



AI Research in Indonesia

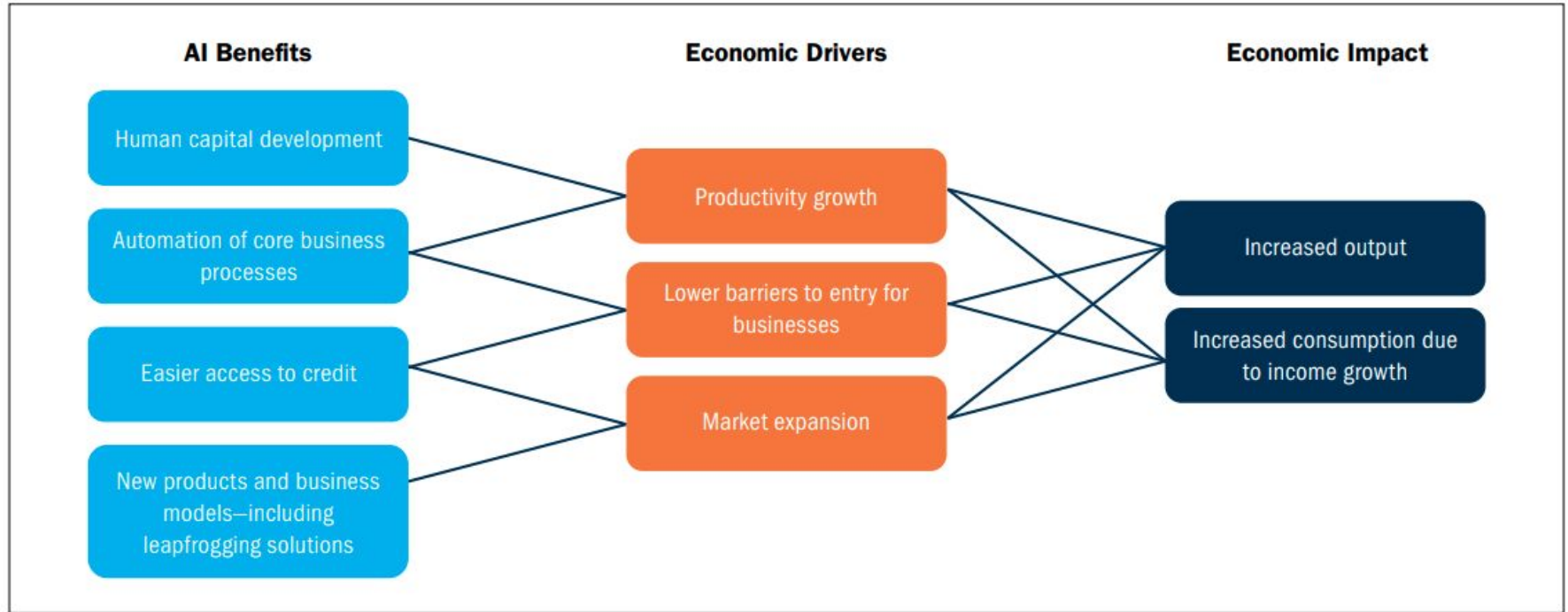
Mohamad Ivan Fanany, Dr. Eng.,



Talk Outline

- Role of AI for a nation
- Principles of AI Development
- Global Data Protection Regulation
- Decentralized AI for Indonesia
- Explainable AI Strategies
- Is AI research headed in the right direction?
- AI research trends
- AI research in Indonesia

Role of AI for a Nation (IFC-World Bank Group)



Source: [The Role of Artificial Intelligence in Supporting Development in Emerging Markets](#)

The AI Industry and Global Challenges

1. Artificial intelligence needs more attention from politicians
2. Economic power through artificial intelligence
3. Data is a competitive advantage
4. Artificial intelligence start-ups are the giants of the day after tomorrow
5. Research is more important than ever
6. Without infrastructure there is no artificial intelligence
7. Artificial intelligence must be financed
8. Global challenges for humanity
9. Artificial intelligence needs supervision
10. It needs an artificial intelligence ethics framework

