**Assignment CS5113**

This assignment is to investigate on how to improve the performance of a few target blockchain architectures at theoretical (quantitative) level design and further how to implement experimentally for validation.

There will be 3 specific seed papers (**adaptive** chain model, **asynchronous** chain model, and **realtime** NFT chain model) posted on canvas under “home”, and your group will select one of those, and do the following.

1. Study those 3 seed papers.
2. Identify new variables (e.g., with respect to the mining process, the consensus algorithm, the 51% rule, to mention a few) to be incorporated **specifically into the model in the seed paper** and build a new model and solve it (i.e., in steady state as solved in the seed paper and be ready to plot graphs). (a report in the format below) and class presentation (10-15 minutes, a presenter will be randomly picked by the instructor at presentation) from each group **50%, 03-26-2024 in class**)

-title

-group members (each with his/her contribution in % even in case of equal contributions)

-abstract (0.5 page)

-seed paper review and preliminaries (1 page: clearly show what variables are incorporated from the seed paper and why, along with new variable(s) of your own choice)

-proposed new model clearly and specifically in terms of the new variable(s) you incorporate into the model in the seed paper (4 pages, 2 pages for quantitative description of the new model and 2 page for numerical simulation results).

1. Then, conduct extensive numerical simulations to demonstrate the impact of the new variables of your choice on the same performance metrics as in the seed paper, specifically, (average transaction waiting time), (average block space requied), and γ (throughput) versus i (number of transaction slots), λ (transaction arrival rate, note that and in case of realtime NFT chain), μ (block posting rate) and network traffic (, where assume λ ≤ μ for simplicity). (**50%** possible class presentation if time allows) (due by **04-26-2024**)
2. If your new architecture outperforms the one in your seed paper, validate it through experimental implementation in the open source with help from a manual to be provided in class (shows how to install Ethereum and how to isolate a smart contract and modify and recompile and deploy on a local testnet. (extra **10%** if your group identify and isolate the right smart contracts to implement your new architecture and successfully demonstrate recompilation and deployment,) (due by **04-26-2024**)