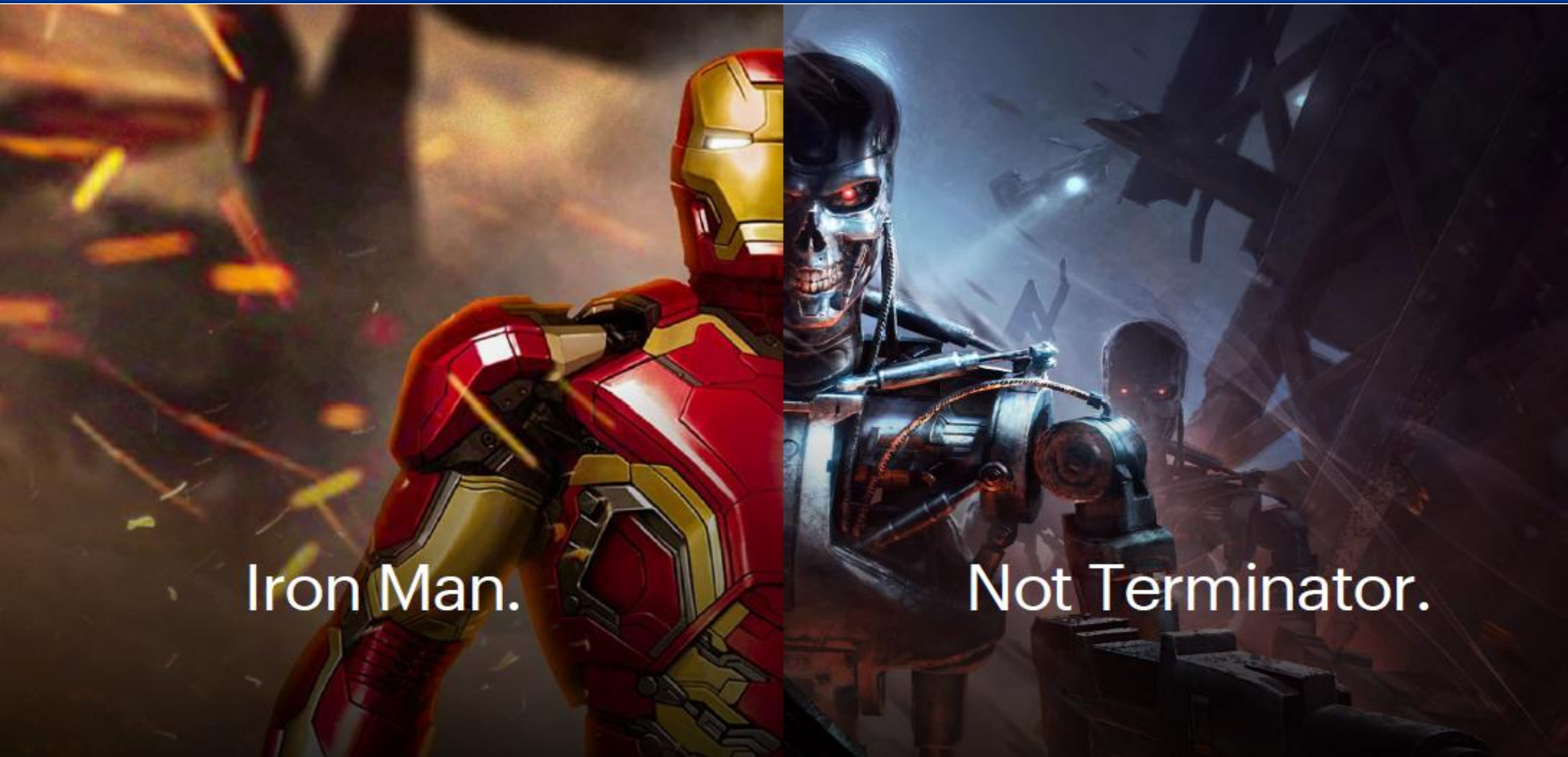
