. However, people want to stream their contents faster from the sites with less latency. If the requested files are available on the caching server, they are delivered to the user extremely faster. Which is why caching is necessary. Assume a [1] Netflix subscriber in London wants to stream the show House of Cards. To ensure fast access and minimum buffering time, Netflix copies the videos from their origin servers in Los Gatos, CA, to the caching server closest to London. Because of this, all subscribers in London can quickly access the show and avoid a transatlantic file transfer. However, it is impossible to keep every movie in the closest caching server of London because of space limitation. To save the space of the cache server, the not so popular movies are needed to be replaced from the cache server with new ones. As a result, there comes a decision taking between what movies to keep and what movies are needed to be replaced from the server.

1. **Research Objectives**

We are going to build a system using deep learning based predictive analytics so that we can decide which contents are needed to be cached and which contents are needed to be replaced from the server. The contents that are trending should be kept in the cache and others should be replaced. The objectives of the research are:

1. To understand, what content caching is and how it works
2. Important of efficient content caching and its mechanism
3. Importance of edge computing and edge network in efficient content caching
4. To develop a model for connection between predictive analytics and efficient content caching
5. To evaluate the model
6. **Literature Review**

As the blessings of modern technologies like mobile phones, tablets, computers etc. are becoming more affordable and easier to get, people are getting more and more used to with these devices’ day by day. And, people are getting more comfortable with content providing sites like Netflix, YouTube, Prime Video and so on. And, the number of users is rapidly increasing day by day. According to [2] Statista, the number of Netflix users in 2020 is 195.15 million by Q3. However, in a recent article of [3] TNPS (The New Publishing Standard), in 2030 the number of Netflix users is expected to increase up to 500 million.

There might be one problem with the loading time of the contents that are far away from the user. To solve that issue, the concept of caching comes in handy. But, the amount of cache memory is limited. That’s why there is a trade-off between which content to cache and which to replace. To efficiently cache data, predictive analytics is so necessary.

* 1. **Content Caching**

Content caching is a performance optimization mechanism in which data is delivered from the closest servers for optimal application performance. According to [4] ‘interserver’, when a system accesses the website, the contents in that site will be provided by a nearby cache server rather than the original server which is remote. As a result, it will decrease the latency.

References

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