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# How would Higher Education Cope with Artificial Intelligence?

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# About Me

**Jazi Eko Istiyanto** (age 62 years) is currently Full Professor in Electronics and Instrumentation at Universitas Gadjah Mada, Faculty of Mathematics and Natural Sciences, a position he held since 2010 before took office at BAPETEN (Indonesia Nuclear Energy Regulatory Agency) as the Chairman from February 2014 until October 2021.

Before serving the Government of Indonesia, he held academic managerial positions as Head of the Computer Science and Electronics Department (2011-2014), and Head of the Physics Department (2007-2011) Universitas Gadjah Mada.

Jazi Eko Istiyanto holds a Ph.D (1995) in Electronic Systems Engineering, and an M.Sc (1988) in Computer Science, a Postgraduate Diploma (1987) in Computer Programming and Microprocessor Applications from University of Essex, Colchester, United Kingdom, and a B.Sc (1986) in Nuclear Physics from Universitas Gadjah Mada, Yogyakarta, Indonesia.

His research interests cover embedded systems and cyber-physical systems security. He is also a registered engineer (electronic engineering) in Indonesia and ASEAN countries.





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# First We Make IT, Then IT Makes Us

**IT builds good habits**, discipline, organised, preventing errors, warning (alert/alarm), preventing delay, everything is recorded, can also be supported by Artificial Intelligence.

**IT “compel” us to do what is right**, at the right time, efficiently and effectively.

**IT can force us not to do corruption**, prevent bribery, miss-management and other irresponsible behaviour.

**Even bad people have to behave in front of IT**

**IT (eg Artificial Intelligence) can identify potential threats, and prevent them from happening**



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# Emergency Preparedness and Response



Transportation  
September 2013

Table Top Exercise  
October 2009

**Nuclear Threats must be prevented. It is nearly impossible to track stolen radioactive sources**

**Nuclear Incidents/Accidents/Trafficking etc cost a lot of money to deal with, might occupy a significant amount of space in waste disposal facility, etc**

