

BotScreen: Trust Everybody, but Cut the Aimbots Yourself

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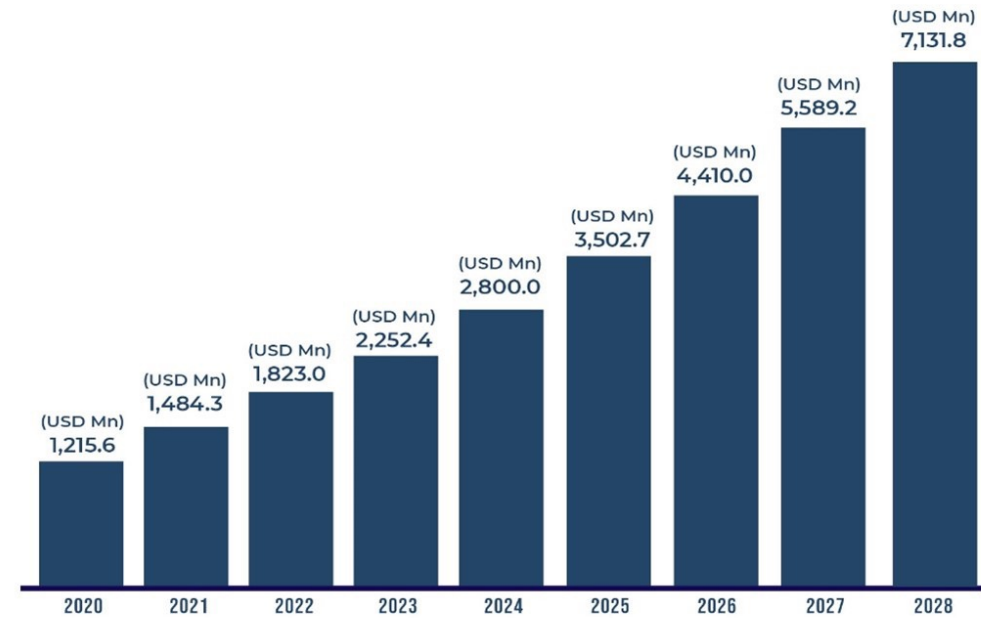
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Growing E-Sports Industry



GLOBAL ESPORTS MARKET, -2021-2028



Source: www.acumenresearchandconsulting.com

Cheating in Online Games



Cheating Irritates Gamers

Anger Over 'Destiny 2' PC Cheaters Has Reached A Tipping Point

Paul Tassi Senior Contributor ⓘ

News and opinion about video games, television, movies and the internet.

While cheating has been a problem on the PC version of Destiny 2 for months, the switch to Steam and the recent release of Trials have taken the problem to a new level, and it is currently decimating PvP on the platform.

Gamers are leaving because of cheating

Cheating Damages Game Company

PUBG MOBILE

PUBG Mobile Cheat Makers Ordered to Pay \$10 Million in Damages

"These Judgements send a clear message that we will not tolerate cheating in PUBG Mobile."



By [Jared Moore](#) ✓ Updated: Jan 8, 2022 1:35 am 📄 Posted: Jan 8, 2022 1:34 am

Members of a hacking group creating cheats for [PUBG Mobile](#) have been ordered to pay \$10 million in damages – which PUBG's developers say they'll reinvest into anti-cheat technology.

Our Focus: Aimbot



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CS:GO Player "forsaken" Caught Cheating While Representing India In Global Tournament In China