Asimov Principles of AI Development

Asimov's Three Laws of Robotics






1. A robot must not injure a human being, or through inaction, allow a human being to come to harm

2. A robot must obey orders given to it by human beings except where such orders would conflict with the First Law.

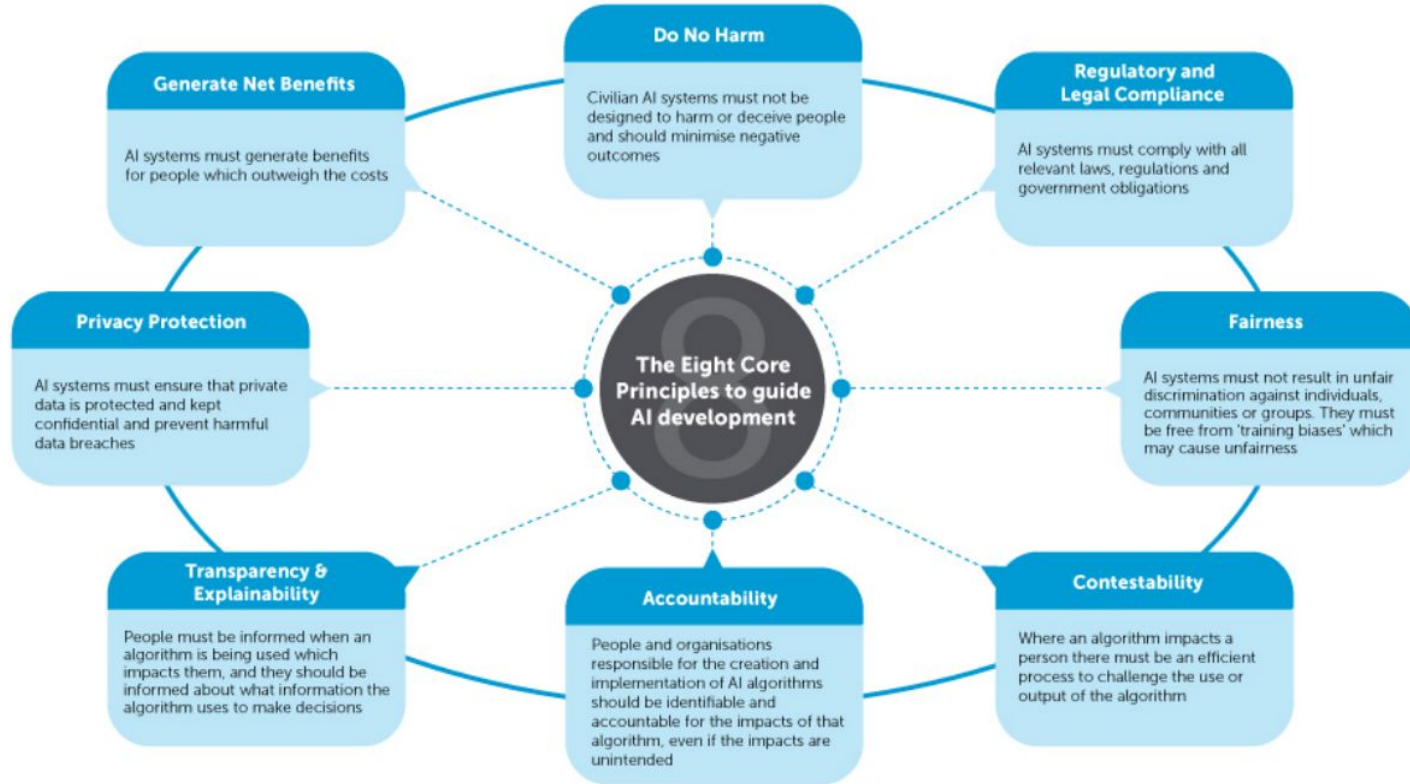
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second law.



