



Perkembangan Artificial Intelligence di Dunia Teknik Elektro

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Chairman of Indonesia AI Society (IAIS)
Fac of Eng Unika Atma Jaya



Born in Purwokerto, 6 July 1973
1975 Magelang (got polio, paralyzed on the right leg)
1978-1983 Solo, Kartasura, Wonosobo, Denpasar
1988 graduated SMPN 2 Denpasar
1991 graduated SMAN 1 Denpasar
1995 graduated S-1, Teknik Elektro ITB
1995 faculty member at Unika Atma Jaya
1997 continued study at KU Leuven, Belgium
1998 obtained Master of Artificial Intelligence (MAI)
2003 completed Doctor in Engineering (PhD)



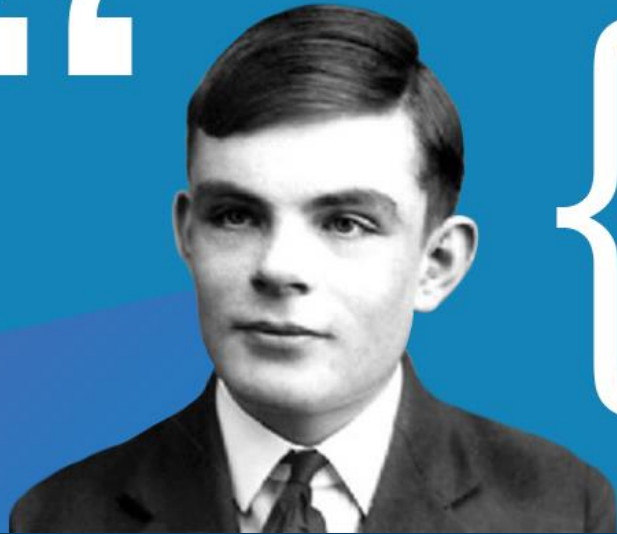
1995-now: Faculty member Unika Atma Jaya, Jakarta
2007-now: lecturing Computer Security at SGU & Binus Intl.
2015-now: lecturing at Doctor of Comp Sci (DCS) Binus
2010: Asesor BAN-PT
2008 : Certified Information System Auditor (CISA)
2016 : Insinyur Profesional Madya (IPM)
2019 : Co-founder of Indonesia AI Society (IAIS)
2020: Coord of Atma Jaya Artificial Intelligence Base (AJAIB)
2021: Ketua Alumni Belgia
Membership: IEEE, ACM, ISACA, SIAM, PII, INAPR
cofounder: IAIS, Indonesia HoneyNet Project, Health IT Security

Sejarah Kecerdasan Artificial (Artificial Intelligence/AI)

- ▶ 1956: Dartmouth Summer Research Project on Artificial Intelligence
- ▶ 65+ tahun, naik dan turun (development, stagnant, re-development). Setiap kali klimaks membuat **terobosan baru** dalam pengetahuan
- ▶ Fuzzy oleh Lotfi Zadeh 1965, riset grup di Jepang 1970, Mamdani fuzzy controller (1974), Dubois comprehensive study of traffic conditions (1977). Industrial applications of fuzzy logic in Japan (1976-1987)
- ▶ Genetic Algorithm oleh John Holland (1970), populer akhir 1980an
- ▶ SVM oleh Vapnik (1965) baru dipresentasikan Computational Learning Theory (COLT-92) dan sangat populer kemudian



“



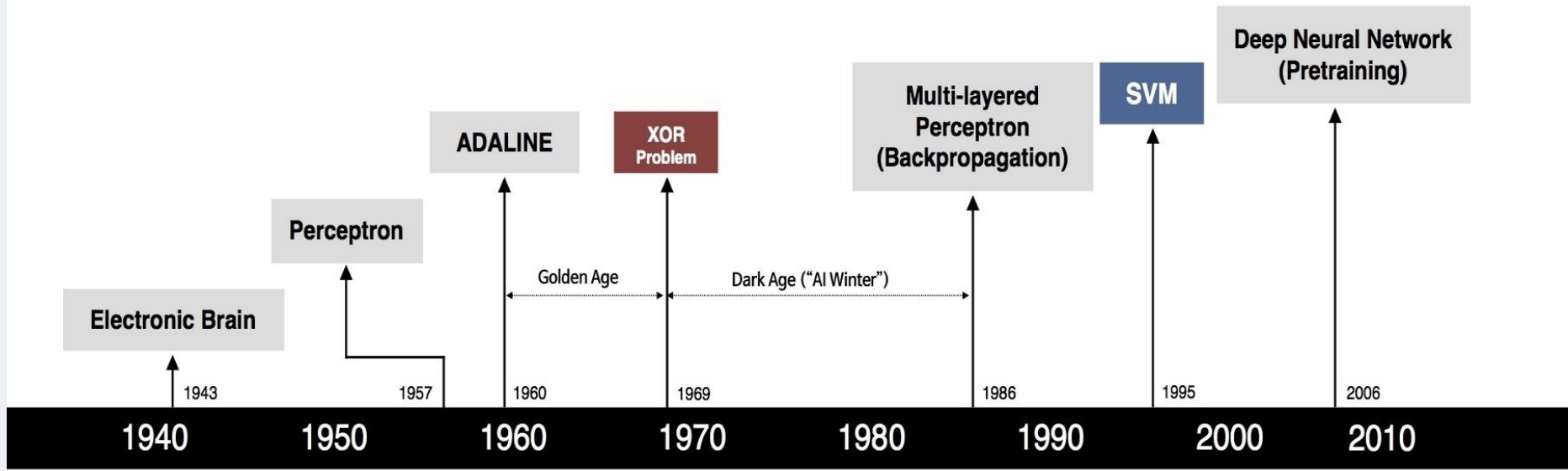
...what we want is a
machine that can learn
from experience.