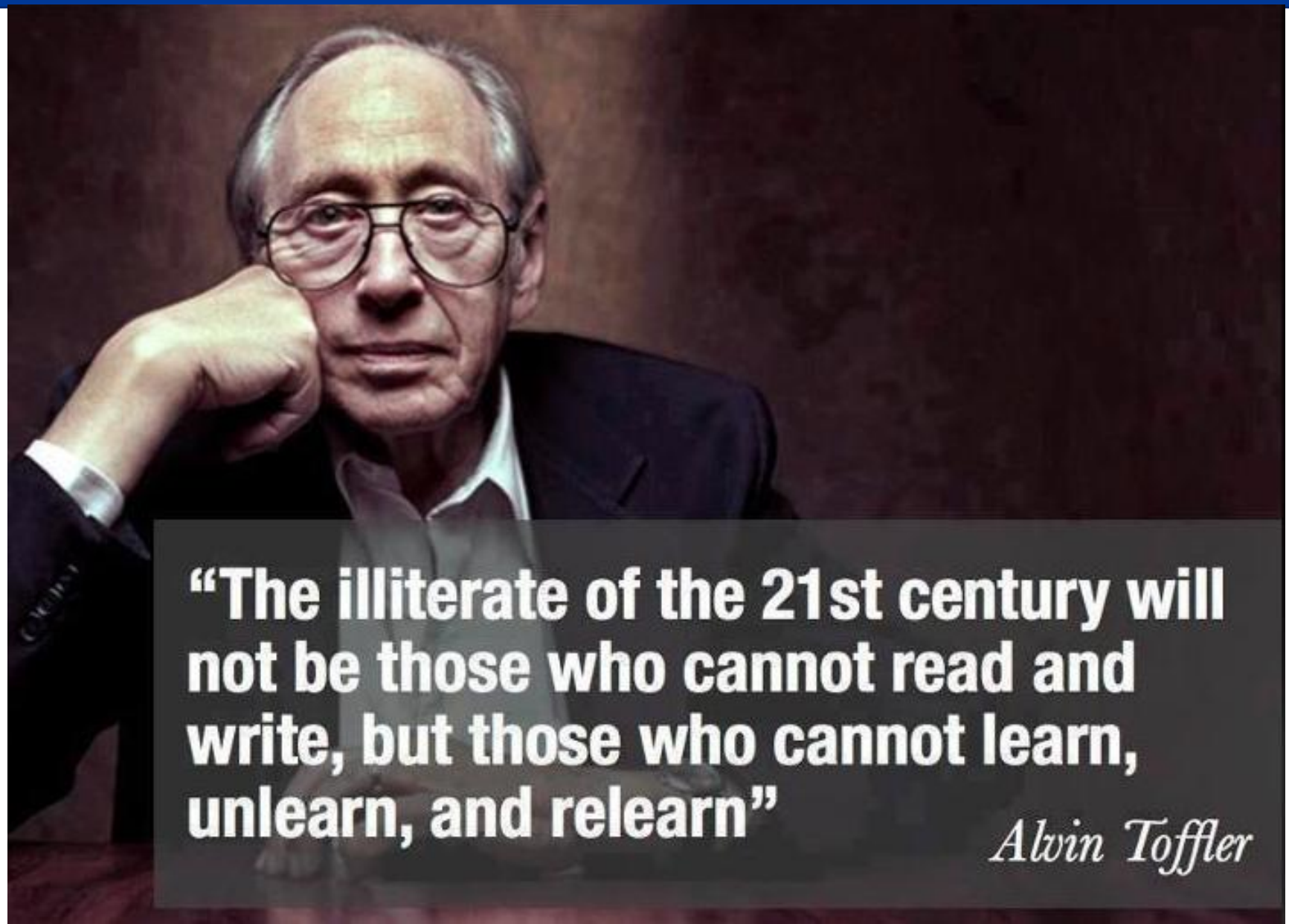
Friend or Foe