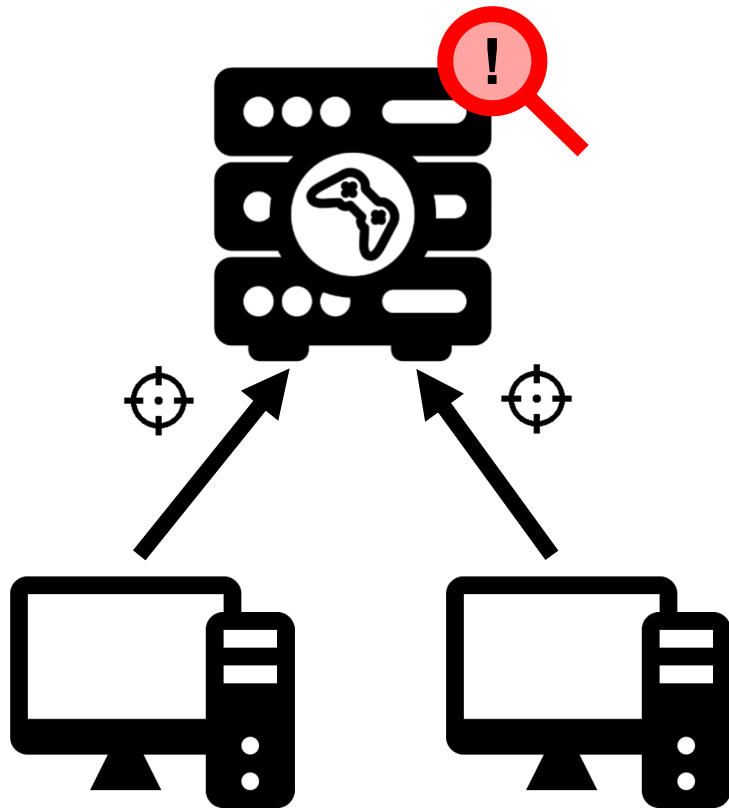
Gwyn D'Mello

Updated on Oct 22, 2018, 17:12 IST

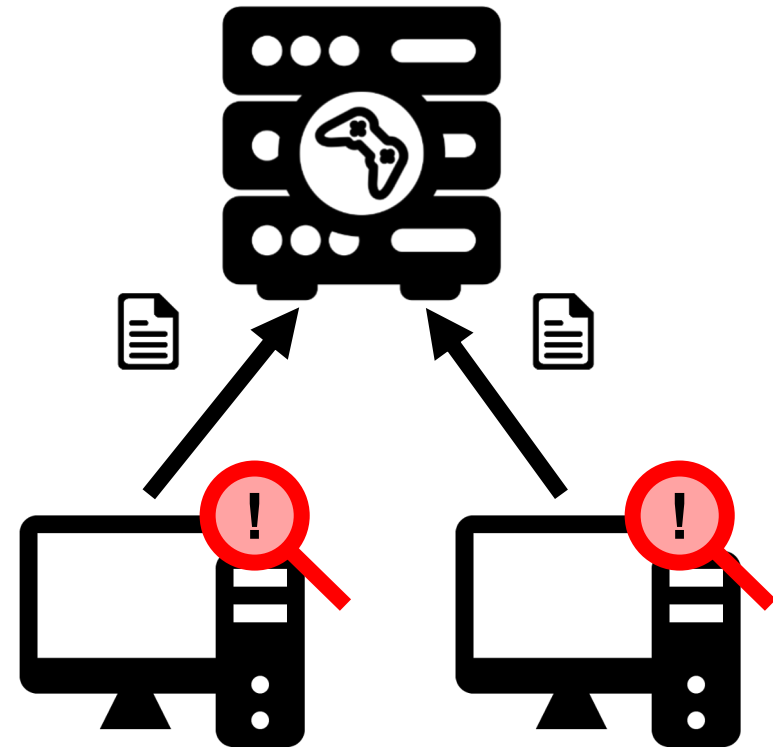
Professional Counter-Strike: Global Offensive player Nikhil "forsaken" Kumawat was caught cheating at a tournament in Shanghai this past weekend. He was part of the roster for OpTic India (an offshoot of OpTic Gaming), participating at the Extremesland Zowie Asia CS:GO 2018 tournament.

Aimbots can threaten the Esports industry

Existing Solutions?