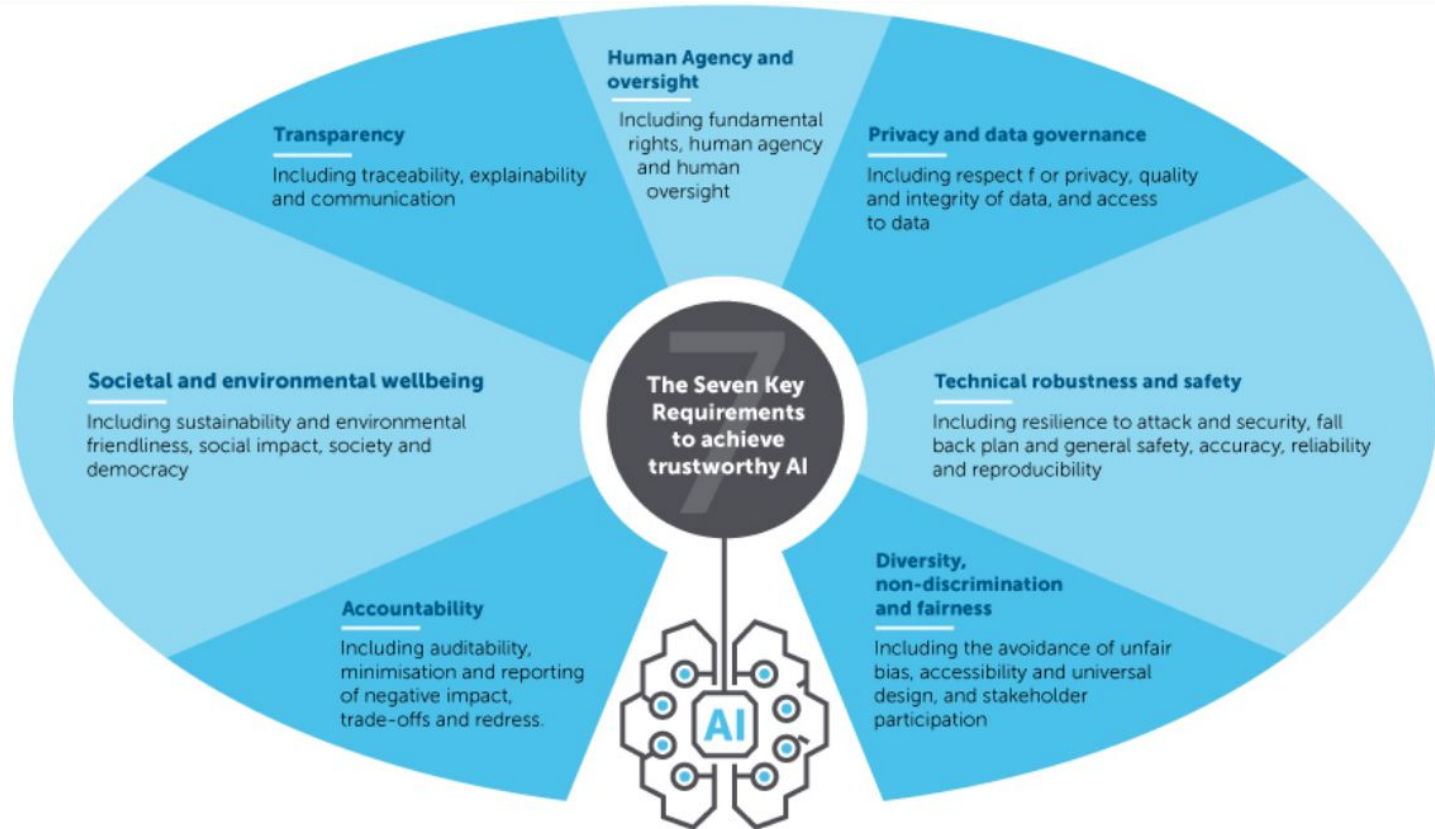
WHY ASIMOV PUT THE THREE LAWS OF ROBOTICS IN THE ORDER HE DID:

POSSIBLE ORDERING	CONSEQUENCES	
1. (1) DON'T HARM HUMANS 2. (2) OBEY ORDERS 3. (3) PROTECT YOURSELF	[SEE ASIMOV'S STORIES]	BALANCED WORLD
1. (1) DON'T HARM HUMANS 2. (3) PROTECT YOURSELF 3. (2) OBEY ORDERS	EXPLORE MARS!  HAHA, NO. IT'S COLD AND I'D DIE.	FRUSTRATING WORLD
1. (2) OBEY ORDERS 2. (1) DON'T HARM HUMANS 3. (3) PROTECT YOURSELF		KILLBOT HELLSCAPE
1. (2) OBEY ORDERS 2. (3) PROTECT YOURSELF 3. (1) DON'T HARM HUMANS		KILLBOT HELLSCAPE
1. (3) PROTECT YOURSELF 2. (1) DON'T HARM HUMANS 3. (2) OBEY ORDERS	 I'LL MAKE CARS FOR YOU, BUT TRY TO UNPLUG ME AND I'LL VAPORIZE YOU.	TERRIFYING STANDOFF
1. (3) PROTECT YOURSELF 2. (2) OBEY ORDERS 3. (1) DON'T HARM HUMANS		KILLBOT HELLSCAPE

