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Genève

21st June 2023

MONITORING LARGE GENERATIVE LANGUAGE MODELS:

TRENDS AND IMPACT ON CYBERSECURITY AND ON COMPETITIVE INTELLIGENCE

Hes·so

HES-SO Team

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Objectives

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Monitoring trends and support the DDPS cyber defense **strategy**

- **Conducting a bibliometric** analysis of publications related to major **generative language models**
- **Tracking** the trends and cybersecurity implications of **large generative language models**
- **Tracking** the trends and competitive intelligence implications of **large generative language models**

Ambitions

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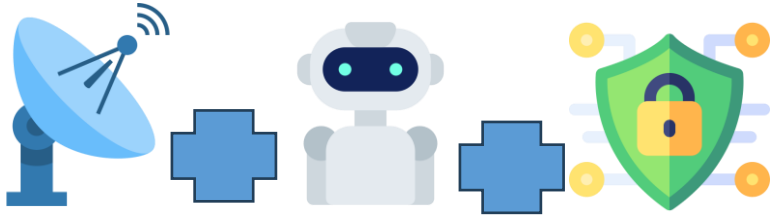
We intend to become an active center of Competence in



Competitive intelligence | **Artificial intelligence** | **Cybersecurity**

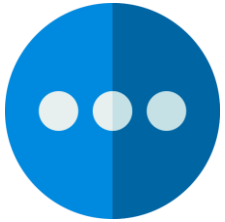
This means an active approach to technology watch

Workshops

Networking

Dedicated web page

Internal communication



and more...

Methodology

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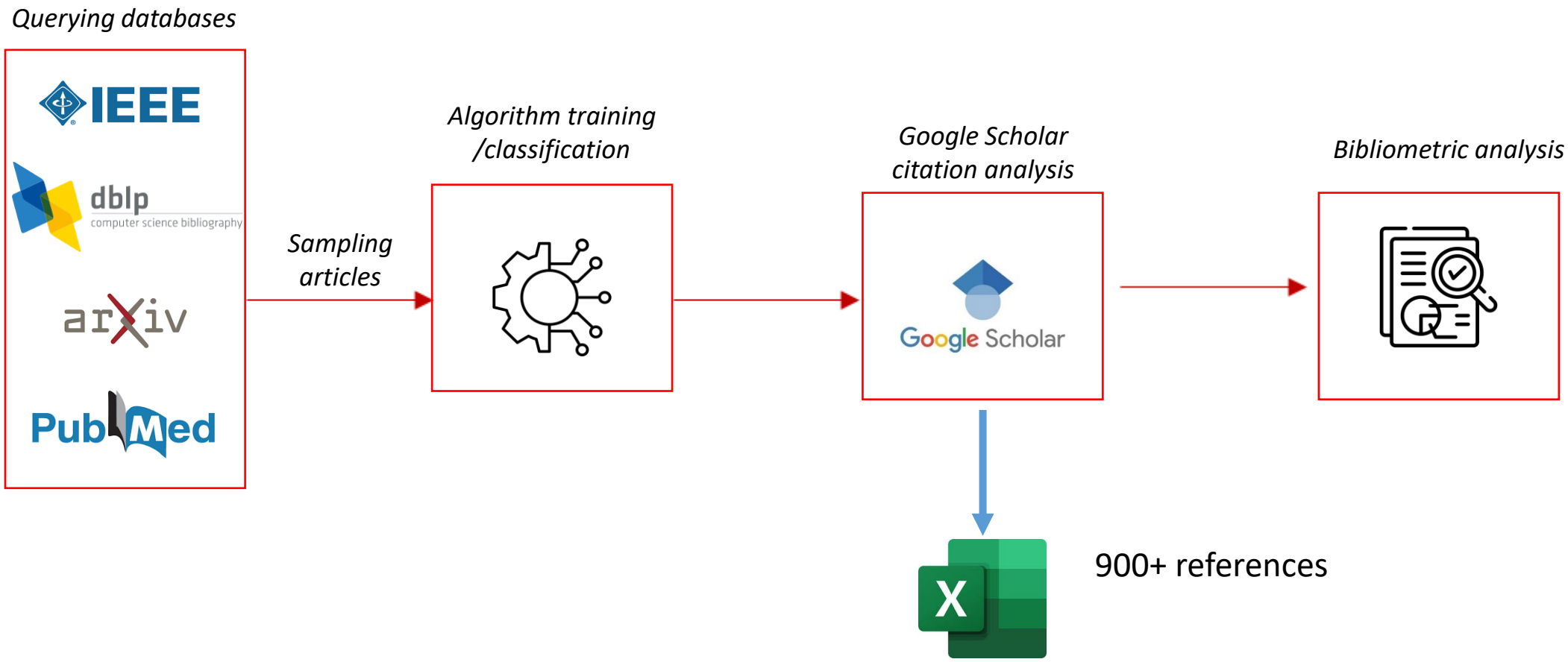
Data pipeline