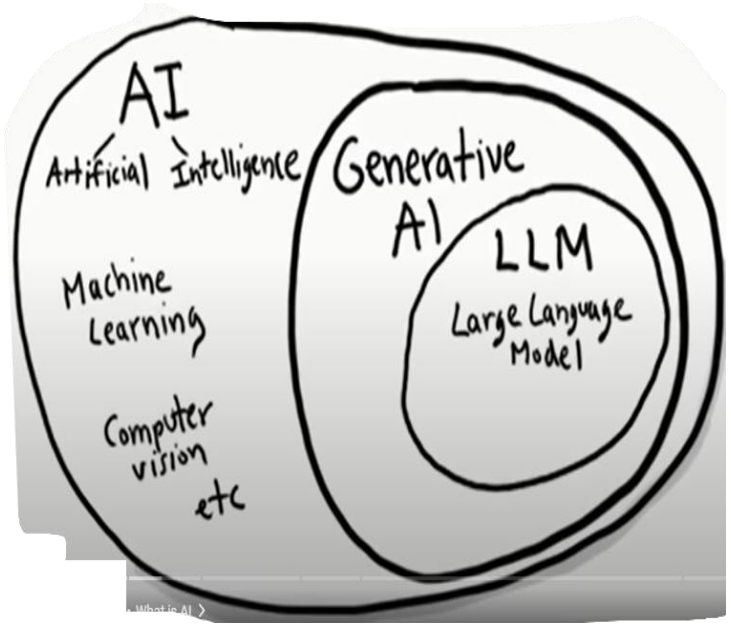
Quotation about the **FUTURE**

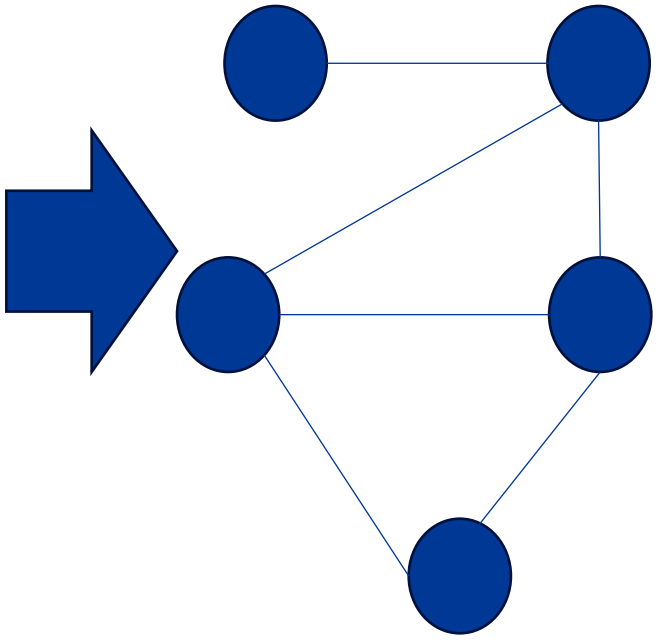


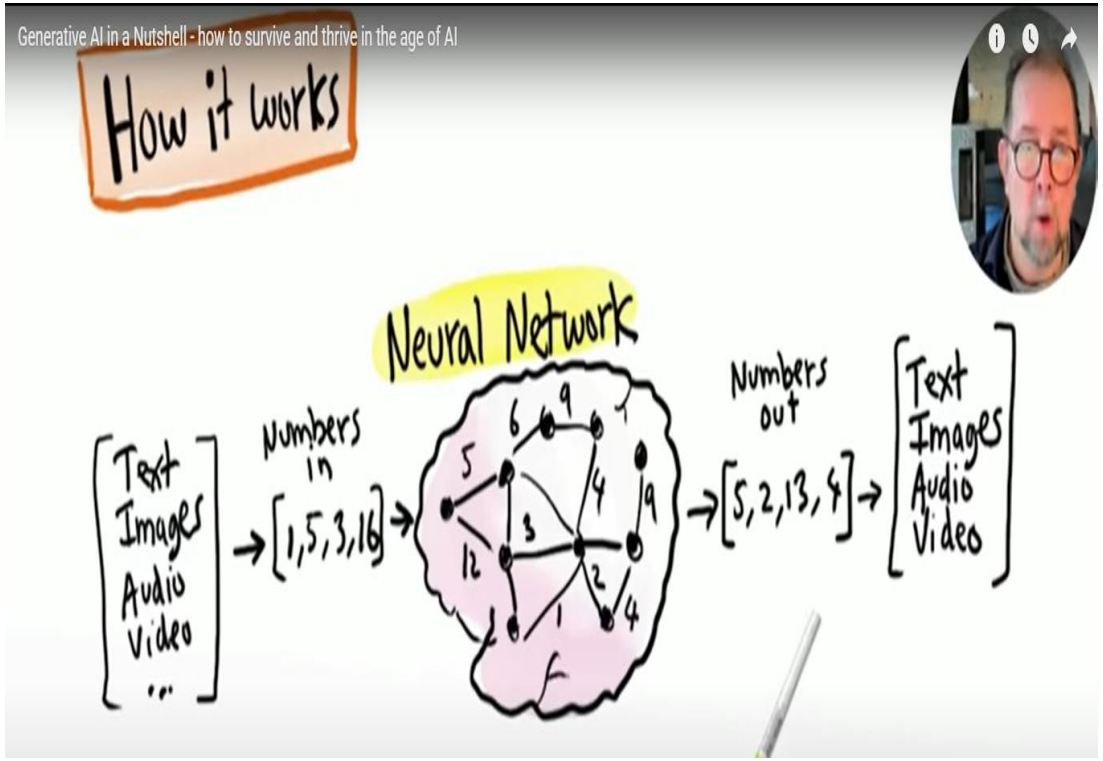
What is AI?