Alan Turing, 1947

AI Definitions & Interpretations

- ▶ “AI is concerned with **intelligent behavior** that will make machines intelligent so they can appropriately act in environments with perception” (Nilsson, Stanford)
- ▶ “AI is to study how to make computers do **intelligent work that only people can do** in the past” (Winston, MIT)
- ▶ “**Thinking Humanly Approach, Acting Humanly Approach, Thinking Rationally Approach, Acting Rationally Approach**” (Russel, Norvig)
- ▶ “Ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings” (Encyclopedia Britannica)
- ▶ “Intelligence demonstrated by machines” (Wikipedia)
- ▶ “A theory, method, technology and application system that use digital computer or computer-controlled machines to simulate, extend and expand human intelligence, perceive the environment, acquire knowledge, and use knowledge to obtain the best results” (China Electronics Standardization Institute)





1940	1950	1960	1970	1980	1990	2000	2010
S. McCulloch - W. Pitts	F. Rosenblatt	B. Widrow - M. Hoff	M. Minsky - S. Papert	D. Rumelhart - G. Hinton - R. Williams	V. Vapnik - C. Cortes	G. Hinton - S. Ruslan	
<ul style="list-style-type: none"> Adjustable Weights Weights are not Learned 	<ul style="list-style-type: none"> Learnable Weights and Threshold 	<ul style="list-style-type: none"> XOR Problem 	<ul style="list-style-type: none"> Solution to nonlinearly separable problems Big computation, local optima and overfitting 	<ul style="list-style-type: none"> Limitations of learning prior knowledge Kernel function: Human Intervention 	<ul style="list-style-type: none"> Hierarchical feature Learning 		