**Integration of Information Technology between BAPETEN and BATAN**

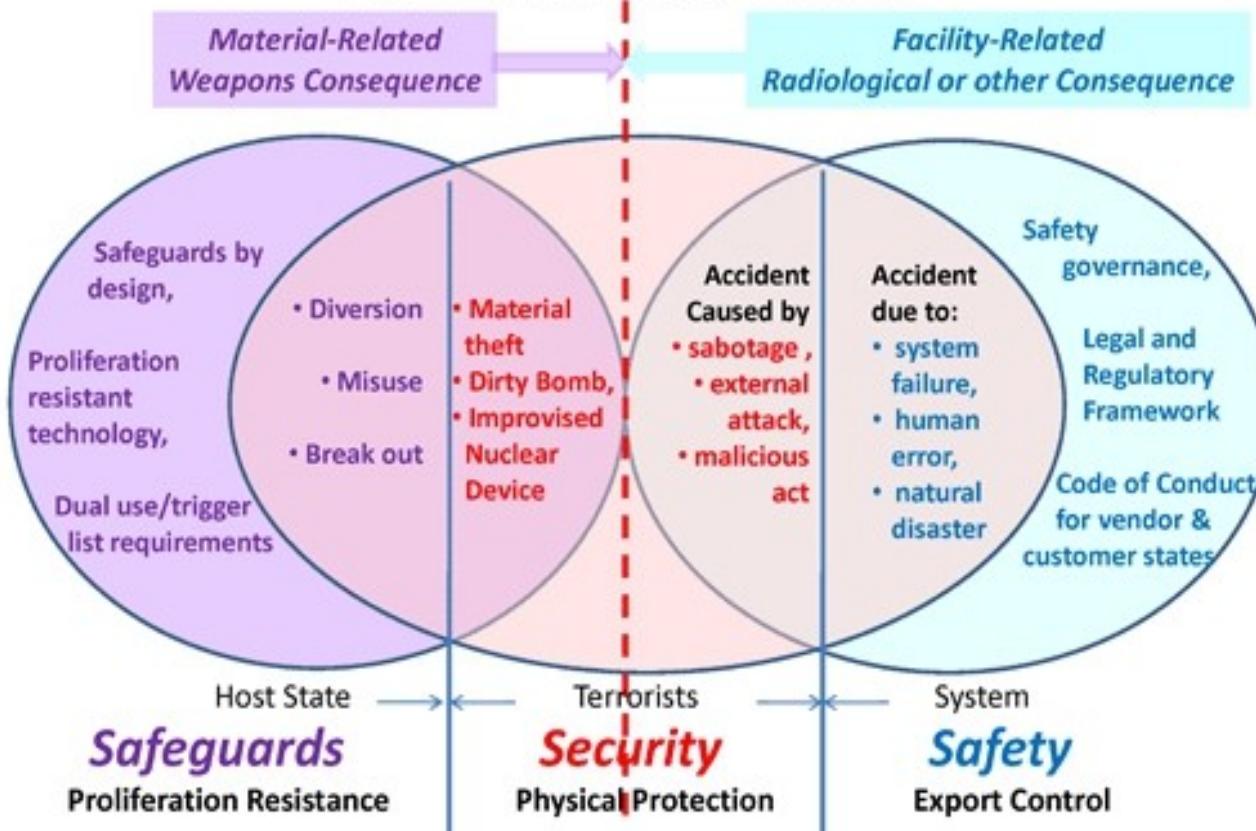


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# Safety, Security, and Safeguards, and Information Technology

## 3S (Safety, Security, & Safeguards)

International Initiative on 3S-based Nuclear Energy Infrastructure was First Proposed in the G8 Summit 2008 at Chitose, Hokkaido, Japan



+Cybersecurity  
(to secure data “at rest”, “in transit”, “in storage”), and  
Artificial Intelligence

+Blockchain  
“Immutability”  
(prevent insider threats, data modification etc)

+Data Analytics  
(profiling of stakeholders?), and  
Artificial Intelligence



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# An Intelligent Computer Server is trying to assassinate the President and masterminding a Coup de'etat



- (1) Using EBGS (and AI), BAPETEN only need to have a computer server, a Chairman, and a IT admin. Licensing and Inspection can be done “machine-to-machine” as they are all “Things” of the Internet of Things.
- (2) The computer server will get more and more intelligent as it learns through its experience in its dealings with the users
- (3) In Higher Education Institutions, professors/lecturers, administrators etc need not fill and upload the many forms. Instead their interaction with the students and among themselves serves as “the filled out forms” and already acknowledged by the server. Each then can focus more on devising a new way of teaching, research, industrial consulting, community works, etc



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# “Deus Ex-Machina” (Elon Musk)



“Gods will emerge from machines” (Elon Musk)

The Robot (Alicia Vikander) eventually kills its Creator

“Singularity” (2045) when Machine Intelligence surpasses all-human-on-Earth Intelligence

“AI is more dangerous than Nukes” (Elon Musk)



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# How does AI work? (simplified)

A newly born child learns from its mother, then its father, and other people around, and also from the environment

It then catches few words with their respective meaning

After sometimes it becomes an intelligent human being

Based on what it is trained on, the human being can be a hero or a villain, good or bad, well-behaved or naughty

2022 International Conference on Computer Engineering, Network, and Intelligent Multimedia (CENIM)

## Inductive Graph Neural Network with Causal Sampling for IoT Network Intrusion Detection System

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# Public Dataset for NIDS (Network Intrusion Detection Systems)

## Timeline

- 10 Classes
- 2.540.044 Data
- 49 Features/Attributes

UNSW-NB15  
2015



- 5 Classes
- 3.668.045 Data
- 42 Features/Attributes

BoT-IoT  
2018



- 10 Classes
- 22.339.021 Data
- 44 Features/Attributes

ToN-IoT  
2019



- 5 Classes
- 148.157 Data
- 42 Features/Attributes

NSL-KDD  
2009



- 15 Classes
- 2.830.743 Data
- 79 Features/Attributes

CICIDS  
2017



- 15 Classes
- 4,525,399 Data
- 80 Features/Attributes

CSE-CIC-IDS  
2018



\*Over the years, dataset development has become increasingly rich and diverse.