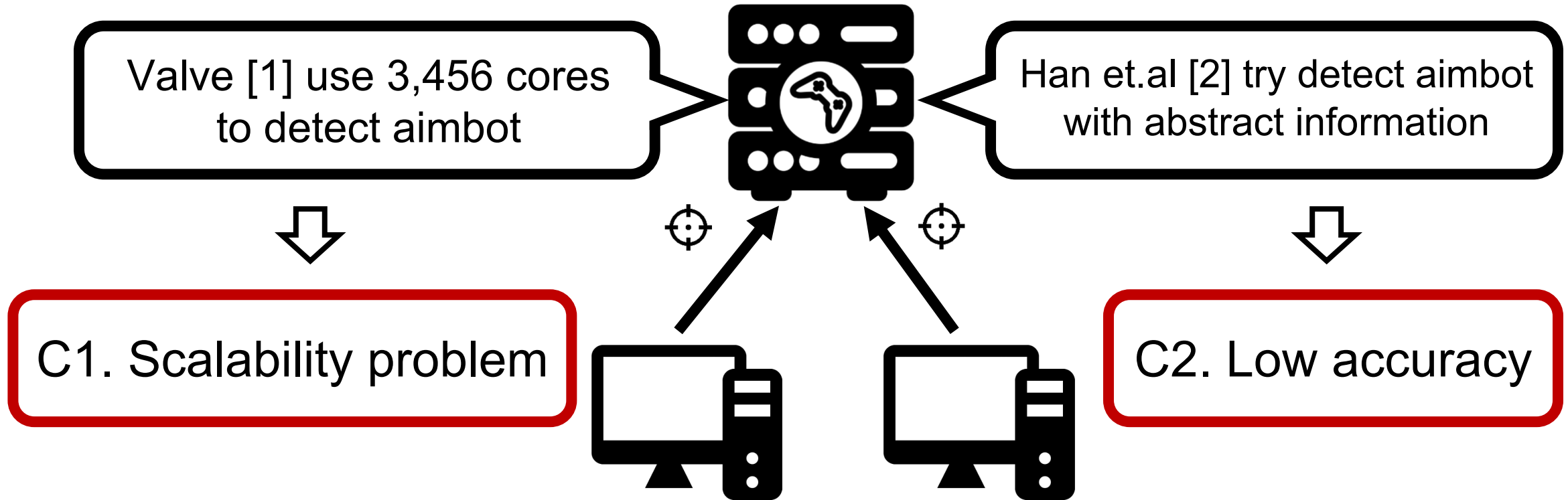


Server-side

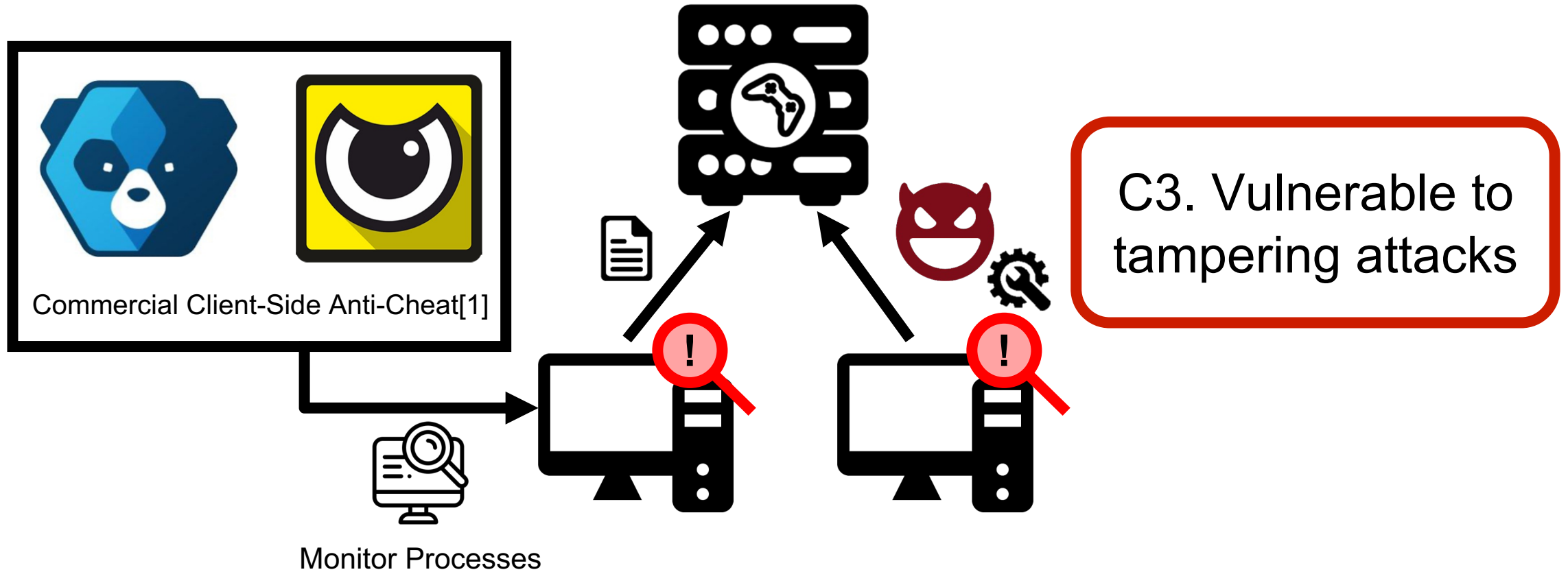


Client-side

Server-Side Detection



Client-Side Detection



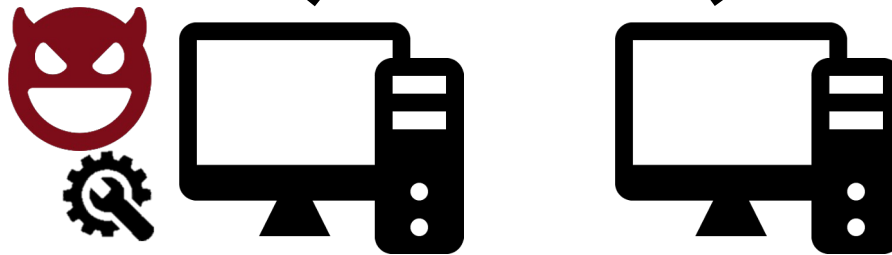
Detecting Aimbots is Challenging

C1. Scalability problem



C2. Low accuracy

C3. Vulnerable to tampering attacks