Brief history of neural network

Artificial Intelligence



Engineering of making Intelligent Machines and Programs

Machine Learning



Ability to learn without being explicitly programmed

Deep Learning



Learning based on Deep Neural Network

1950's

1960's

1970's

1980's

1990's

2000's

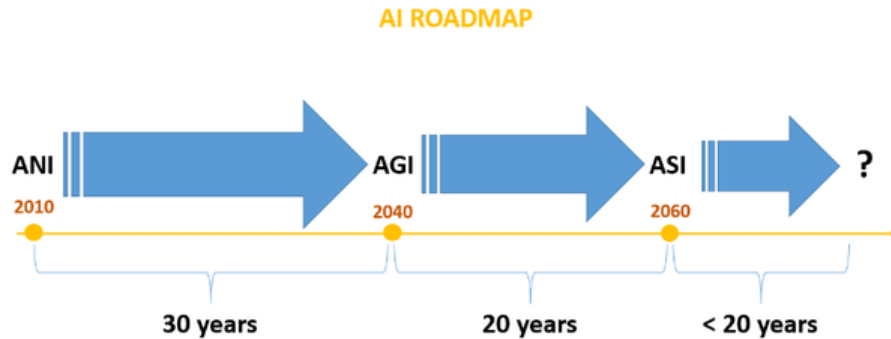
2006's

2010's

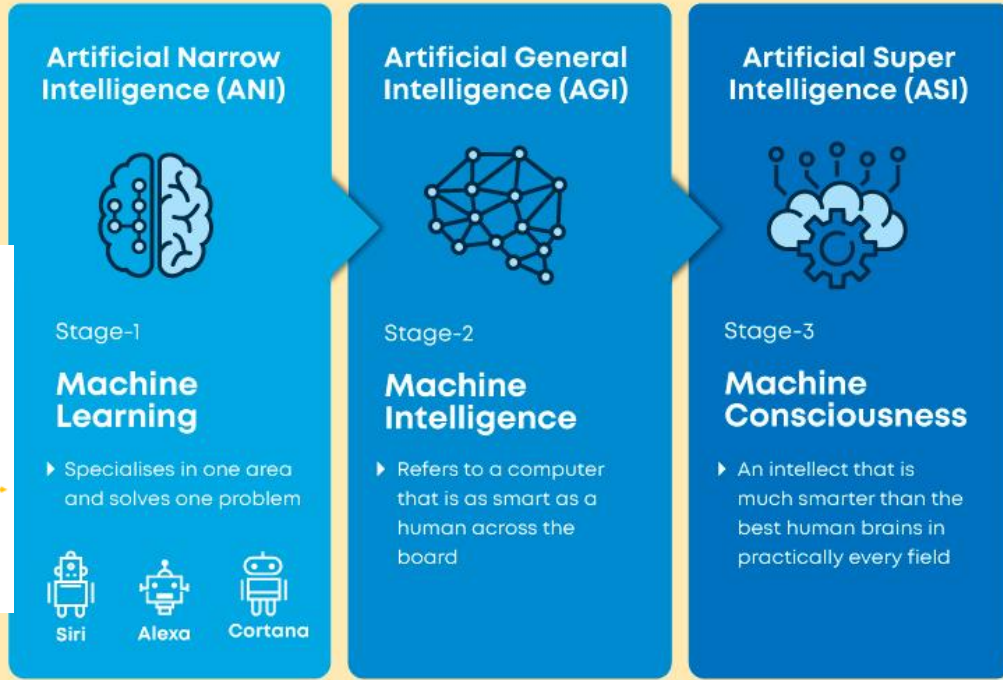
2012's

2017's

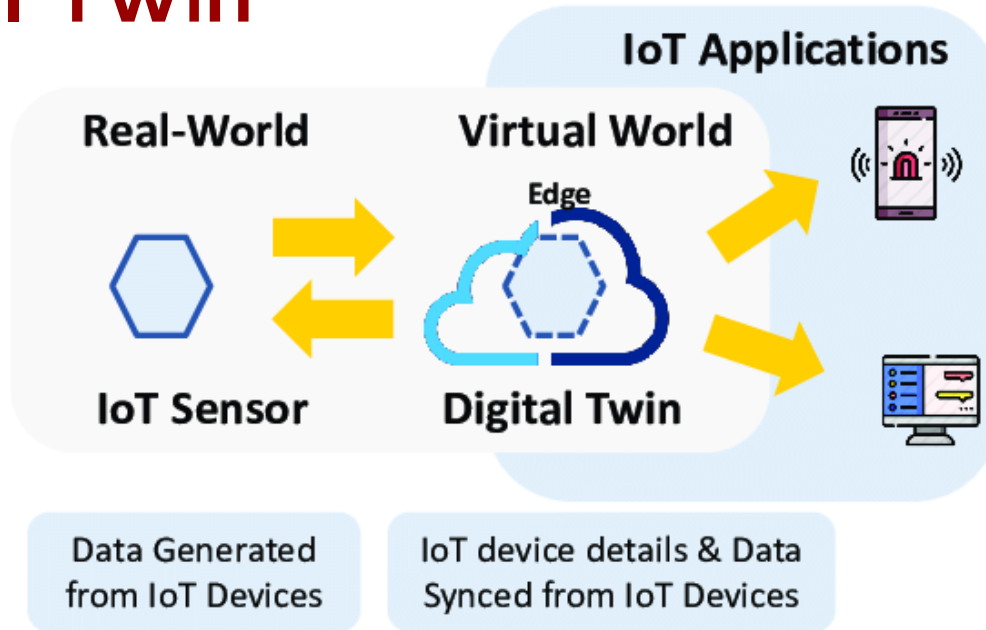
Menuju Super AI



3 Types of Artificial Intelligence



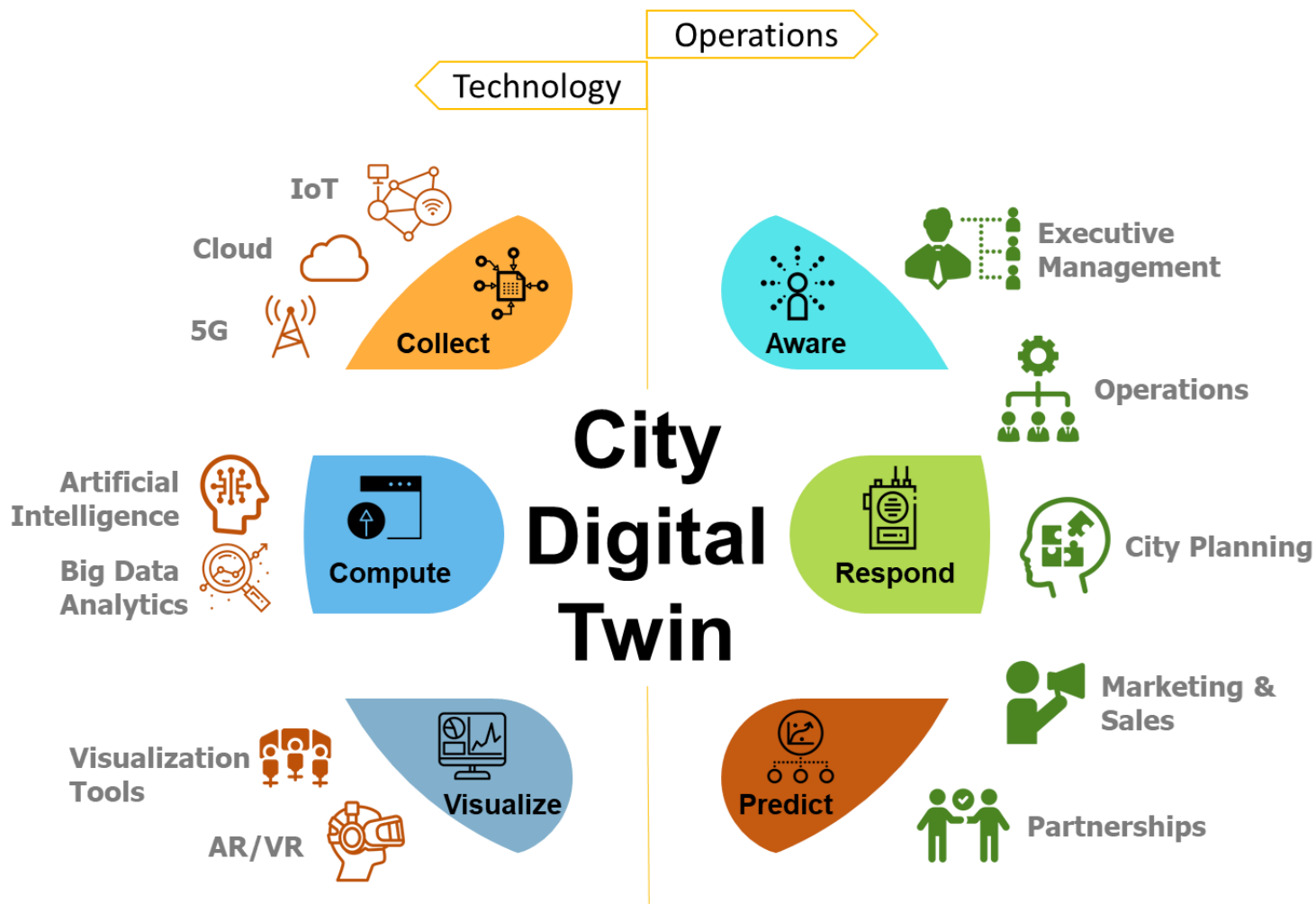
Digital Twin



https://www.researchgate.net/figure/Concept-of-Digital-Twin-in-IoT_fig1_340120997

