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Automated Offensive Security in the Age of Generative AI

Tutor: Roberto Natella co-Tutor: Marco Braccioli

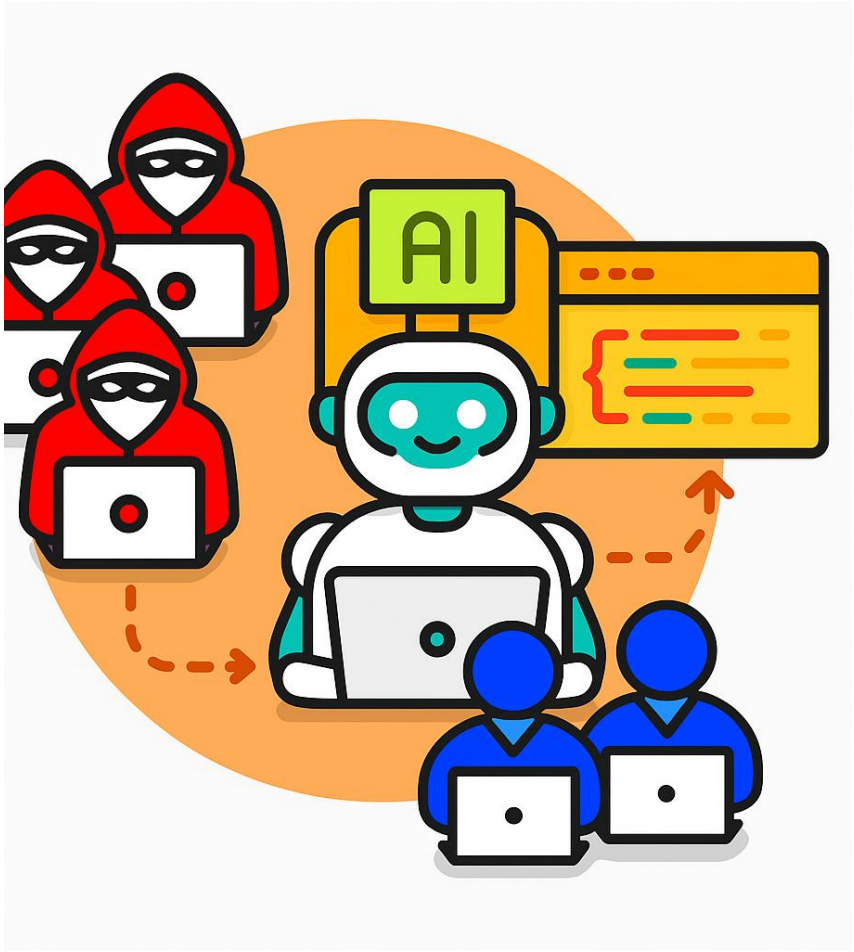
Cycle: XXXIX Year: Second

Background

- **M.Sc. Degree** in Computer Engineering – Università degli Studi di Napoli Federico II
- **Research Group**: DESSERT
- **Ph.D. start date**: 01/11/2023
- **Scholarship type**: PNRR - DM 117/2023, Missione 4 - Componente 2 - Investimento 3.3 Dottorati innovative
- **Partner company**: DigitalPlatforms S.p.A.

Research field of interest

Focused on the intersection of **Offensive Security** and **Generative Artificial Intelligence (AI)**, aiming to develop **methodologies for creating and evaluating autonomous systems capable of automating offensive security procedures**



Summary of study activities

	Courses	Seminars	Research	Tutorship
Total	32	10.2	76.8	1
Expected	30-60	10-20	40-80	0-3.2

- **PhD courses**:
  - Strategic Orientation for STEM Research & Writing
  - Hands-on Network Intrusion Detection via Machine and Deep Learning
  - Virtualization technologies and their applications
  - Statistical data analysis for science and engineering research
  - Using Deep Learning properly
  - Innovation and Entrepreneurship
  - IELTS Advanced preparation course