Definition: AI is the broader concept of machines being able to carry out tasks in a way that we would consider “smart.”

Goal: To simulate human intelligence — including reasoning, learning, problem-solving, perception, and language understanding.

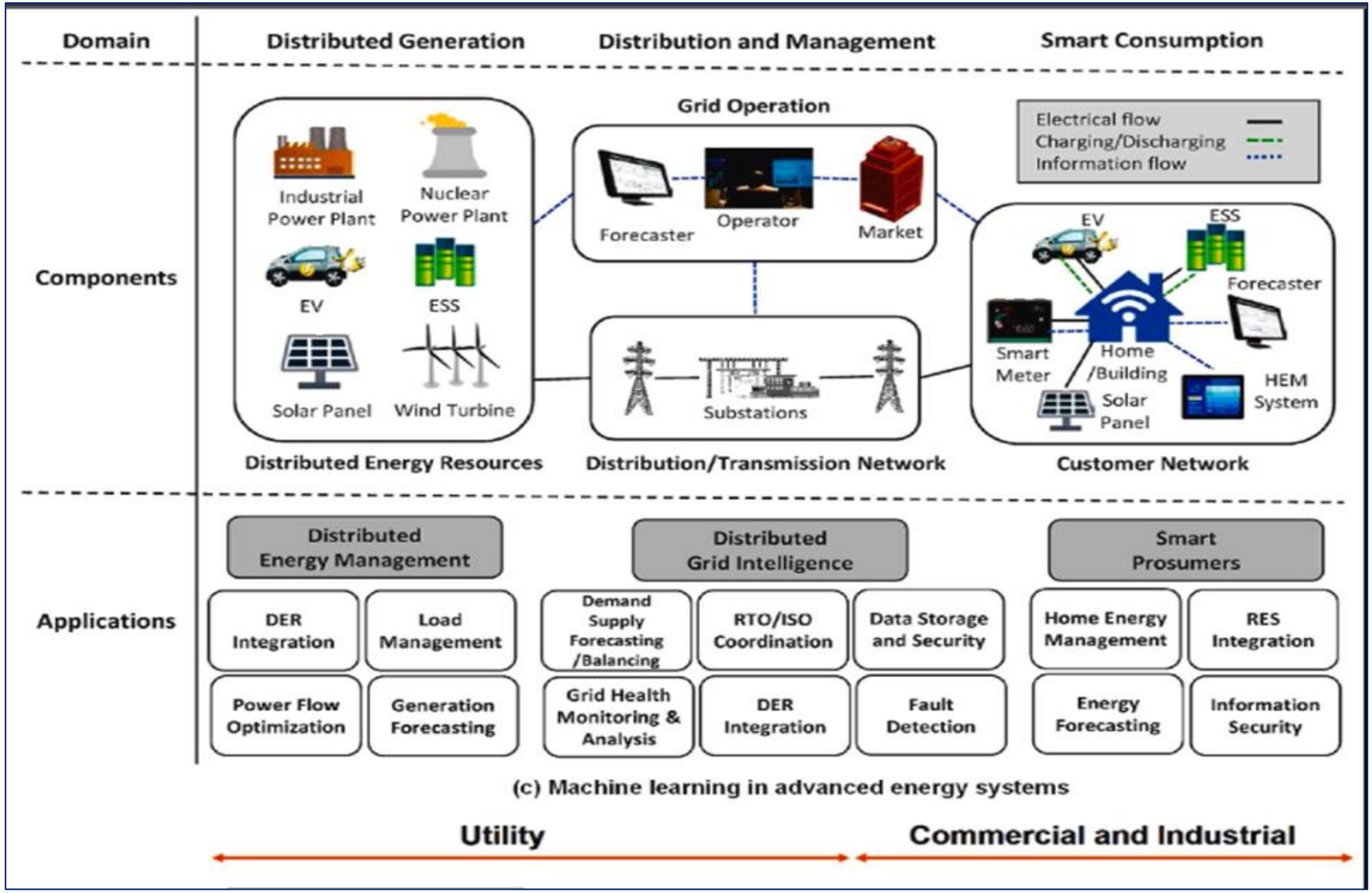