- ▶ a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making

<https://www.ibm.com/topics/what-is-a-digital-twin>



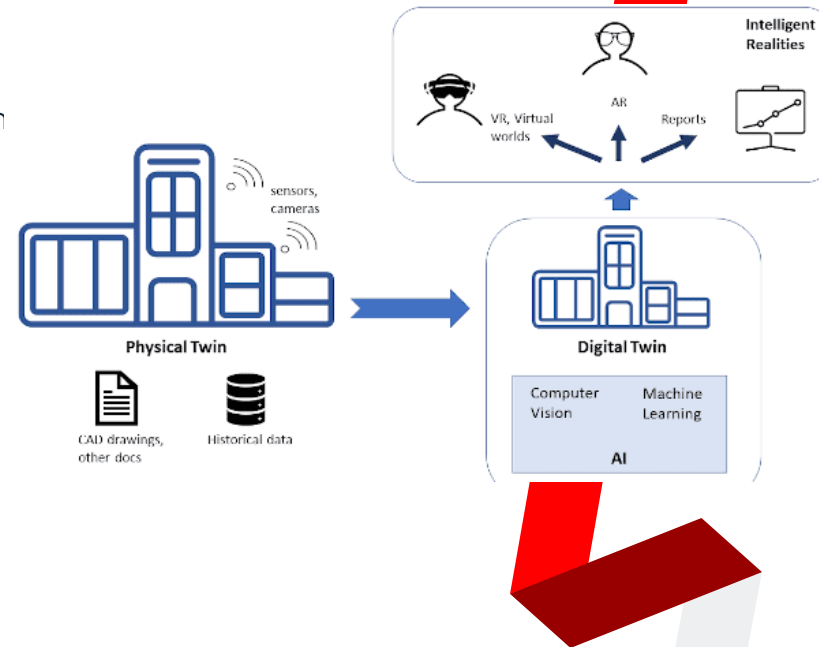
 OpenFace

IoT + Big Data + AI + Visualization

▶ IoT
continuously collect and orchestrate the data necessary for organizations to derive value from physical assets. This feed of real-time data is what ensures that a digital twin maintains an actual live copy of an asset, process, or ecosystem.

- ▶ Big Data
1. Volume
 2. Velocity
 3. Variety
 4. Variability
 5. Veracity
 6. Visualisation
 7. Value

▶ AI
in the form of machine learning, computer vision, speech recognition, speech processing or optimization makes it possible to understand objects and processes in the physical world. Autonomous decisions can be made. AI thus represents the brain of the digital world

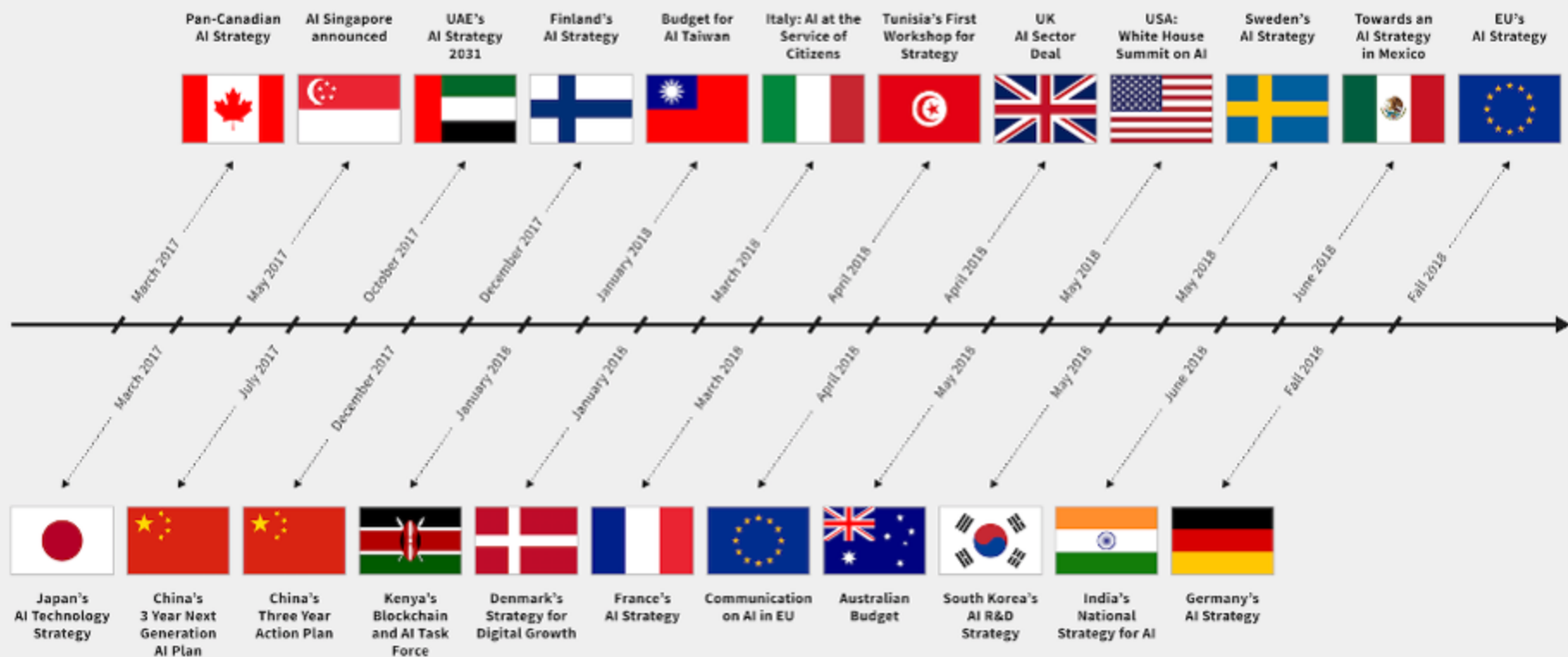


<https://e.huawei.com/id/eblog/industries/insights/2020/how-digital-twins-enable-intelligent-cities>