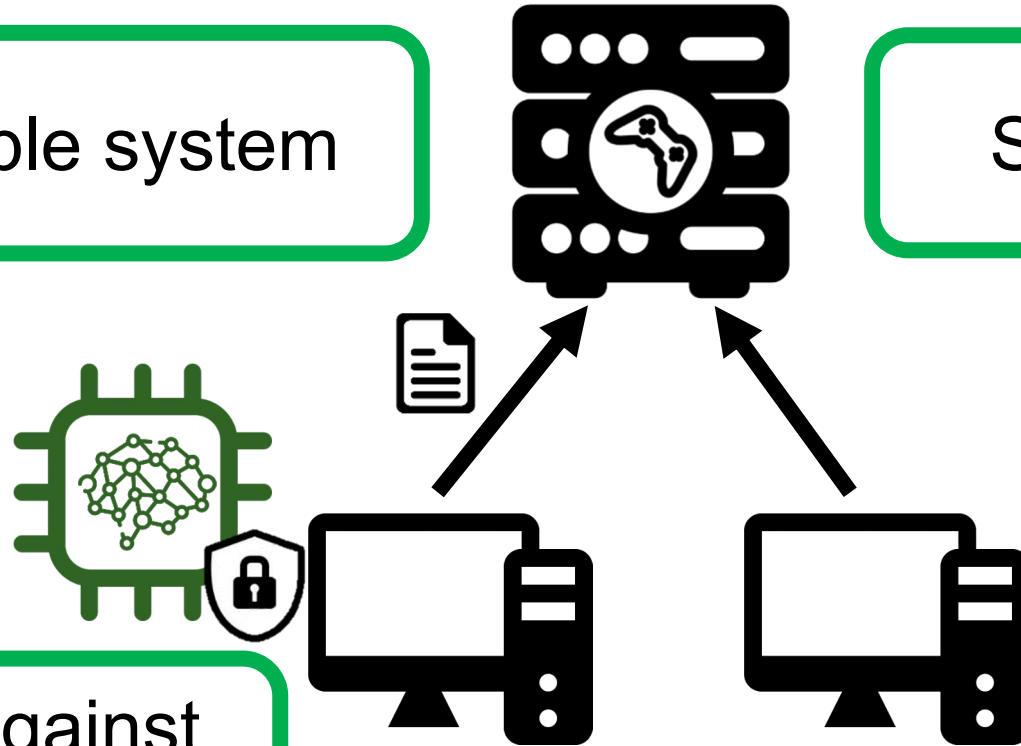


New System: BotScreen

S1. Scalable system

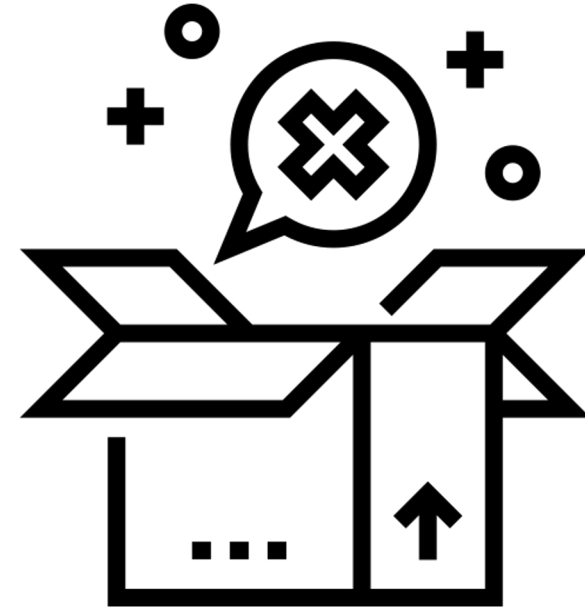
S2. High accuracy

S3. Resilient against tampering attacks



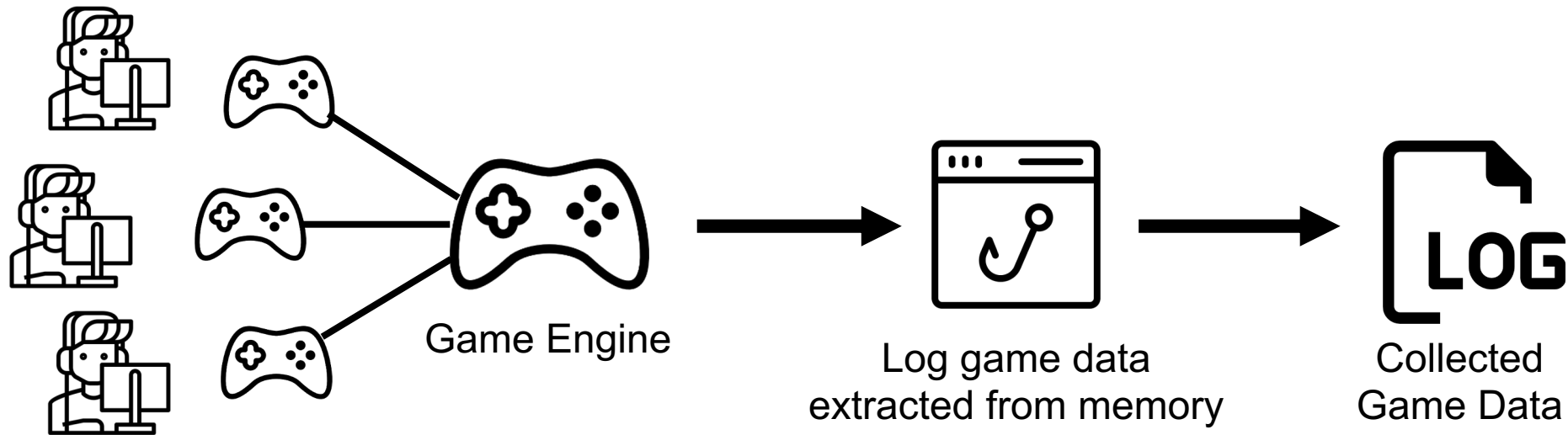
Extra Challenge

- No available datasets
- Hard to obtain new quality datasets



