

# Behaviors of Markov-Modulated Bernoulli Switches

Jun Kyu Ahn



Georgia Tech College of Engineering  
H. Milton Stewart School of Industrial and Systems Engineering

2023 ISyE Summer Undergraduate Research Scholars Program

Advisor & Supervisor: Dr. Debankur Mukherjee, Dr. Siva Theja Maguluri & Eyal Castiel

## Progress

Arrival  $\lambda$  Queue Service Node  $\mu$   
Traffic Intensity =  $\rho = \frac{\lambda}{\mu}$

1 7 a  
2 9 b  
3 5 c  
2 3  
3 2  
<Hungarian Algorithm -  $O(n^3)$ >

Virtual Output Queues for Queue n

<Switch Network System with VOQs>

$$Q(t+1) = (Q(t) + A(t) - M(t))_+$$

<Markov Property>

### Hypotheses

The switch network will reach equilibrium, and the mean of the following observable variables will follow a trend of...

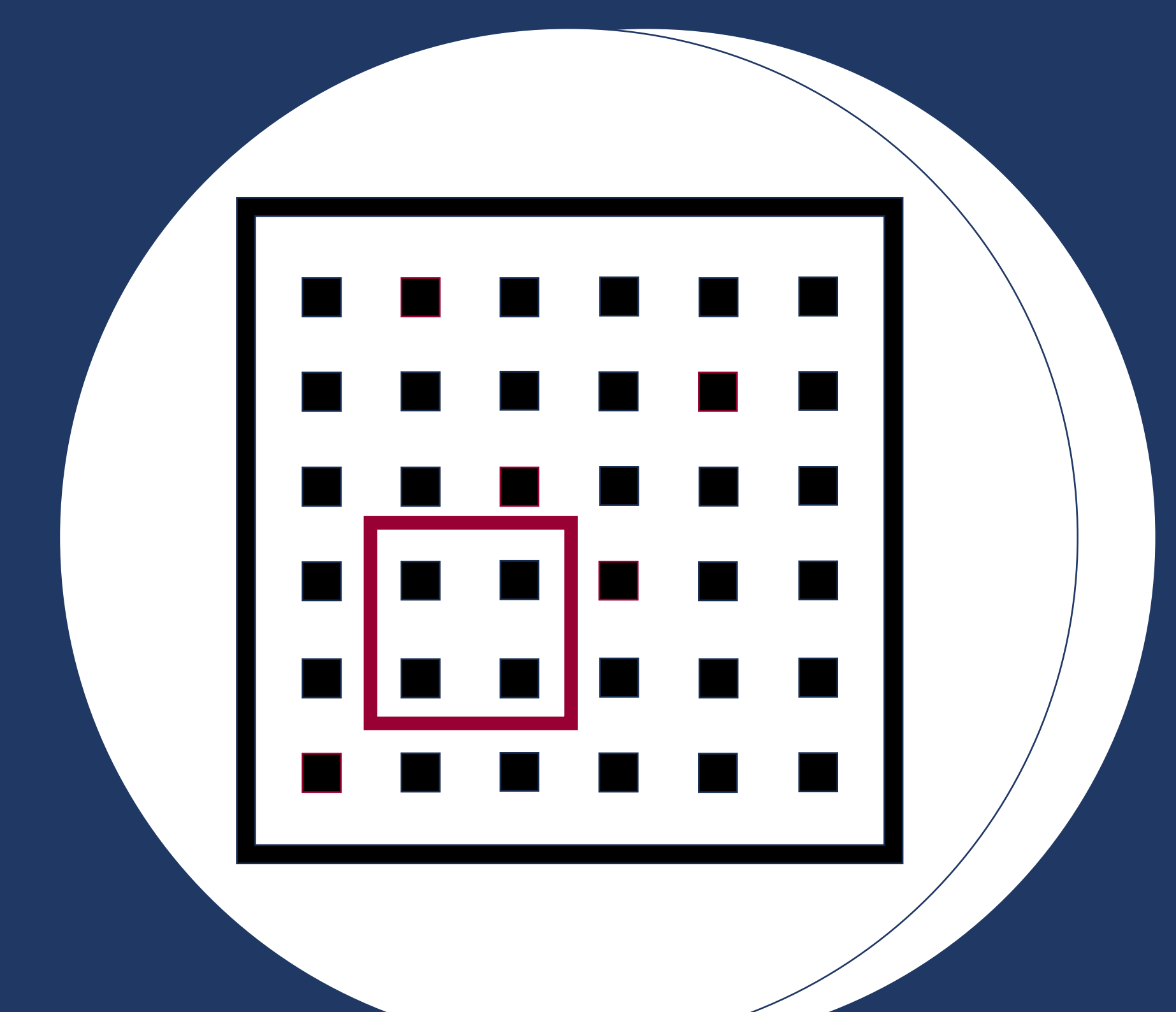
1. Linear ( $\bar{L}(n)$ )
  - i. Total Queue Length
  - ii. Schedule's Weight
  - iii. Number of Non-Empty VOQs
2. Logarithm ( $\ln(n)$ )
  - i. Clearing Time
3. Constant (1)
  - i. Length of Maximum Virtual Output Queue

Total Queue Length, n = 64  
Single Switch

Total Queue Length  
Multiple Switches

Clearing Time  
Multiple Switches

## Future Objectives



Reference



GitHub