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# Advantages of e-Govt (and AI)

- Transforming the budget into Intelligence
- Easing (and alleviating) the burden of the employees so that even though take home pays do not increase, the complexity of works decrease because of work off-loading to automation
- Laws and Regulations are embedded in the software and systems to prevent mis-management, errors (reworks), “corruption”. No employee nor manager need spend some of their lives in jail
- Enabling organizations to become intelligent through interaction with the users/citizens
- Laws and Regulation across Ministries and Agencies can be harmonised via Artificial Intelligence, to reap the benefits of AI capabilities in detecting future conflicts among Laws and Regulations



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# Visit by Dr. Jeremy Epstein (NSF) to Our Lab



Cybersecurity needs AI (If you do not know the steps to solve a problem, train a machine learning algorithm –MLA-- to do the task)

Training an MLA needs lots of data, to create a Dataset

The Dataset must be protected by Cybersecurity techniques so that AI it trains is secured and does not become “wild”, and out of control

Social Media (Google, Fb, WA, etc) has been collecting data on its users and they trains AI using the Dataset they create from these Data

DIKTI can do the same through Sinta, Bima, Sister, etc. Professor and Student profiling fasten the process of promotion.



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## Imagine when industrial systems are overtaken by malicious AI (with Malik Khidir, PT Stechoq Robotika Indonesia)





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# 10 Stages of AI Development

- (1) Rule or Knowledge-based Systems**
- (2) Context-based & Retention Systems**
- (3) Narrow Domain or Expert AI Systems**
- (4) Reasoning AI Systems**
- (5) Self-Aware Systems**
- (6) Artificial General Intelligence (AGI)**
- (7) Artificial Super Intelligence (ASI)**
- (8) Transcendent AI**
- (9) Cosmic AI**
- (10) God-like AI**



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# AI Challenges and Risks in Higher Education

- (1) student (and staff/Professor/Mgmt) dishonest and un-ethical behaviors
- (2) AI algorithmic bias against certain groups in society
- (3) The Decrease in Social Interaction
- (4) An Acute Dependence on Technology
- (5) Access Equality to AI Platforms
- (6) Privacy

<https://www.educationnext.org/a-i-in-education-leap-into-new-era-machine-intelligence-carries-risks-challenges-promises/>  
<https://tech.ed.gov/files/2023/05/ai-future-of-teaching-and-learning-report.pdf>



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# Some AI Tools Used in Education and Research



ChatGPT



grammarly



QuillBot

scite\_



turnitin™



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# How AI helps in Writing An Academic Paper



Hinder **CRITICAL**  
**THINKING** development  
due to over-reliance on AI

**“Human in the Loop”** is  
still needed for verification,  
ensuring coherence, data  
completeness, and depth  
of analysis



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# Teaching and Learning in the Era of AI

From Cognitive Recall to:

- Thinking and Problem Solving
- Reasoning and Logic
- Design and Creativity
- Collaborative
- Soft Skill Embedded Education

**Variation of teaching methods: classical, project-based learning, problem based learning, ...**



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# AI in the hands of Bad Guys

- To create new Malwares (malicious software/hardware)
- To build Dark Webs
- To launch a Cyber Attack (Phising, DDOS – Distributed Denial of Services, etc)
- To find vulnerabilities in Computer Protocol to exploit (This is also done by the good guys for opposite reasons, to secure)
- To write a un-secure software/hardware





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# ChatGPT(1) – The End of Literature Review?

Sebagai arah untuk penelitian masa depan, otomatisasi proses pengukuran dapat ditingkatkan untuk memberikan hasil yang lebih akurat. Selain itu, variasi perangkat IoT yang dievaluasi dapat diperluas untuk meningkatkan validitas penelitian dan memberikan wawasan yang lebih kaya. Akhirnya, penelitian dapat difokuskan pada penutupan komponen perangkat keras yang tidak perlu bekerja dan port keluaran saat melakukan pengukuran serta menggunakan sistem operasi berbasis konsol (tanpa GUI) untuk mengurangi konsumsi daya yang terukur. Hal ini dapat membantu mengurangi konsumsi daya secara signifikan.