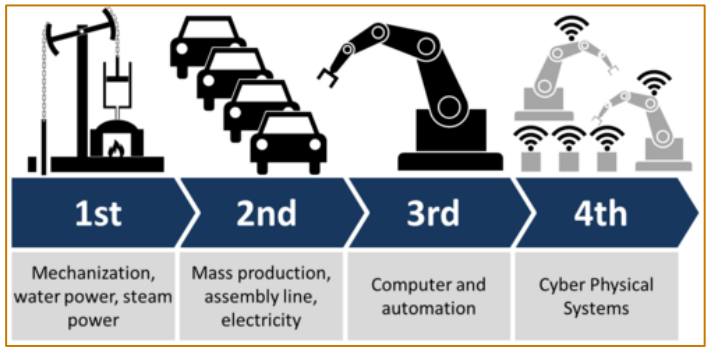
Source: Henrik Kniberg

AI in distributed smart grids…



AI plays a pivotal role to ensure quick access to real time data on the grid,

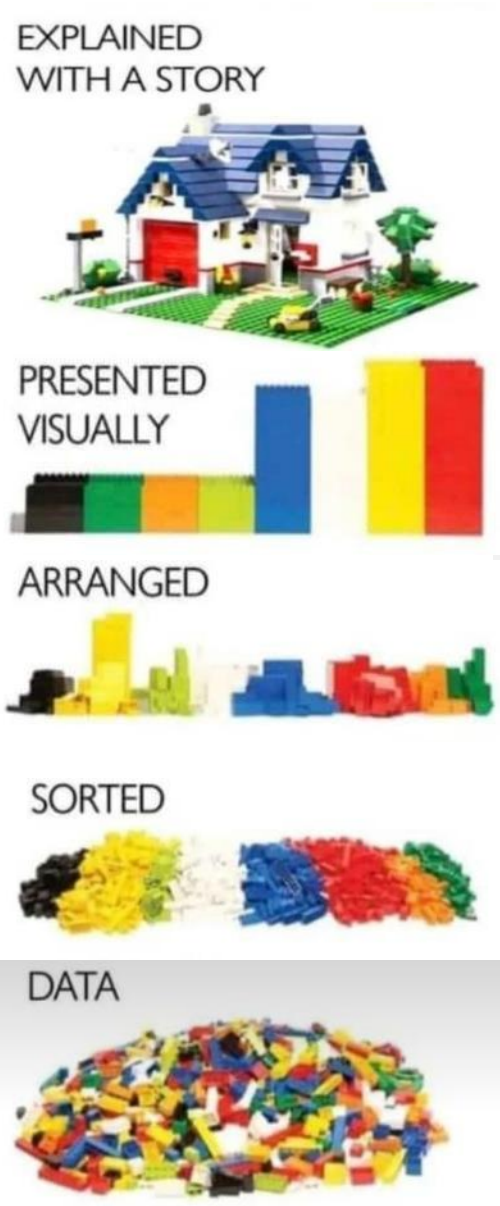
quick response from different devices and communication between devices that traditionally could not communicate.



