Name : Dev Parekh

PRN : 22UF17146CM101

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Topic : Self Learning Assessment - Applications of AI in Cyber Security

Applications of AI in Cyber Security and Digital Forensics

Cyber threats are growing rapidly as organizations rely more on digital systems. Attackers are becoming smarter, tools are more advanced, and new technologies introduce new risks. Because of this, security professionals must constantly improve their methods for protecting and analyzing systems.

Artificial Intelligence (AI) has become one of the most important technologies in cyber security today. It helps not only with detecting cyber attacks but also supports digital forensic investigations after incidents occur. As a college student learning cyber security, I believe understanding AI-driven security is essential for future professionals in this field.

Why AI Matters in Cyber Security

Traditional security systems use predefined rules and threat signatures. These methods are helpful but limited — they can only detect attacks that have been seen before. However, modern cyber criminals modify their malware, automate attacks, and try new techniques every day.

AI models can analyze large amounts of data and learn from patterns of behavior. This allows them to:

- ➔ Detect unknown threats
  Respond faster to attacks
  Analyze suspicious activities in real time

AI does not replace human experts — instead, it supports them and reduces the workload by handling repetitive and time-consuming tasks.

Major Applications of AI in Cyber Security

🔐 1. **Intelligent Threat Detection**

AI-based systems can detect anomalies in:

- Network traffic
- User behavior
- File activities

For example, machine learning algorithms can learn what normal behavior looks like and alert security analysts when unusual actions occur — such as unexpected login attempts at late hours or abnormal access to sensitive files.

This helps organizations catch potential attacks before serious damage happens.

⚙️ 2. **Automated Incident Response**

When a cyber attack is detected, every second matters. AI helps by:

- Automatically isolating infected systems
- Blocking suspicious IP addresses
- Restricting compromised accounts

This quick response shortens the attack window and reduces the impact of cyber incidents.

📩 3. **Detecting Phishing and Social Engineering**

Phishing emails remain one of the most successful attack methods. AI tools scan:

- Email text structure
- Sender identity
- Links and attachments

If something seems risky, the email can be marked as spam or blocked. Some advanced systems can even detect voice-based social engineering attacks using deepfake audio.

AI in Digital Forensics

Cyber security focuses on preventing and stopping attacks. Digital forensics focuses on finding evidence after an attack. AI supports investigators in many important ways:

🕵️ 1. **Faster Evidence Analysis**

Investigators collect huge amounts of data:

- Log files
- Emails
- Hard drive contents

AI tools can quickly scan and sort this data, highlight suspicious artifacts, and save valuable investigation time.

🧬 2. **Malware Classification**

Instead of manually analyzing harmful files, AI can:

- Identify malware family
- Detect infection behavior
- Predict attacker goals

This helps experts understand how the attack began and how to prevent similar incidents.

🧩 3. **Attack Path Reconstruction**

AI detects patterns in digital evidence and helps create a timeline:

- When the attacker entered
- What they accessed
- Which files were copied or modified

🎥 4. **Multimedia and Deepfake Forensics**

Cybercrimes sometimes involve images, videos, or audio.
AI models support:

- Face recognition in CCTV evidence
- Fake media (deepfake) detection

- Voice comparison for identity verification

These techniques are becoming very important as digital manipulation tools become common.

The Future of AI in Security & Forensics

AI adoption continues to grow, and many exciting developments are on the way:

➔ Self-healing systems that automatically repair vulnerabilities
➔ AI-driven threat intelligence sharing between organizations
➔ Smarter insider threat detection using behavior analytics
➔ Real-time forensic reports during active threats

Students entering this field will have many opportunities to work with these emerging technologies.

Conclusion

AI is becoming a core part of cyber security and digital forensics. It strengthens defense systems and accelerates investigations when incidents occur. Although challenges exist, the benefits are much greater.

As a student learning cyber security, I see AI as a tool that can help us be prepared for future threats. By studying AI-driven security methods today, we can build safer digital environments tomorrow.