J

ringkas jadi point point



- Dalam pengujian, model perangkat Raspberry Pi 3 dan Pi Zero digunakan untuk mengukur konsumsi energi saat menjalankan berbagai algoritma kriptografi.
- Pi 3 tampil lebih unggul dalam hal kinerja daripada Pi Zero, dengan perbedaan sekitar dua kali lipat.
- Rata-rata, kedua perangkat memiliki tingkat konsumsi energi yang serupa.
- Pi Zero terlihat lebih boros dalam algoritma yang diukur berdasarkan konsumsi energi per operasi ( $\mu\text{Wh}/\text{Operation}$ ), mungkin karena lebih cocok untuk dijalankan pada model Pi 3 dengan empat inti pemrosesan.
- Keputusan pemilihan perangkat harus didasarkan pada kebutuhan dan prioritas, seperti biaya atau kinerja.
- Dalam penelitian masa depan, otomatisasi pengukuran dapat ditingkatkan, variasi perangkat IoT dapat diperluas, dan penghematan energi perangkat dapat dipertimbangkan.



## Capable of Summarising A Given Text



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# ChatGPT(2)-- The End of Consulting?

The screenshot shows a ChatGPT interface. The user asks, "what is the definition of Artificial Intelligence?" The AI responds with a detailed explanation of what AI is, mentioning it's a field of computer science and technology focused on creating systems and machines capable of performing tasks requiring human intelligence. It then defines AI systems as designed to mimic human intelligence, mentioning machine learning, neural networks, natural language processing, and more. The AI categorizes AI into two main types: Narrow or Weak AI (ANI) and General or Strong AI (AGI). It provides examples for both, noting that ANI systems are designed for specific tasks like Siri and Alexa, while AGI is a theoretical concept still being developed. Finally, the AI lists several applications of AI across various domains, including healthcare, finance, education, autonomous vehicles, robotics, and more, highlighting its potential to automate repetitive tasks and improve efficiency.

Capable of Answering a  
Theoretical Question



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# ChatGPT(3) – The End of Programmers?

Default (GPT-3.5)

Change it into the python language

```
python
Certainly! Here's the same smart door system simulation in Python:
import random
import time

# Simulated motion sensor function
def is_motion_detected():
    # Simulate the presence of motion by generating random values
    return random.choice([True, False]) # 50% chance of detecting motion

if __name__ == '__main__':
    # Seed the random number generator
    random.seed()

    # Simulated smart door system
    door_open = False

    while True:
        if is_motion_detected():

            if motion:
                print("Motion detected. Opening the door.")
                door_open = True
            else:
                print("No motion detected.")
                door_open = False

            # Simulate the door closing after a few seconds
            if door_open:
                time.sleep(3)
                door_open = False
                print("Door closed.")

        # Wait for a moment before checking again
        time.sleep(1)

    # Wait for a moment before checking again
    time.sleep(1)
```

Send a message

create a smart door system that can open when detect movement using a sensor in C++

```
cpp
Creating a smart door system that opens when it detects movement using a sensor in C++ typically involves interfacing with hardware components like a motion sensor or PIR (Passive Infrared) sensor. Below is a simplified example of C++ code that simulates the behavior of such a system. Please note that this is a basic software simulation and not a full-fledged hardware implementation.

#include <iostream>
#include <thread>
#include <random>

// Simulated motion sensor function
bool isMotionDetected() {
    // Simulate the presence of motion by generating random values
    return (rand() % 2 == 1); // 50% chance of detecting motion
}

int main() {
    srand(static_cast<unsigned>(time(nullptr))); // Seed the random number generator

    // Simulated smart door system
    bool doorOpen = false;

    while (true) {
        bool motion = isMotionDetected();

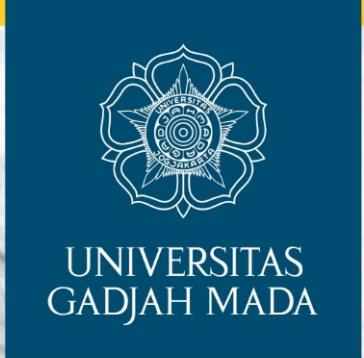
        if (motion) {
            std::cout << "Motion detected. Opening the door." << std::endl;
            doorOpen = true;
        } else {
            std::cout << "No motion detected." << std::endl;
            doorOpen = false;
        }
    }
}
```