Source: Mr. Syed Saqib Ali Overview of AI techniques in distributed smart grids

Digitalization enable AI adoption

(**How** the *CENTRE* will deliver value to the business and customers)



Data Flow *vs* Secure Collection

DIKW Pyramid

WISDOM

KNOWLEDGE

INFORMATION

DATA

Customers & Business Partners

Eskom Data Utilization

Smart Electricity Platform

Data Utilization & Monetization (Business & Customers)

Data Transformation (Dx Engineering Analytics Centre)

Repositories e.g. Dx Historian, MDMS

Data Transfer and Exchange

MICRO CONTROLLER

INNOVATION TECHNOLOGY

MAINTENANCE

SOLAR POWERED

WIRELESS COMMUNICATION

DRONE

REMOTE CONTROL

The Good and the Bad of AI…

The Good

- Increased efficiency and productivity.
- Automation of repetitive tasks.
- Enhanced decision-making.
- New innovations and discoveries.

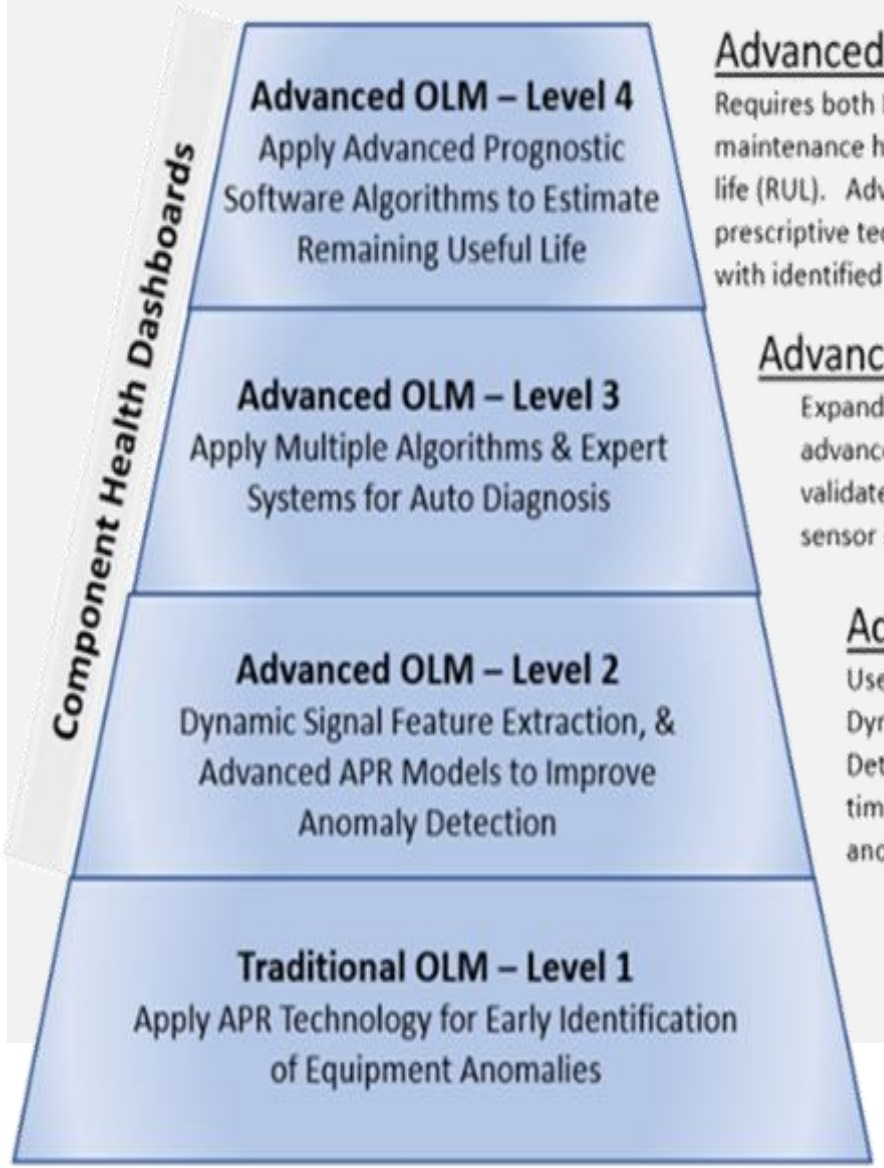
The Bad

- Job displacement.
- Bias and fairness.
- Privacy concerns.
- Security threats.
- Ethical dilemmas.

Applying AI and ML to outage planning and lifecycle management is currently not possible

Eskom

Traditional and Advanced Continuous On-Line Monitoring



Advanced COLM – Level 4: Prognostics

Requires both FMEA analysis and engineering studies on current condition and maintenance history to apply advanced algorithms to predict remaining useful life (RUL). Advanced applications also apply Artificial Intelligence (AI) and prescriptive technologies and provide recommended work packages associated with identified failure types

Advanced COLM – Level 3: Diagnostics

Expands FMEA Analysis use to speed diagnosis. Greater application of advanced algorithm techniques and diagnosis support capabilities to validate anomalies and auto diagnose certain failures modes, based on sensor inputs.

Advanced COLM – Level 2: Additional Sensors

Uses FMEA analysis to influence addition of more online sensors. Dynamic signal feature extraction can improve "Anomaly Detection". (Example: extract 1x, 2x features from a vibration sensor time waveform and APR models can be focused on identifying anomalies to allow for more effective diagnosis of equipment issues.

Traditional COLM – Level 1: APR Application

Use existing/available sensors/process data to apply APR software/models to provide for monitoring & alerting – "Identifying Anomalies"

- EPRI have performed extensive work in **applying AI and ML** to plant data.
- The pyramid that EPRI developed to indicate the **maturity level** required for applying AI and ML to process data.