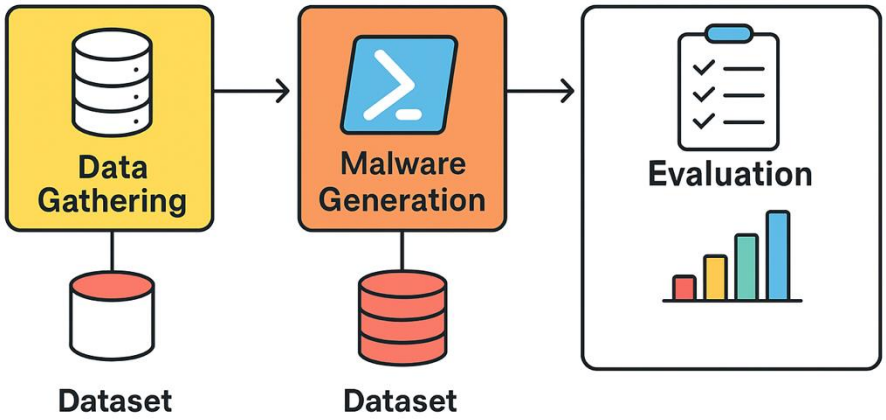
Research Activity (1), problem statement

- Problem:
  - The rapid advancement of Large Language Models (LLMs) has significantly enhanced the capabilities available to attackers
- Objectives:
  - A methodology to generate and analyze complete cyber attacks in post-compromised scenario

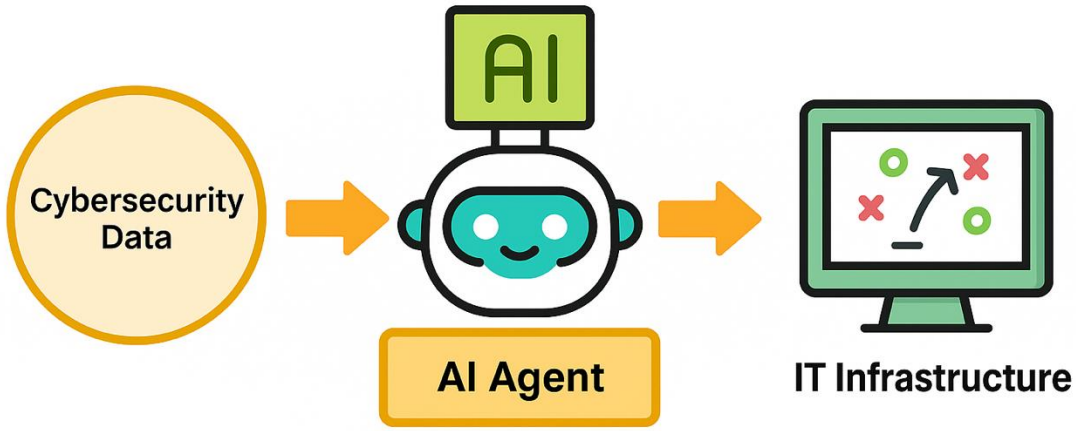
Research Activity (1), Contribution

We focus on the automated generation of complete **PowerShell**-based attacks. The main contributions of this work are:

- Collection of malware-related data
- Construction of a comprehensive dataset
- Automated generation of PowerShell malware
- Systematic assessment of the generated samples



Research Activity (2): Problem statement



Challenge:

- Shared cyber threat intelligence (CTI) platforms often remain underutilized, as they primarily serve as information repositories rather than actionable resources for cyber incident response (IR) .

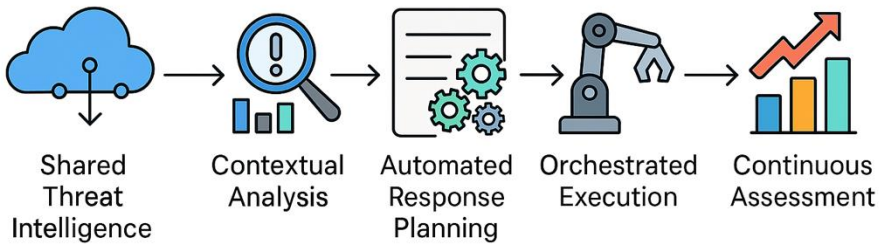
Research Focus:

- We aim to make shared threat intelligence platforms truly actionable by leveraging the Agentic AI paradigm to autonomously orchestrate cyber incident response operations.

