

School of Technology Management & Engineering

NMIMS, Navi Mumbai Campus

**Topic Approval Form**

AY 25-26

Program: B Tech AIDS Semester: VII

**Project Team details**

Group no.: 2

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| **Sr. No.** | **SAP ID** | **Roll No** | **Name** | **Signature** |
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Type of Project (Tick any one)

**Application □ Product □ Research □**

**Project Details**

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| Title | Passive CAPTCHA for Web Bot Detection |
| Project Objectives | * Develop a solution that passively collects environmental and behavioral data from a user's browser. * Utilize an AI/ML model on the backend to analyze collected data. * Accurately identify bots. * Protect UIDAI's backend APIs from DoS/DDoS vulnerabilities without significant human interaction. * Detect web bots that have a browser-like fingerprint and exhibit human-like behaviour, as these are particularly difficult to detect |
| Motivation | * The digital realm is increasingly dominated by web bots, which are exploited for malicious activities such as data theft, fraud, and denial-of-service attacks. * There's a persistent "arms race" in cybersecurity where advancements in bot-detection are met with increasingly sophisticated evasion tactics, especially through mimicking human-like behavior and browser fingerprints. * Traditional CAPTCHA technologies have become easily bypass-able due to advancements in AI. * AI-generated behaviours can significantly reduce the performance of bot detection systems and achieve near-human-level pass rates on commercial CAPTCHA systems |
| Expected outcomes | * A passive, multi-layered solution that distinguishes between human users and bots, replacing disruptive CAPTCHAs. * A frontend capable of capturing environmental and browser parameters, as well as behavioral biometrics like mouse movements. * A backend system employing AI/ML analysis, including a web log module using an ensemble of classifiers (Support Vector Machines, Random Forests). * A mouse movement module utilizing a Convolutional Neural Network (CNN) classifier trained on mouse movement data. * A fusion of detection modules that prioritizes mouse movement scores for a more robust detection approach. * The ability to use minimal interactive data or a honeypot trap if passive analysis is inconclusive. |

**Latest References**

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| --- | --- |
| **Sr. No.** | **Publication (Author, “Title”, Journal/Book/Conference, Date, Page, Volume, year)** |
|  | Javier Martínez Llamas, Koen Vranckaert, Davy Preuveneers, Wouter Joosen, “Balancing Security and Privacy: Web Bot Detection, Privacy Challenges, and Regulatory Compliance under the GDPR and AI Act”, PMC, N/A, N/A, 11962364, 2025. |
|  | Jiahua Liu, Zeyuan Cui, Wenhan Ge, Pengxiang Zhan, “DMTG: A Human-Like Mouse Trajectory Generation Bot Based on Entropy-Controlled Diffusion Networks”, arXiv, N/A, N/A, abs/2410.18233, 2024. |
|  | Christos Iliou, Theodoros Kostoulas, Theodora Tsikrika, Vasilis Katos, Stefanos Vrochidis, “Detection of Advanced Web Bots by Combining Web Logs with Mouse Behavioural Biometrics”, ACM, N/A, N/A, 3447815, 2021. |
|  | Christos Iliou, Theodoros Kostoulas, Theodora Tsikrika, Vasilios Katos, “Web Bot Detection Evasion Using Generative Adversarial Networks”, N/A, N/A, N/A, 354391714, 2021. |
|  | Grażyna Suchacka, Jacek Iwański, “Identifying legitimate Web users and bots with different traffic profiles”, Knowledge-Based Systems, N/A, 105875, N/A, 2020. |

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| Comments/ Remarks |  |
| Faculty Mentor: Dr. Preeti Agrawal | Sign: |
| Panel Member 1:  Panel Member 2: | Sign:  Sign: |
| Dr. Preeti Gupta  Associate Dean, STME  NMIMS Navi Mumbai | Sign: |

If any change in project title after Review 1 presentation as per comments received from panel and areas of concern to be noted here