<https://exsight.id/blog/2021/04/02/7v-karakteristik-lengkap-big-data/>

https://www.eublockchainforum.eu/sites/default/files/research-paper/convergence_of_blockchain_ai_and_iot_academic_2.pdf

National Artificial Intelligence Strategies



Indonesia AI Society -- www.IndonesiaAI.org



Diprakarsai oleh Asosiasi Prakarsa Indonesia Cerdas (APIC) di Jakarta
25 Jan 2019, deklarasi publik 25 Okt 2019, badan hukum 24 Jan 2021
Berkembang pesat ke seluruh wilayah Indonesia



Anggota adalah para pegiat AI dari quadhelix (ABGC):

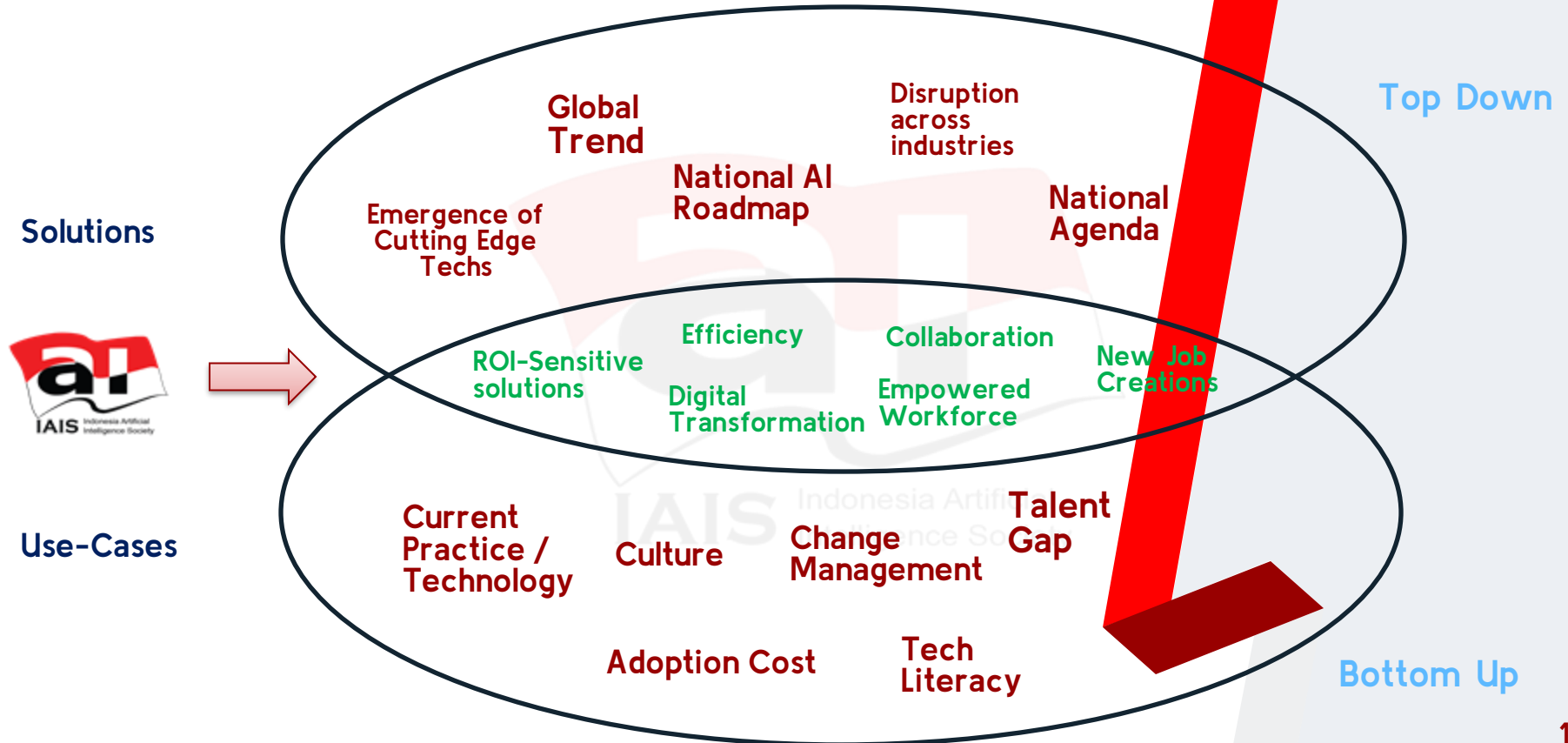
Akademia: UI, ITB, UGM, ITS, Atma Jaya, Binus, Gunadarma, UKSW, UKDW, dkk

Industri: Nodeflux, Bahasakita, Kata.ai, Gojek, Tokopedia, IBM, Microsoft, Schlumberger, dll