Eight Core Principles of AI Development (CSIRO)



Seven Key Requirements for Trustworthy AI (EU)



Source:

<https://thenextweb.com/syndication/2019/05/01/here-are-the-7-requirements-for-building-ethical-ai-according-to-the-eu-commission/>

7 Requirements for Ethical AI (EU Commission)

1. Human agency and oversight
2. Technical robustness and safety
3. Privacy and data governance
4. Transparency (traceability, explainability and communication)
5. Diversity, non-discrimination and fairness
6. Societal and environmental well-being
7. Accountability

Source:

<https://thenextweb.com/syndication/2019/05/01/here-are-the-7-requirements-for-building-ethical-ai-according-to-the-eu-commission/>

AI at Google: our principle

Source: [AI at Google: our principles](#)



Sundar Pichai
CEO

Objectives for AI applications:

1. Be **socially beneficial**.
2. Avoid creating **unfair bias**.
3. Be built and tested for **safety**.
4. Be **accountable** to people.
5. Incorporate **privacy** design principles.
6. Uphold high standards of **scientific excellence**.
7. Be made available for uses that **accord** with these principles.

AI applications we will **not** pursue:

1. Technologies that cause or are likely to cause overall **harm**.
2. Weapons or technologies whose principal purpose is to cause **injury** to people.
3. Technologies that gather or use information for surveillance violating **international norms**.
4. Technologies contravenes principles of **international law** and **human rights**.

Google Employees Resign in Protest Against Pentagon Contract



Kate Conger
5/14/18 6:00AM • Filed to: PROJECT MAVEN

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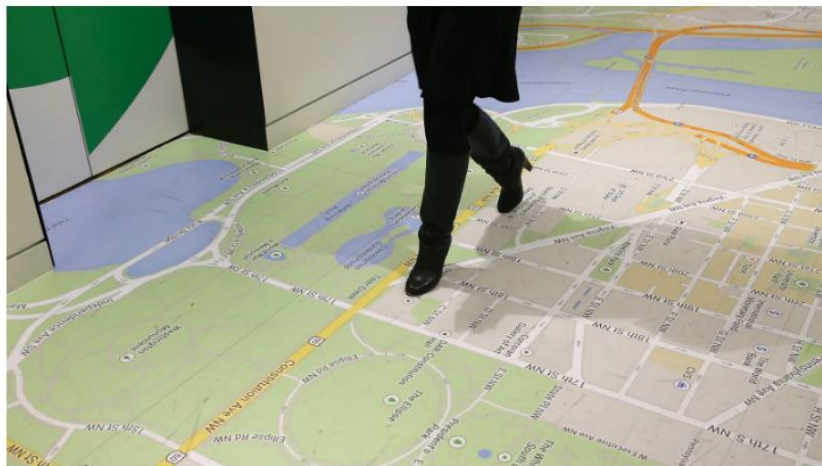


Photo: Mark Wilson (Getty)

Sources:

[Google Employees Resign in Protest Against Pentagon Contract](#)
[Why Google Just Passed on a \\$10 Billion Pentagon Contract](#)

Google Passes on a \$10 Billion Pentagon Cloud Contract, Citing Its New AI Principles

BY HALLIE DETRICK

October 9, 2018 4:19 PM EST



Google CEO Sundar Pichai delivers the keynote address at the Google I/O 2018 Conference at Shoreline Amphitheater on May 8, 2018 in Mountain View, California. Google's two day developer conference runs through Wednesday May 9.

JUSTIN SULLIVAN—GETTY IMAGES

Google is pulling its bid for a \$10 billion Pentagon contract.

Microsoft AI principles

Designing AI to be trustworthy requires creating solutions that reflect ethical principles that are deeply rooted in important and timeless values. Learn how we are putting these principles into practice at Microsoft.