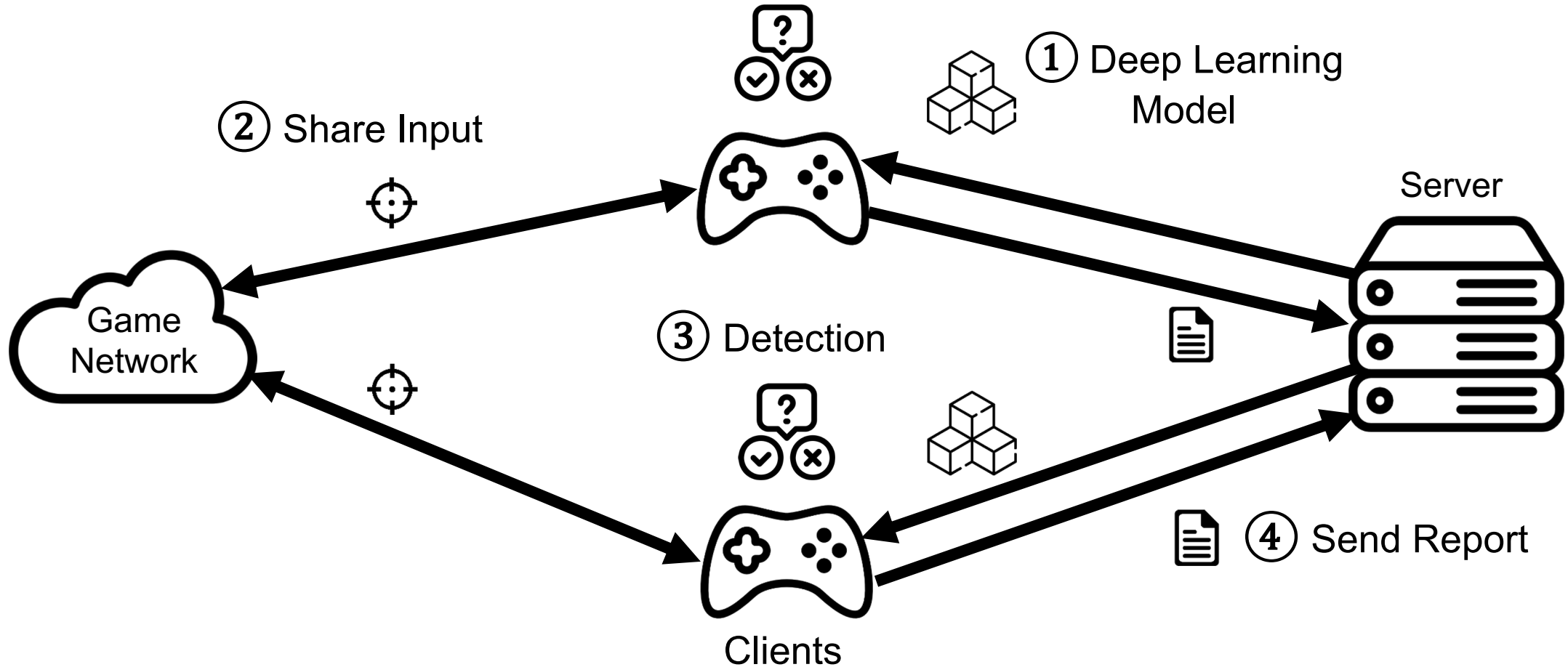
Collecting Real Game Data

Hired 14 gamers

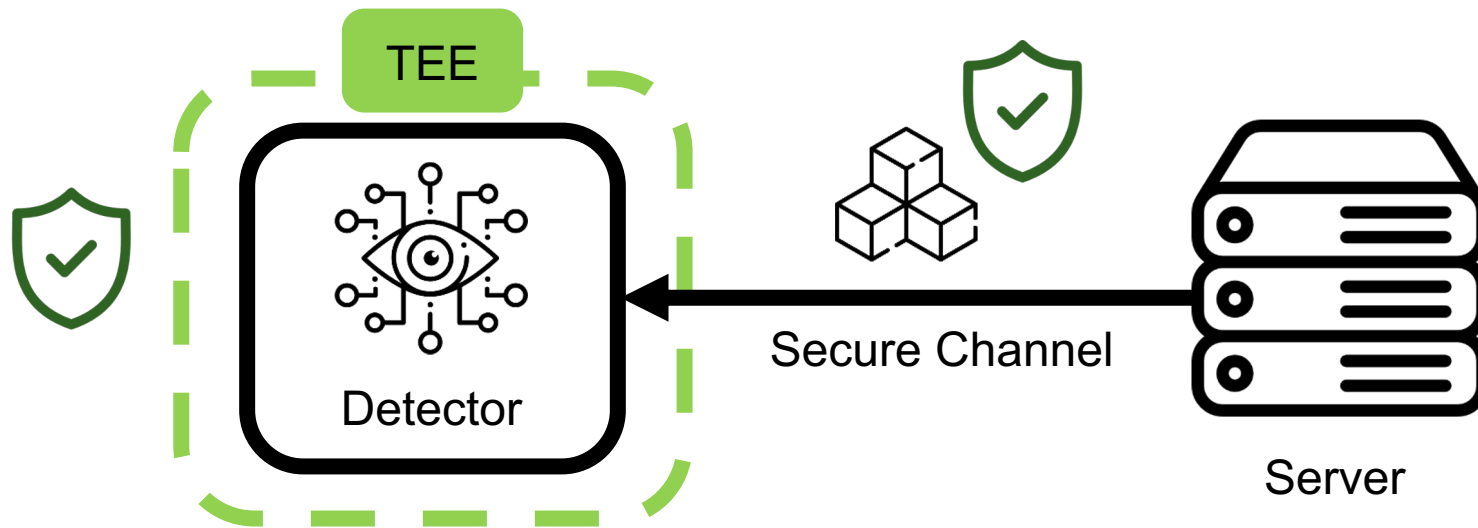


First publicly available real-world high-quality game data

BotScreen Overview

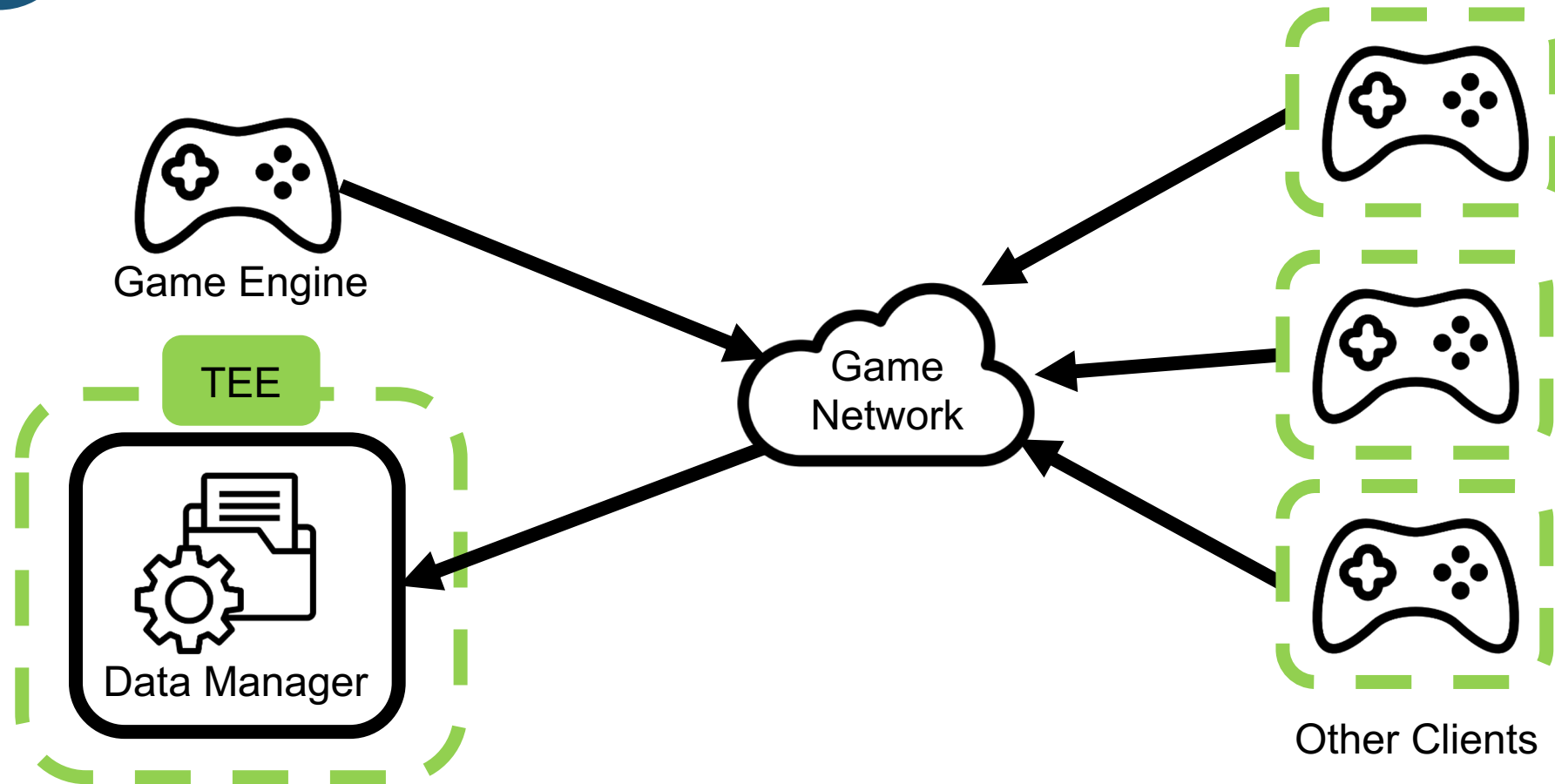


① Safely Distribute Detection Model

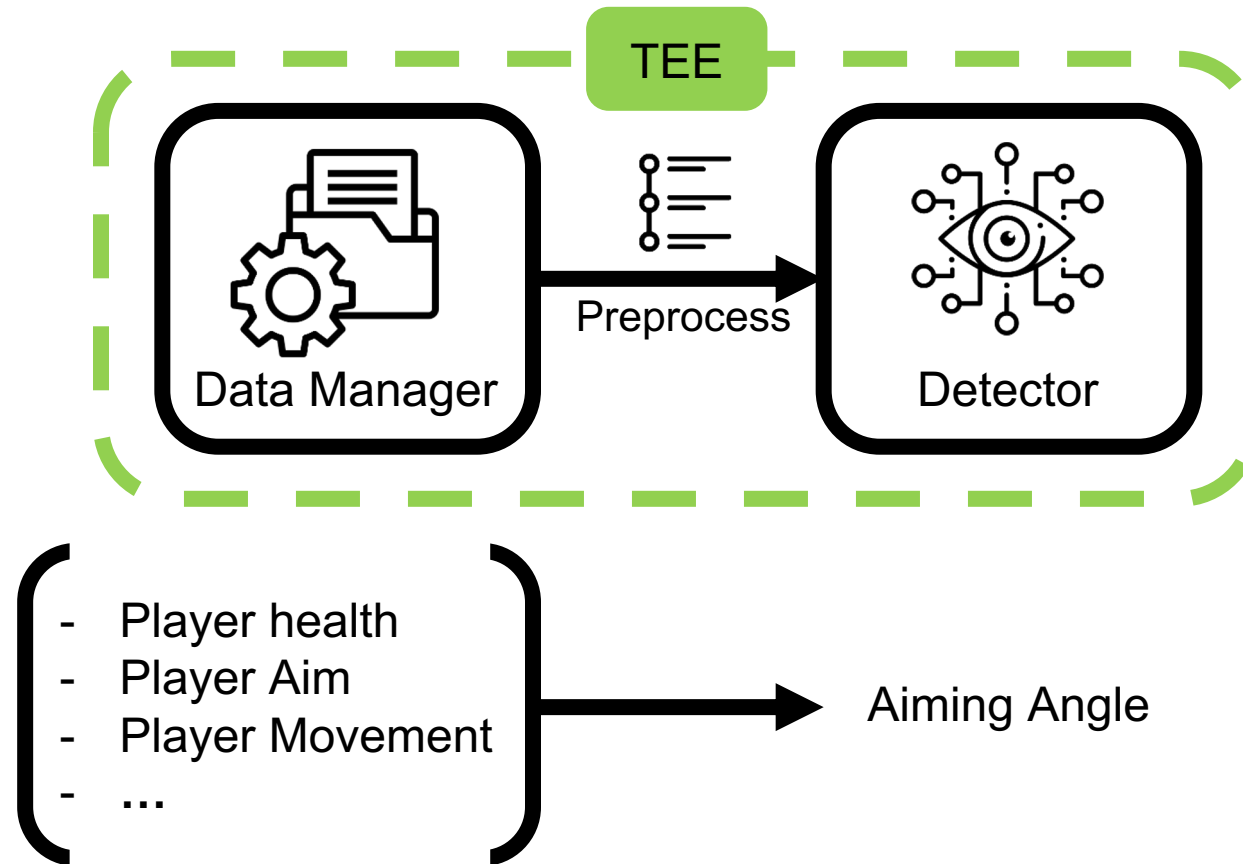