Gov: BRIN (dahulu: BPPT, LIPI), Kemhan, Ristek, Dikbud, dll

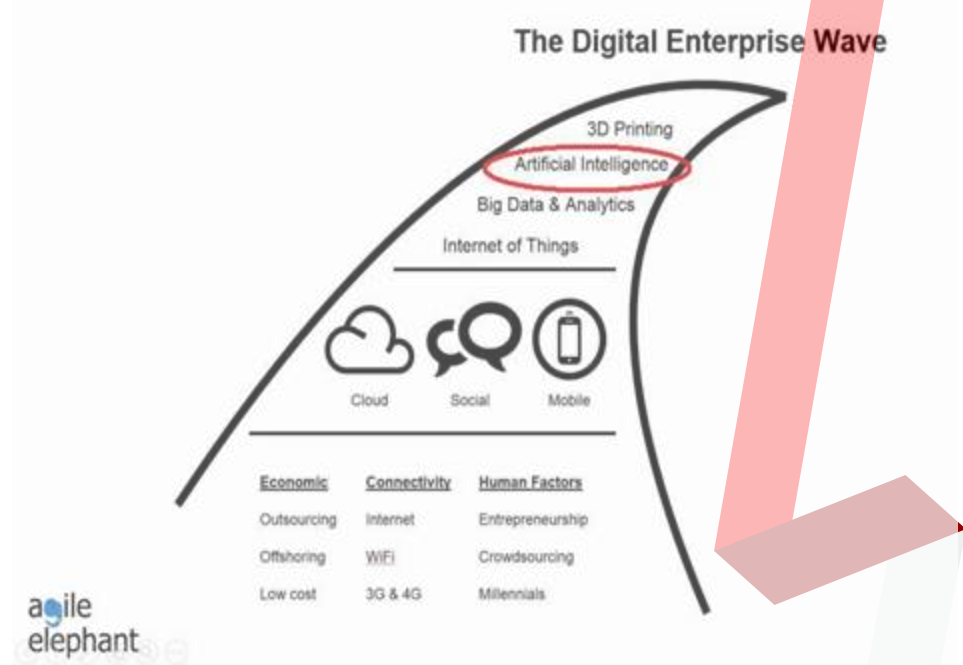
Komunitas

Indonesia AI Society in supporting AI application in Indonesia



The Pillars

Indonesia National Interest



Vision

Menumbuhkan keahlian mendalam dalam bidang Kecerdasan Artifisial, yang berdampak terhadap ekonomi, sosial dan budaya secara nasional dan regional, mengembangkan talenta lokal dengan kualitas global, dan membangun ekosistem Kecerdasan Artifisial yang kuat di Indonesia.

Foster deep expertise and collaboration among stakeholders in Artificial Intelligence therefore key organization for the establishment of AI Ecosystem in accordance to Indonesia AI Strategy.

Mission

- ▶ Contribute to the development of AI National Strategy & AI Roadmap
- ▶ Capacity and Capability Building.
- ▶ Develop competencies across sectors in the field of AI for technological leadership through collaborations.
- ▶ Accelerates adoption of AI in strategic sectors
- ▶ Promotes fairness, transparency and inclusivity to enable collaborations across stakeholders nationwide deep at grassroot level.



AI Contribution from the Grassroots

Indonesia AI Society reach out deep amongst the community through Chapters nationwide

600+ verified membership of AI experts and enthusiast to Indonesia grassroots through Chapters with multiple strategic projects

1. IAIS Chapter Jabodetabek
2. IAIS Chapter Jabar-Banten
3. IAIS Chapter Jateng-DIY
4. IAIS Chapter Jatim
5. IAIS Chapter Sumatra
6. IAIS Chapter Kalimantan
7. IAIS Chapter Diaspora (abroad)

Indonesia's National Strategy on AI

LAUNCHING THE NATIONAL STRATEGY OF ARTIFICIAL INTELLIGENCE 2020-2045 WITH THE FORMER MINISTER OF RESEARCH / THE HEAD OF THE BRIN

Watched by the Vice President of the Republic of Indonesia,
JAKARTA, 10 AGUSTUS 2020

>> <http://ai-innovation.id>



The use of Artificial Intelligence technology aims to provide increased productivity for businesses, to increase productivity from the efficiency of **human resource utilization**, and to encourage **innovation in various sectors**.



AI National Strategy Vision and Mission



Indonesia's Vision for 2045

"A Sovereign, Advanced, Equal, and Prosperous Indonesia that protects all Indonesians and their homeland, advances the people's welfare, educates the people, and participates in creating a lawful world based on independence, perpetual peace, and social justice."

Ethics and Policy

To realize ethical artificial intelligence in line with Pancasila's values

Development of AI Talents

To prepare talents in artificial intelligence-related fields that are competitive and possess character

Infrastructure and Data

To realize data and infrastructure ecosystems that support artificial intelligence's contribution to the country's interests

Research and Innovation

To develop a collaborative research ecosystem and artificial intelligence innovations to accelerate bureaucratic reform and superior national industries

AI National Strategy Framework for the National Strategy

The framework helps describe the conditions of priority sectors and their relation between national initiating programs in the four areas of focus and priority sectors, as well as the selection of quick win activities to utilize artificial intelligence

Four Areas of Focus

1. Ethics and Policy
2. Talent Development
3. Infrastructure and Data
4. Research and Industrial Innovation

Five Priority Sectors

1. Health Care Services
2. Bureaucratic Reform
3. Research and Education
4. Food Resilience
5. Mobility and Smart Cities



Quadruple Helix Ecosystem in National Strategy



CREATING AN ORCHESTRATOR FOR THE COUNTRY'S INDUSTRIAL RESEARCH AND INNOVATION

- To reach the purposes of industrial research and innovation's mission in the field of artificial intelligence, which is to accelerate bureaucratic reform and strengthen the country's industry to create clean bureaucracy and superior industry that produces economic impacts, all industrial research and innovation initiatives in the field of artificial intelligence **must be orchestrated to orient toward these goals by maximizing all of the country's research and innovation resources.**
- These various resources are contributions from actors under the quadruple helix umbrella (the government, industries, academia, communities).
- For this purpose, an orchestrator for a quadruple helix ecosystem in industrial research and innovation in the field of artificial intelligence is needed

The Roles of All Stakeholders in Quadruple-helix Synergy



KORIKKA: Collaborative Industrial Research and Innovation for Artificial Intelligence

IAIS in National Development of AI Technology to accelerate Innovation



<https://ai-innovation.id/strategi>



The banner for TFRIC-19 (Task Force Riset dan Inovasi Teknologi untuk Penanganan COVID-19). It features the logo of the Indonesian Ministry of Education, Culture, and Higher Education (Kemendikbudristek) and the text 'TFRIC-19'. Below the title, it lists various stakeholders involved in the task force, including government agencies (INSTITUSI LITBANG & PEMERINTAH), universities (PENGURUSAN TINGGI), communities (KOMUNITAS), industry (INDUSTRI), and startups (START-UP). The banner also includes a URL: <https://tfric-19.id/>.