[Learn more \(PDF\) >](#)

Source: [AI Principles & Approach from Microsoft](#)

Fairness

AI systems should treat all people fairly

Reliability & Safety

AI systems should perform reliably and safely

Privacy & Security

AI systems should be secure and respect privacy

Inclusiveness

AI systems should empower everyone and engage people

Transparency

AI systems should be understandable

Accountability

AI systems should have algorithmic accountability

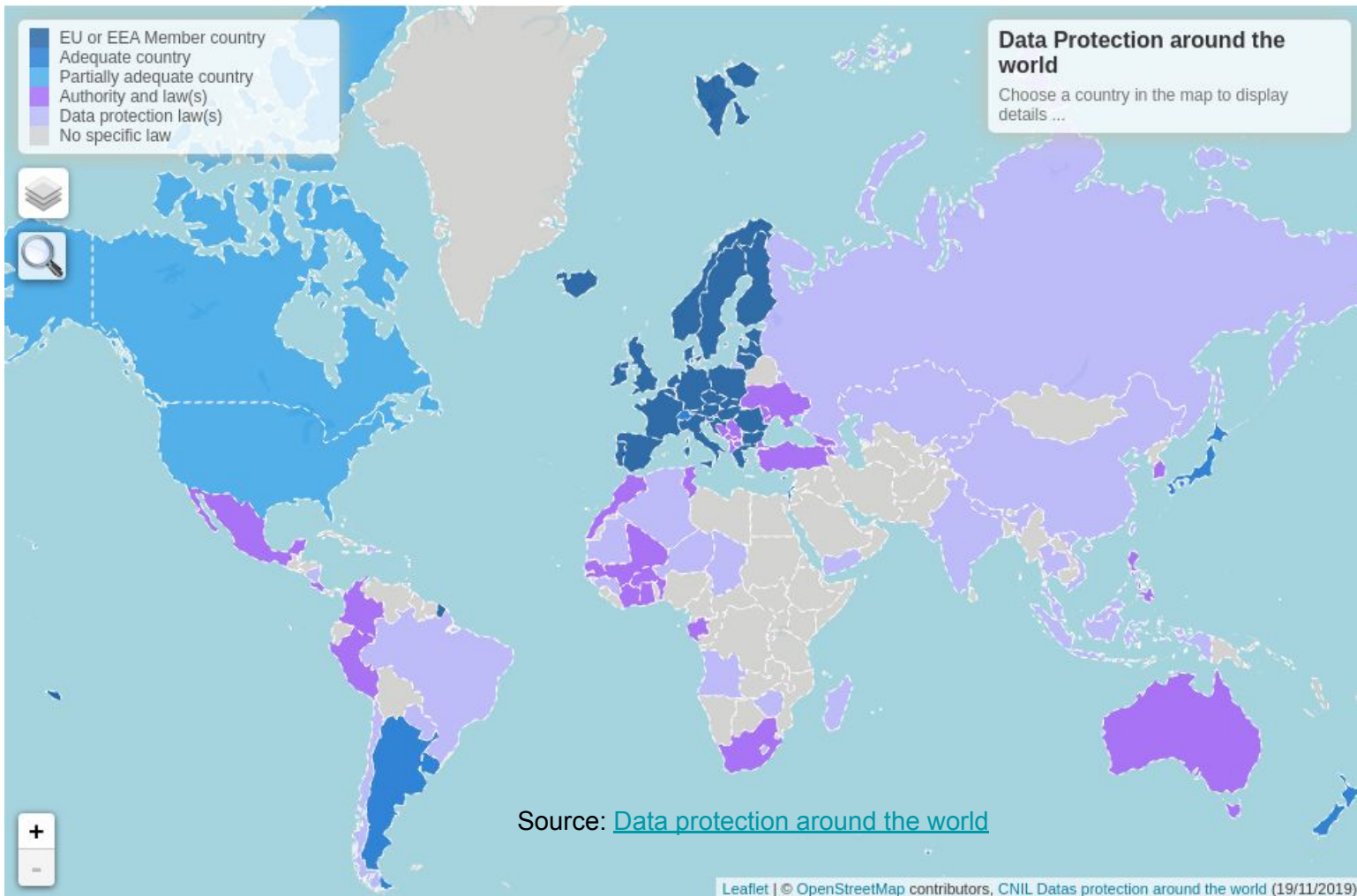
Data Trust

Source: [Element AI](#)

- Provide individuals with a greater measure of control over their personal data;
- Increase access to data and foster innovation;
- Address asymmetries of power that exist between corporations, the government and individuals;
- Enhance the protection of individual privacy and other human rights; and,
- Empower the public to share in the value of data and artificial intelligence.