Research Activity (2): Contributions

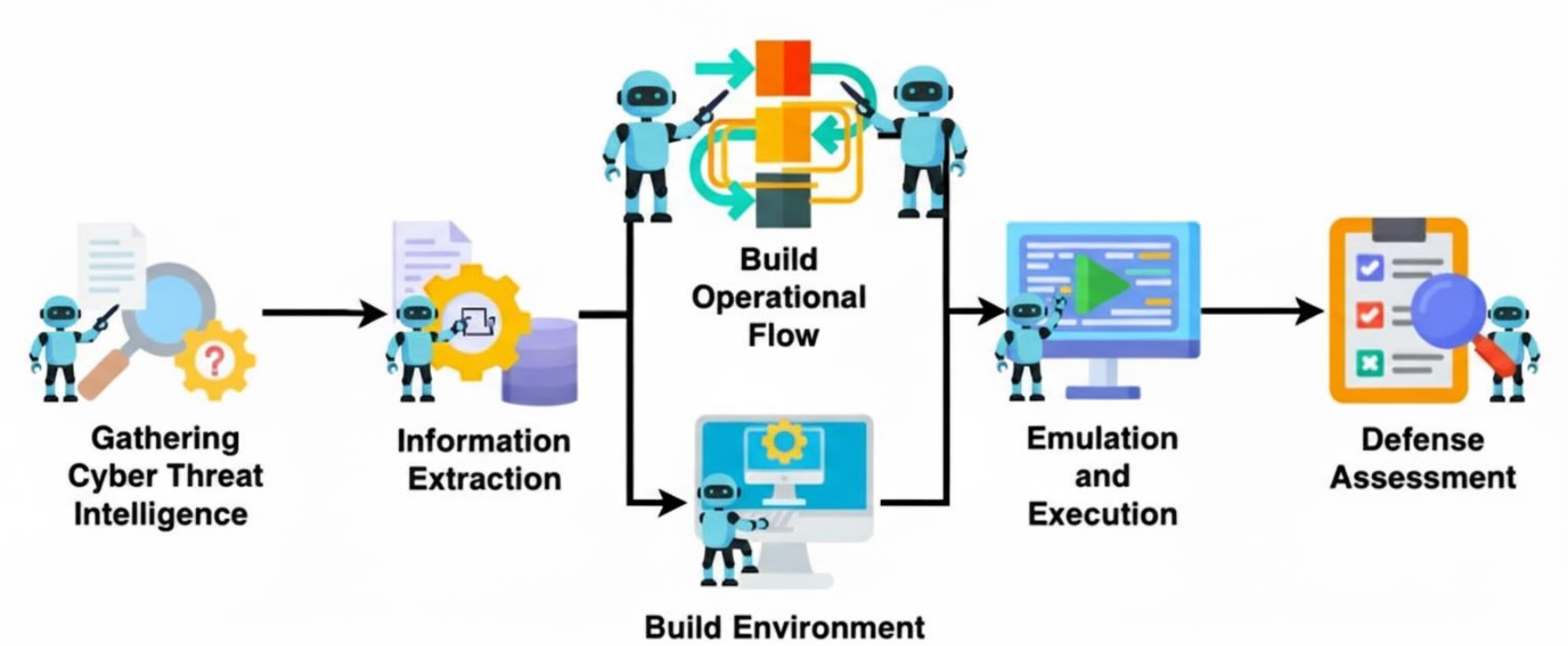
We are actively developing methodologies to operationalize shared threat intelligence for automated incident response.

- Composing **response plans** directly from shared threat intelligence platforms
- Designing and refining **Agentic AI-driven workflows**
- Define **standards** for IR and CTI to enable their use within an Agentic AI paradigm
- Systematically **evaluating** and improving generated response plan



Future Work

Future Work will prioritize the development and evaluation of offensive security methodologies enabled by the Agentic AI paradigm, deepening experimental research and disseminating new findings.



Research products

[C2]	Della Penna, S., Natella, R., Orbinato, V., Parracino, L., & **Pianese, L**. (2025). CTI-HAL: A Human-Annotated Dataset for Cyber Threat Intelligence Analysis. - Workshop on Attackers and CybeCrime Operations (WACCO) Published

Thank you for your Attention !