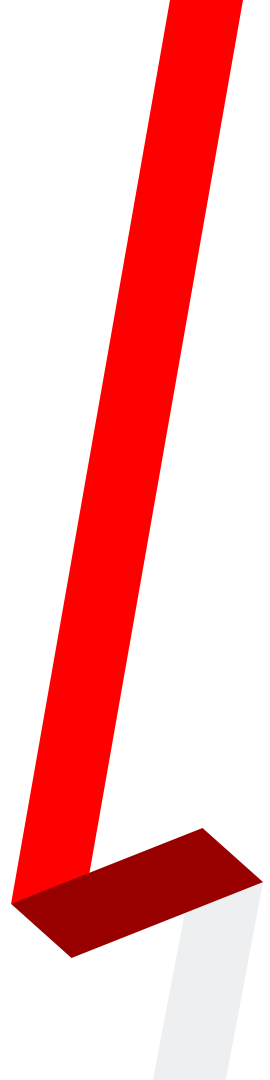
The logo for PIKA (Pusat Inovasi Kecerdasan Artifisial Indonesia) and its description. The logo features the Kemendikbudristek logo and the text 'PIKA'. The description states: 'PIKA adalah organisasi yang akan dibentuk oleh BPPT untuk memfasilitasi terbentuknya konsorsium ekosistem dari kolaborasi unsur-unsur Quadruple yang akan mengkonsentrasikan terapanannya pada jalur strategi nasional untuk kecerdasan artifisial yang terpelatkan dalam empat area fokus (etika dan kebijakan, pengembangan talenta, infrastruktur dan data, serta riset dan inovasi industri), dan dalam lima bidang prioritas (kesehatan, reformasi birokrasi, pendidikan dan riset, ketahanan pangan, dan mobilitas/kota cerdas).'

AI Development in Indonesia



POTENTIAL REGIONAL COLLABORATION

- Collaboration in Developing AI Talents
 - Government is scaling up AI talent development through multiple ministries, i.e: Ministry of Communication (Kemenkominfo) and Ministry of Education, Culture, Research and Technology (Kemendikbud-ristek)
 - IAIS with its consortium (Intel Asia Pacific and Japan and SL2 Indonesia) develops National Standard Competency (SKKNI) with Ministry of Communication through DTS that is targeting 5.000 students throughout 2021 - 2022
- Industry acceptance to AI Talents
 - IAIS with Kominfo has mapped curriculums to suit the industry for immediate talent deployment.
 - As a result, IAIS and consortium are currently registering “Associate Data Analyst” occupation to Ministry of Workforce (Kemenaker)
 - More is underway to bridge talents and industry for AI adoptions.
 - Use-cases are consolidated to be presented to tech principals for further deployment of AI skilling program.



