

# Red Team vs Blue Team: AI Simulation for Cybersecurity Defense

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Internship: Digisuraksha Parhari Foundation

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Github Links:

<https://github.com/Roshni1603/Red-vs-Blue-AI-Simulation.git>

[https://github.com/nityamodi0810/Red\\_Blue\\_AI\\_Simulate.git](https://github.com/nityamodi0810/Red_Blue_AI_Simulate.git)

# Introduction

- Red vs Blue Teaming:
- Red Team: Simulates attackers to test vulnerabilities.
- Blue Team: Defends systems by detecting and responding to threats.
- AI Simulation:
- Using AI to create virtual environments that mimic real-world scenarios for training, testing, and improving models.
- AI can help automate attack and defense strategies.



# Problem Statement

- Increasing frequency of cyber attacks
- Manual Red vs Blue exercises lack scalability and consistency.
- Need for automated, ethical, and safe testing environments.
- Difficulty in modeling AI-driven cyberattacks and defenses.

# Solution

- Red Team agent simulates offensive actions across common services (HTTP, FTP, SSH).
- Blue Team agent monitors, detects, and responds to threats using predefined logic.
- Logs and system alerts are generated for analysis and evaluation.
- Supports cybersecurity education, enterprise training, and strategic planning.

# Objective

- o Build an AI-based simulation of Red (attacker) vs Blue (defender)
- o Provide a scalable, ethical training ground for cybersecurity.
- o Track and evaluate performance metrics (detection, compromise rate).



# Architecture Overview

- Red Agent ↔ Environment ↔ Blue Agent
- Interaction loop between agents and environment
- Virtual hosts simulate SSH, HTTP, FTP services.
- Each step logs system status and alerts.

# Code & Tool Breakdown

Programming Language: Python

Key Files:

red\_team\_agent.py – Implements offensive logic for simulating attacks

blue\_team\_agent.py – Handles defensive strategies and monitors system activity

environment.py – Controls the simulation environment and coordinates agent actions

Libraries Used:

random – For generating unpredictable behavior in simulations

os: Provides functions to interact with the operating system

sys: Provides access to system-specific parameters and functions

Output:

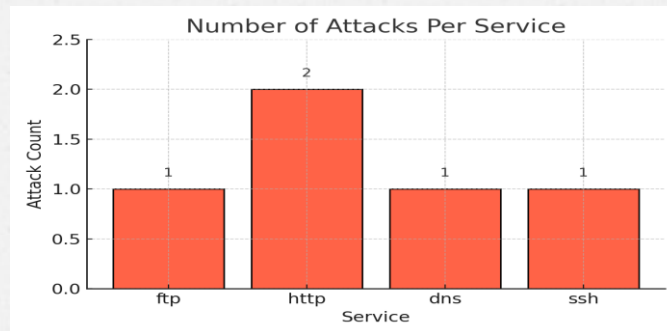
Logs – Record each action taken by agents

Alerts – Notify about detected attacks or anomalies

System Status – Provides snapshot of the network during simulation

# Results & Observations

## Chart: Number of Attacks Per Service



- - HTTP had the highest number of attacks (2)
- - FTP, DNS, and SSH each had 1
- - Suggests HTTP is more vulnerable or targeted



# Real-World Use Cases

## **Cybersecurity Training Environments**

- o Used by enterprises, military, and academia for safe cyber defense training.

## **Red & Blue Team Operations**

- o Your AI system can automate this model for consistent and scalable testing.

## **Educational Platforms**

- o Your project fits perfectly in learning environments and cyber bootcamps.

# Future Enhancements

- **Smarter AI:** Add reinforcement learning for adaptive attack/defense.
- **Real Tools:** Integrate Metasploit, Snort, Wireshark, Kali.
- **Larger Networks:** Use Docker/GNS3 for scalable setups.
- **Live Dashboards:** Visualize attacks/defense with Grafana & Streamlit.
- **Educational Mode:** Add Purple Team & learning competitions.

# Conclusion

- Showcased realistic cyber scenarios
- Scalable and ethical AI-based simulation.
- Effective for training and strategy testing.
- Contributes to adaptive cybersecurity systems.





THANK YOU!!!