Attacker Cannot Tamper Detection Model

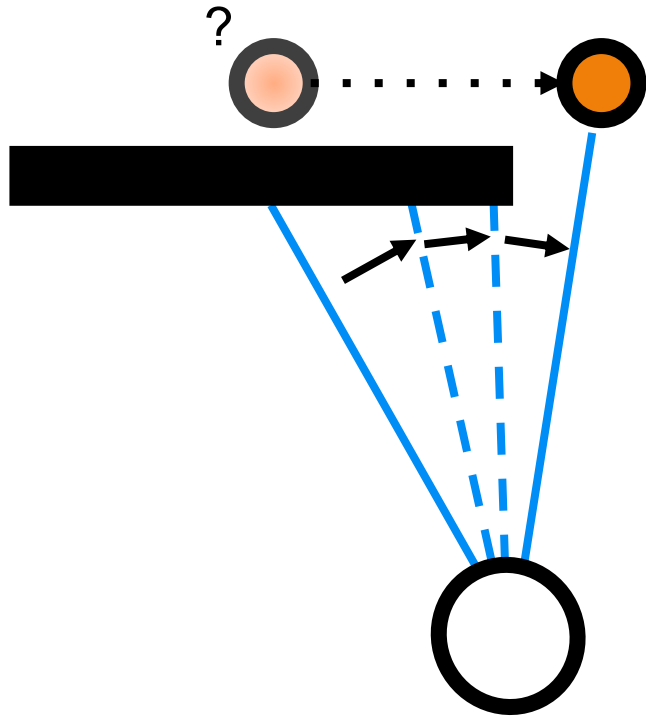
② Sharing Inputs



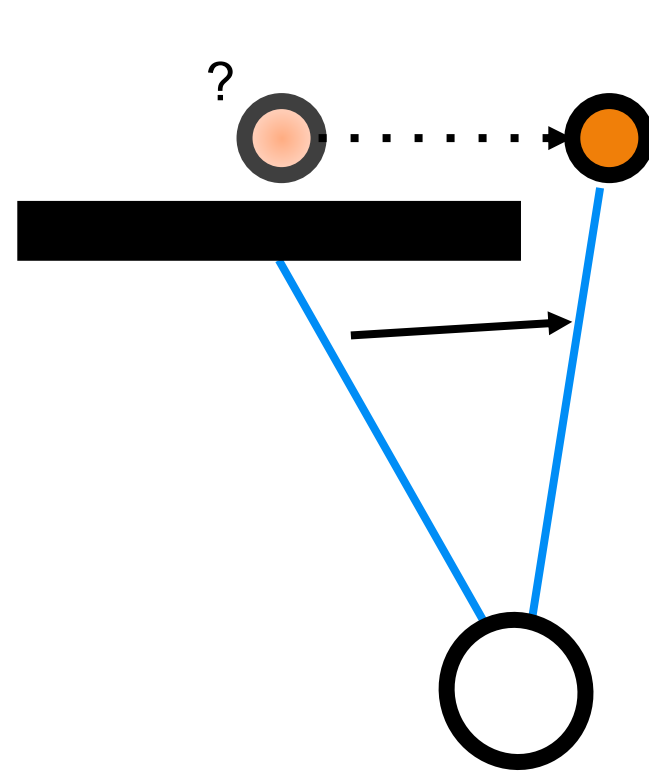
3A Extract Features



Detecting with Aiming Angle

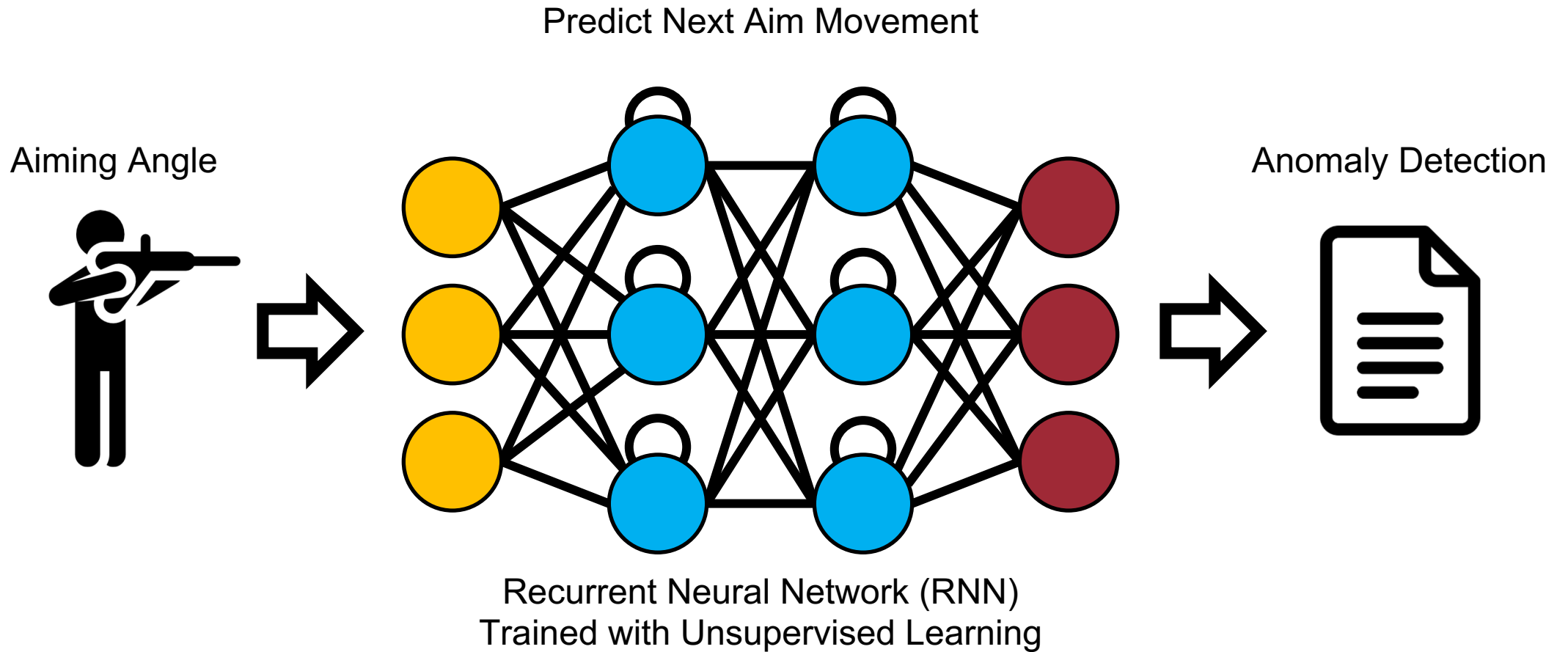


Honest Player

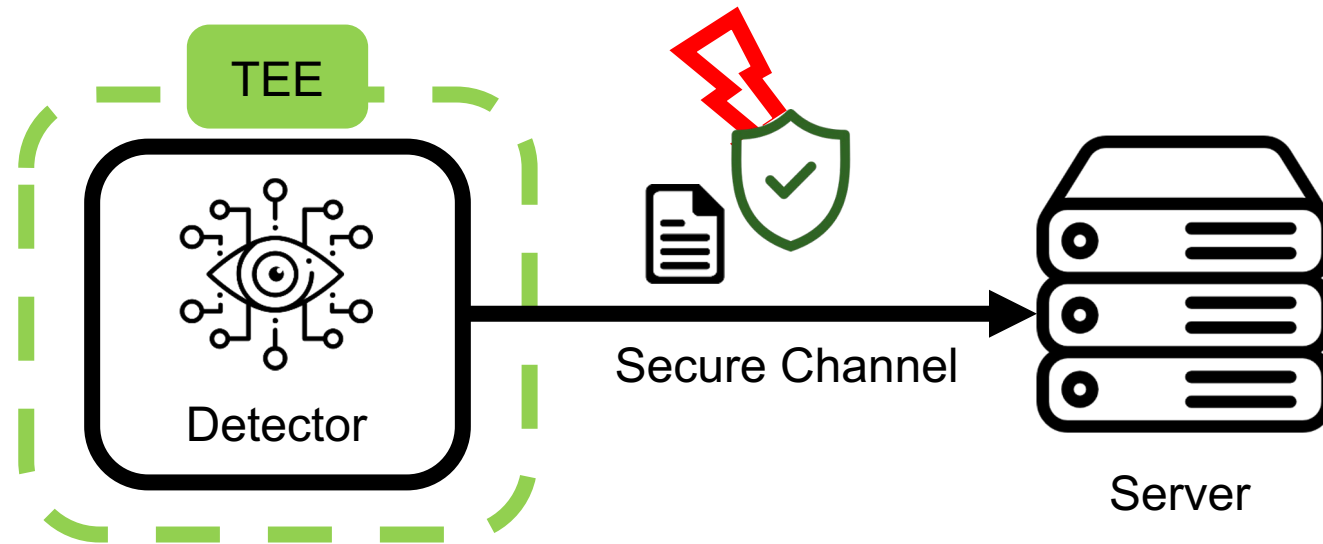


Aimbot Player

3B Detection Model



④ Send Trusted Report



Attackers Cannot Tamper Detection Result

Evaluation

- Can BotScreen accurately detect aimbots?
(Is it more accurate than other methods?)
- How does BotScreen affect game performance?

Implementation

- Counter-Strike: Global Offensive as a target game
- Stacked GRU for RNN model
- Intel SGX for TEE