- This means that local identification of developing faults is possible, but **applying AI and ML to outage planning and lifecycle management is currently not possible.**
- To move to level 3 and 4 the **data continuity issues** that were highlighted earlier must be solved.

Why AI cannot be ignored…

- AI **enables** smart grids.
- AI can **optimize** the generation, transmission, and distribution of electricity, as well as support better control and self-regulation of the grid.
- AI can **create new opportunities** and value for energy stakeholders, such as utility companies, consumers, and prosumers.
- AI can help **distribution improve** their efficiency, reliability, and sustainability of the power system.
- However, distribution also need to consider the **challenges and risks** of AI, such as data privacy, security, ethics, and regulation, and adopt a balanced and collaborative approach to harness the full potential of AI for the distribution environment
- AI algorithms can revolutionize their **maintenance strategies**, leading to:
  - improved efficiency,
  - reduced downtime,
  - enhanced safety, and data-driven decision making.
- By **embracing AI-driven solutions**, power companies can efficiently navigate the challenges associated with growing demand and the transition towards a cleaner and more sustainable energy future.

Proposed Next Steps

1. **Digital Maturity Assessment:**
   - Conduct a digital maturity audit to evaluate readiness in data, infrastructure, and workforce capabilities, providing a foundation for phased AI and digital initiatives

2. **Define Phased Digitisation Projects:**
   - Identify initial Digitisation projects, such as predictive maintenance, and gradually expand to more complex applications like real-time monitoring as maturity increases
   - Establish key milestones across data infrastructure, employee skills, and technology integration. This roadmap will guide progression and help prioritise future Digitisation investments.

3. **Build Data Infrastructure and Governance:**
   - Strengthen data collection, storage, and management practices to ensure quality data for AI. Establish data governance policies for security, compliance, and scalability

4. **Workforce Upskilling and Training:**
   - Launch training programs tailored to different maturity stages, focusing on data literacy and analytics initially, then progressing to advanced AI skills.
   - Provide new opportunities for employees, which repurpose resources.

Thank you