The experimental results demonstrate the performance of the DDoSChain framework in identifying and mitigating DDoS attacks. The evaluation includes performance of the models, scalability analysis, blockchain performance assessment, and controlled experiments to validate the system's robustness. As shown in Tables 1 and 2, XGBoost achieved the highest detection accuracy, precision, recall, and F1 score.

Table 1

Performance Comparison of Machine Learning Models- CICDDOS2019

Model	CICDDoS2019			
	Accuracy	Precision	Recall	F1 Score
Decision Tree	98.35	98.62	98.35	98.48
Random Forest	98.58	98.62	98.58	98.60
Extra Trees	98.37	98.50	98.37	98.43
XGBoost	**98.79**	**99.00**	**98.79**	**98.99**

Table 2

Performance Comparison of Machine Learning Models- CICIDS2017

Model	CICIDS2017			
	Accuracy	Precision	Recall	F1 Score
Decision Tree	95.38	95.76	95.38	95.41
Random Forest	95.72	95.90	95.72	95.68
Extra Trees	92.65	93.11	92.65	92.49
XGBoost	**98.97**	**98.98**	**98.97**	**98.97**

The system's scalability was evaluated by increasing traffic loads to analyse its response time and throughput. Table 3 displays the findings for various packet rates, demonstrating that DDoSChain consistently maintained quick reaction times and high detection accuracy even when there was huge traffic. To generate network traffic at different packet rates, Scapy and Hping3 were utilised. Throughput was defined as the number of packets successfully processed per second, and Response time was defined as the interval between the time a packet was received and the system detected an attack.

Table 3

Scalability Analysis Under Increasing Packet Rates

Packet Rate (pps)	Throughput (tps)	Response Time (ms)
1,000	937.45	10.39
10,000	9450.71	18.62
100,000	87,319.94	46.56

The effect of incorporating blockchain on DDoSChain performance was assessed by examining transaction latency and throughput. The findings, presented in Table 4, highlight the differences in security and performance metrics. The system utilizing blockchain offers unchangeable attack logging, but results in a minor rise in transaction latency. These metrics were derived from execution logs and timestamps associated with smart contract activities on the blockchain.

Table 4

Blockchain Performance Evaluation

Metric	With Blockchain	Without Blockchain
Transaction Latency (ms)	141.16	53.66
Throughput (tps)	910.11	1541.61