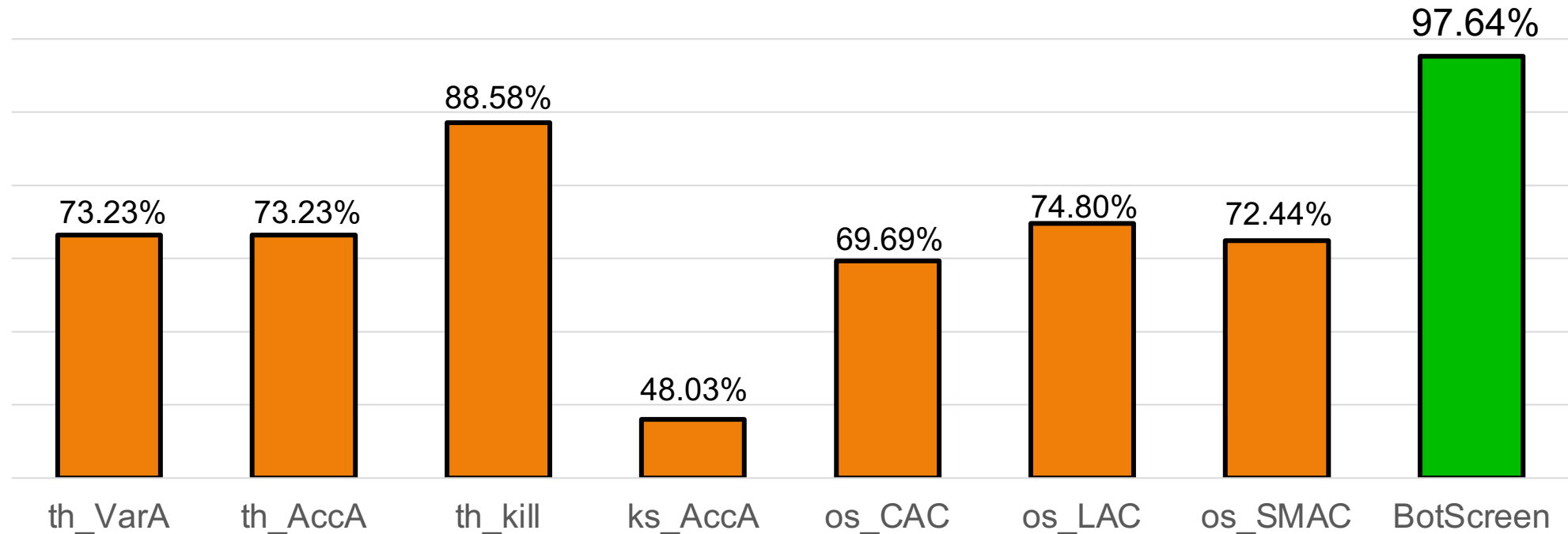
Dataset

- Recruited 14 players
- Played CS:GO
 - Total 28 games
 - Deathmatch mode on various setups
- Recorded benign, aimbot player data
 - Used Osiris[1] for aimbot

Previous Detection Methods

- Threshold based Statistic Methods
 - `th_VarA` : Check variation of aiming exceeds
 - `th_AccA` : Check acceleration of aiming exceeds
 - `th_Kill` : Check overall kill count exceeds
 - `ks_AccA[1]` : Check acceleration of aiming is dissimilar from others
- Open-source Methods
 - 3 CS:GO open-source detection tool from GitHub
 - COW Anti-Cheat, Little Anti-Cheat, SMAC

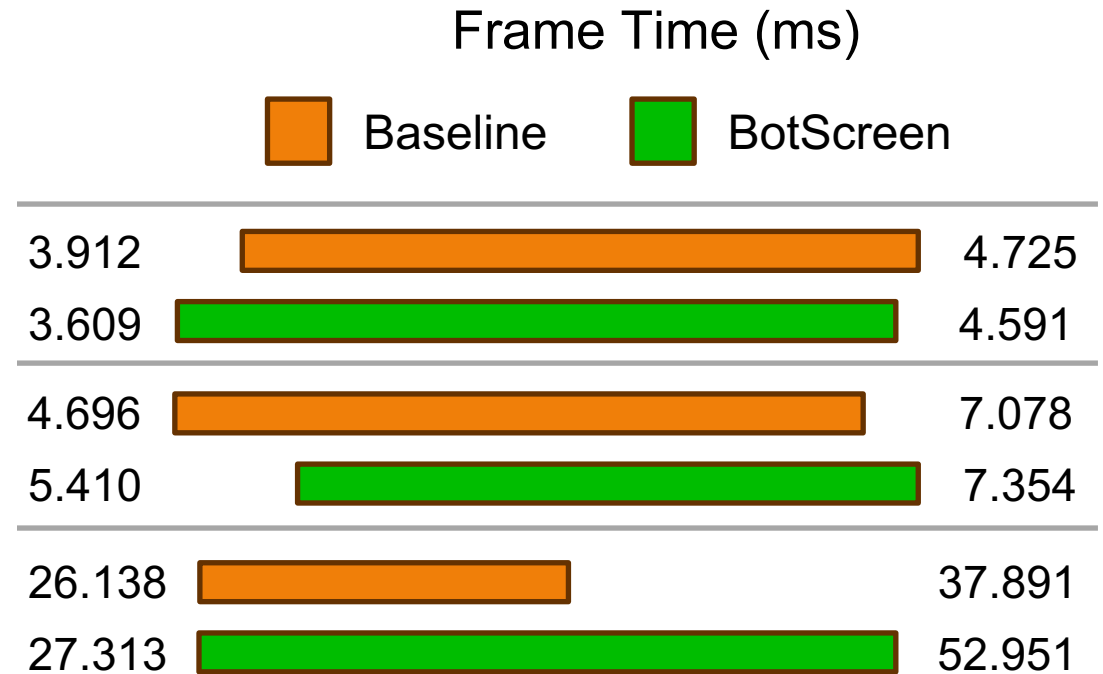
Detection Accuracy



BotScreen Outperforms All the state-of-the-art Methods

Performance Overhead

	Setup		
	CPU	GPU	RAM
High	Intel i7-10700K	RTX 3080	32GB
Mid	Intel i7-7700K	RTX 1050	16GB
Low	Intel i7-7700K (1 Core, max 2.4GHz)	CPU integrated	4GB



BotScreen Incurs Negligible Overhead

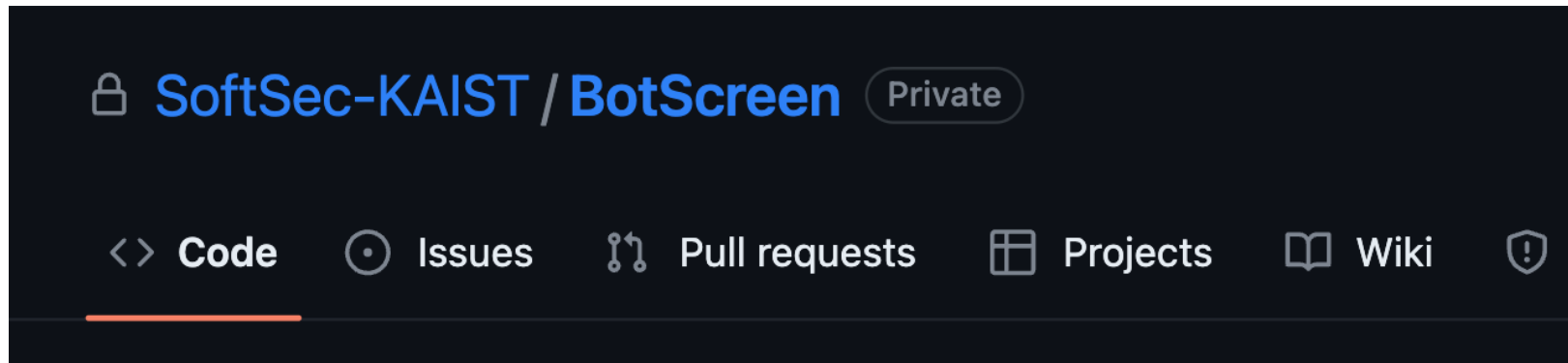
More in the Paper

- Ethical Assessment
- Details about game data preprocessing
- Parameter selection for RNN model
- Accuracy Comparison in different bases
- Applicability to other games
- ...

Open Science



- <https://github.com/SoftSec-KAIST/BotScreen>
- Datasets are also available



Question?