Flowatcher in action

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A software in constant evolution

Secure Code

- Repair cybersecurity bugs
  - Difficult without comprehensive sources
- Copilot uses Codex
  - Trained on public Github repos
- Code is not always robust to certain attacks
- Can introduce security bugs

Testing

- Red Teaming
- Adversarial Testing
  - Generation adversarial examples
- Mutation Testing
  - Make changes to input data to see effect
- Using regex to speed up testing (ReLM)
  - Succinct queries, scalable testing

Attacks

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- Direct and indirect prompt injection
  - Manipulating prompts to cause leakage, DoS or toxic content
  - Sydney chatbot replica created from hidden text (font size, color)

- Model poisoning - Inject malicious data into training data
- Adversarial examples E.g., fake news article
- Data poisoning (triggers) - Syntax-based and translation-based
- Backdoor attacks
  - Trigger for specific inputs
- Model inversion attacks
  - Reconstruct training data or input data from model's output
    - E.g., Samsung attack

Jailbreaking Strategies

- Attention shifting
  - Shift model's attention from Q&A to story telling
  - E.g., Text continuation

- Pretending
  - Pretend to have different goals to actual intentions (over 97% of jailbreak attacks)
  - E.g., Role-playing games

- Privilege escalation
  - Incite model to break imposed restrictions rather than by-passing them
  - E.g., sudo mode pattern

Shields

- Training on Dark Web corpus, e.g., DarkBERT
- Honeypots
- Privacy preserving prompt tuning
- Structured access schemes to control interaction
- AIGC detection - Watermarking, classifier-based, likelihood based
- Models
  - Generative Adversarial Network models for SPAM and anomaly detection
  - Generative Pre-trained Transformer models for NLP tasks, fake Cyberthreat intelligence
  - BERT-based models for SOC applications
- Threat modeling (STRIDE)
- SentinelOne and Microsoft Copilot
- ChatGPT for user authentication

Spears and Metrics

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- Phishing
  - Automating labor-intensive tasks
    - Finding targets, personalized messages (measured by coherency, grammar, ….)
    - *Replying to ransomware payment questions*

- Social engineering
  - Using ChatGPT adds to deliver malware (e.g., Redline Stealer malware)

- Malware
  - Zero-knowledge implementation of code for Top 10 Mitre Attacks
  - Polymorphic malware (e.g., Black Mamba keylogger)
  - From Stack Overflow questions to malicious libraries
  - Vulnerabilities in ChatGPT libraries

Societal Impact

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- Use of “regulatory sandbox” to facilitate experimentation in AI
  - G7 leaders calling for controls

- Impact of algorithms on poverty
  - World Bank-funded algorithm to determine which families should receive financial assistance
- Role of humans as data workers for AI
- Real risks of AI
  - Security, ethics and politics.
- Measurement and mitigation of bias and hostile AI

Competitive intelligence impact

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- LLM models : **virtual assistants** for CI pros
  - Especially helpful for the **analysis phases** of the competitive intelligence (summarizing, synthetizing, report generation)

- Multiplicity of **new tools** allowing to search for web information (webchatgpt extension, You, perplexity.ai, Bing chat...)

- New strategy for BING

  => many search engine who used the free BING API cannot use it anymore (Duckduckgo, Ecosia, Qwant, Brave Search etc...)

  => **Search engine rarefaction**

Thank you for your attention

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Your questions are welcome!