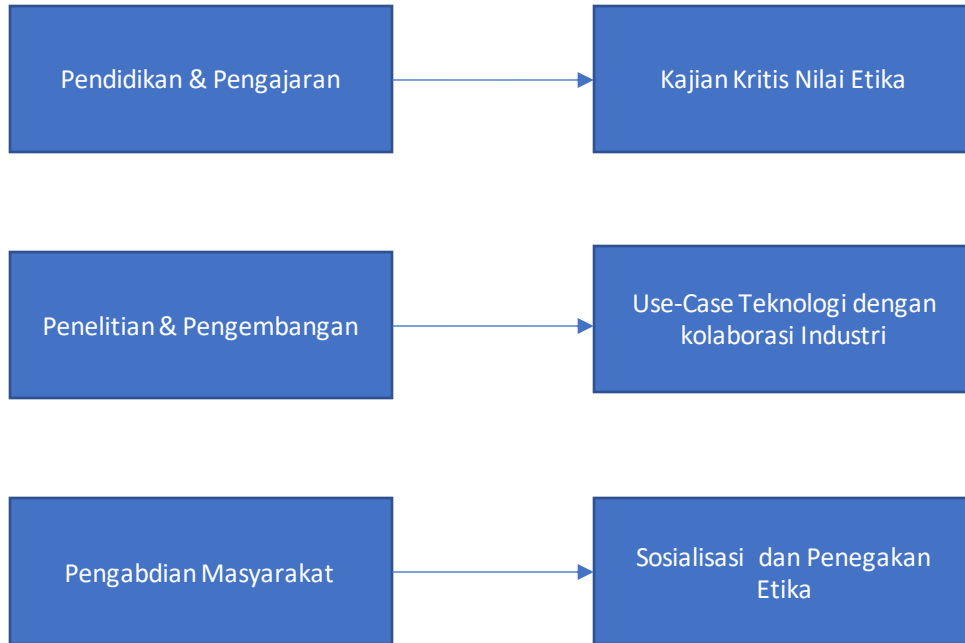
AI Ecosystem in Indonesia



POTENTIAL REGIONAL COLLABORATION

- IAIS is helping decision makers in the government (tech / non-tech) to understand AI implementation better, therefore AI-friendly regulations to trigger innovation.
- Sharing Experience in Developing AI Excellence Center and Infrastructure
 - Universities in Indonesia have initiated AI programs and competencies. UI, ITB, ITS, Universitas Gunadarma, for example, has launched AI Lab.
 - Universitas Kristen Duta Wacana, Unika Atma Jaya, and Swiss German University have signed MoU with IAIS to expedite collaboration on AI program and development of AI competencies. Institut Teknologi Del in Lake Toba is also underway.
- AI Investment in several key sectors, such as agriculture, education, mobility, and smart cities.
 - AI startups, i.e.: **Nodeflux**, **Widya Wicara**, **Alfabeta**, **Qlue**, etc have secured contracts with major corporations.
 - Government is exercising AI and exploring to work with local AI startup.
- Collaboration in AI research that is marked by the launch of **KORIKA** led by Dr. Hammam Riza.

Tri Dharma Perguruan Tinggi dan Etika KA



What is Responsible AI?

- Responsible AI is the practice of designing, developing, and deploying AI with good intention to empower employees and businesses, and fairly impact customers and society—allowing companies to engender trust and scale AI with confidence ([Accenture](#)).
- Responsible AI is a governance framework that documents how a specific organization is addressing the challenges around artificial intelligence (AI) from both an ethical and legal point of view. Resolving ambiguity for where responsibility lies if something goes wrong is an important driver for responsible AI initiatives ([TechTarget](#)).
- Responsible Use of Technology. The increasingly pervasive use of technology in our everyday lives has triggered a debate on how new and disruptive technologies – such as artificial intelligence (AI), robotics, 3D printing, internet of things (IoT), 5G, blockchain, quantum computing, autonomous vehicles, biotechnology, and nanotechnology – should be managed and governed ([WEF](#)).

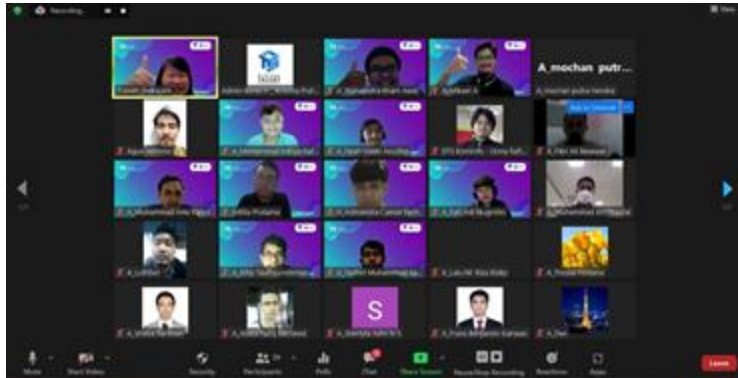
Pushing forward with National Agenda - Talent Development



In 2021, IAIS strategically establishes AI talent consortium that develops national AI Curriculum with Intel AI for Future Workforce

The curriculum is first to be standardized to national competency (SKKNI) and delivered to 2000 students nationwide at pilot scale.

The program is to be scale further with industry specific program to expedite AI adoption at grassroots level.



Activity

- ▶ AI Meetup (kopdar)
-> online webinar, lecture, special interest groups
- ▶ Research collaborations
- ▶ Product developments
- ▶ AI news

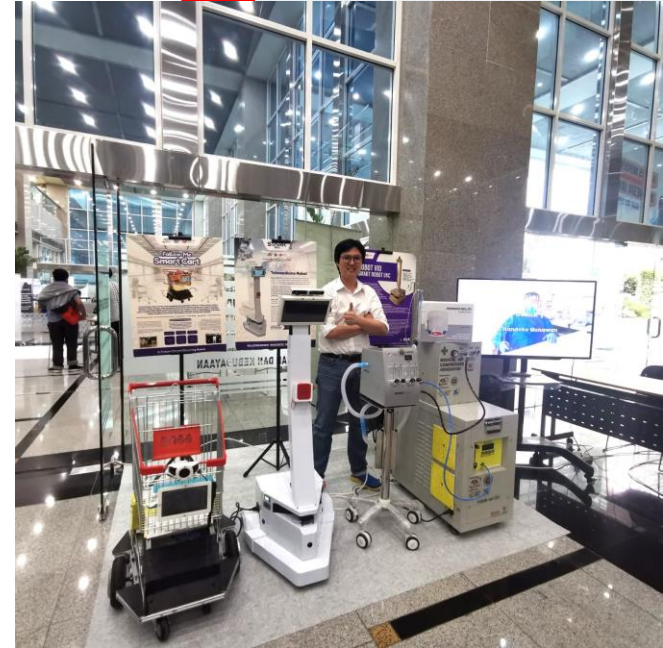


On going (development):

- ▶ Taskforce AI
- ▶ Who's Who in Indonesia AI
- ▶ Joint seminars
- ▶ Joint research/publications



Examples of AI startups



Summary

- ▶ Indonesia punya potensi SDA/SDM yang luar biasa untuk dimanfaatkan menuju cita-cita Indonesia Emas
- ▶ Kolaborasi Quadruple helix (ABG-C) harus dimaksimalkan untuk pengembangan inovasi hingga menghasilkan produk/jasa AI
- ▶ Teknik Elektro berperan penting untuk menghasilkan SDM yg fasih KA, serta karya + inovasi penelitian untuk menghasilkan produk terkait IoT + BigData + AI + Viz
- ▶ Komunitas menjadi komponen penting, yaitu masyarakat sebagai pengguna teknologi cerdas, paham potensi dan risikonya.



Indonesia AI Society

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Join us:

<https://core.indonesiaAI.org>