Send a message

Smart Door System in C++

Smart Door System in Python

Capable of Programming a Hardware  
In Different Programming Languages



# ChatGPT(4) – The End of Programmers?

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Shoe Store</title>
    <link rel="stylesheet" href="style.css" />
  </head>
  <body>
    <header>
      Shoe Store
    </header>
    <main>
      <h1>Welcome to Shoe Store!</h1>
      <ul>
        <li><a href="#">Home</a></li>
        <li><a href="#">About Us</a></li>
        <li><a href="#">Contact Us</a></li>
        <li><a href="#">FAQ</a></li>
      </ul>
    </main>
    <footer>
      <small>Copyright © 2024 Shoe Store. All Rights Reserved.</small>
    </footer>
  </body>
</html>
```

```
body {
  font-family: Arial, sans-serif;
  margin: 0;
  padding: 0;
}

header {
  background-color: #333;
  color: white;
  padding: 10px;
  text-align: center;
}

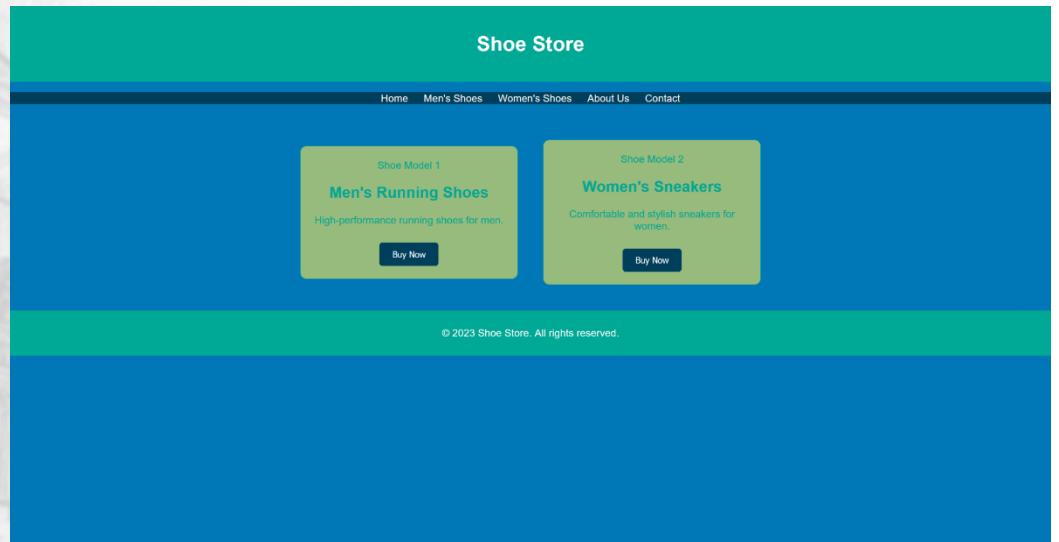
main {
  padding: 20px;
}

h1 {
  font-size: 2em;
  margin: 0;
}

ul {
  list-style-type: none;
  padding-left: 0;
}

li {
  border-bottom: 1px solid #ccc;
  padding: 5px 0;
}

small {
  font-size: 0.8em;
}
```



# Capable of Programming a Website using HTML and CSS



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# Policy On AI



- European Union has released AI Act in which any application that uses private data to be used to do social judgement will be deemed to create “unacceptable risks” and will be prohibited.
- Prohibition of ChatGPT in Schools in New York City has been lifted, but US Government has released “Blueprint on AI Rights Act”, which can be used by business to use AI ethically.
- Amazon, Anthropic, Google, Inflection, Meta, Microsoft, and OpenAI [have committed] to help move toward safe, secure, and transparent development of AI technology
- ACM Policy Recommendations on Generative Artificial Intelligence



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# Closing

- AI has many benefits, and some moral hazards
- AI models depends on Datasets which can be created from Big Data which can be collected from e-Govt interactions with its users
- A new way of teaching, and measuring professors/students performance must be devised to avoid and prevent from unethical use of AI by students and professors
- AI algorithms must be prevented from being evil, immoral, naughty. We need AI Laws and Regulation, and AI technical prowess
- Cybersecurity, Blockchain, Data Analytics, and Artificial Intelligence are to be implemented within Higher Education Institutions to prevent mischief, and to identify potential threats, and prevent them from happening



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