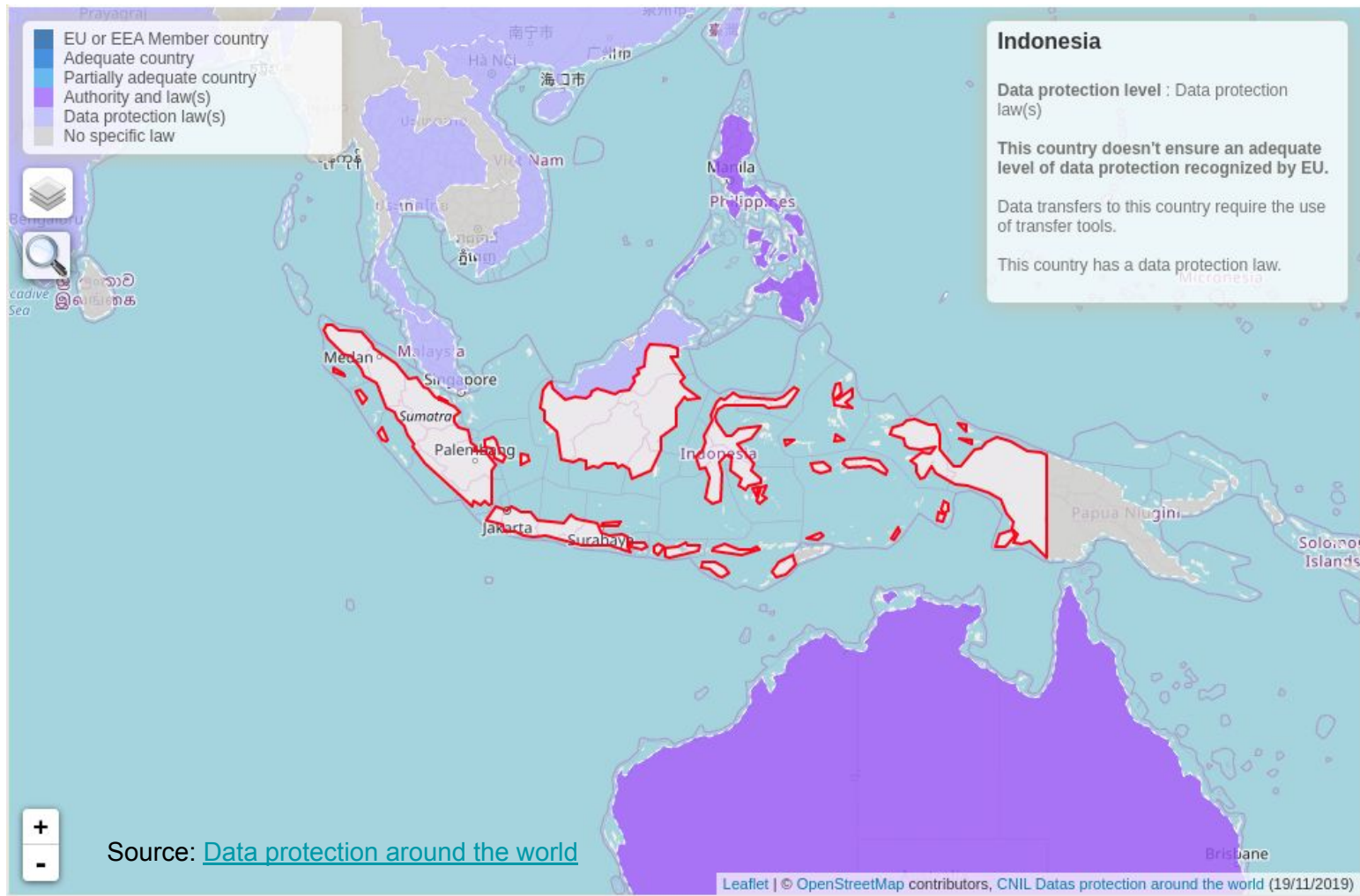
GDPR: Global Data Protection Regulation (EU)

- GDPR requires all companies that collect and handle user data in the European Union **to be more transparent** about their practices and more responsible for the security and privacy of their users.
- Under GDPR, they will also **have to let users obtain that data or to ask the company to delete** it entirely (*Delete data is problematic for two reasons*)
- Companies **must notify users** about “the existence of automated decision-making” and **provide them** with “meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.” (*The first is ok, the second is problematic*)



GDPR around the world

GDPR in Indonesia

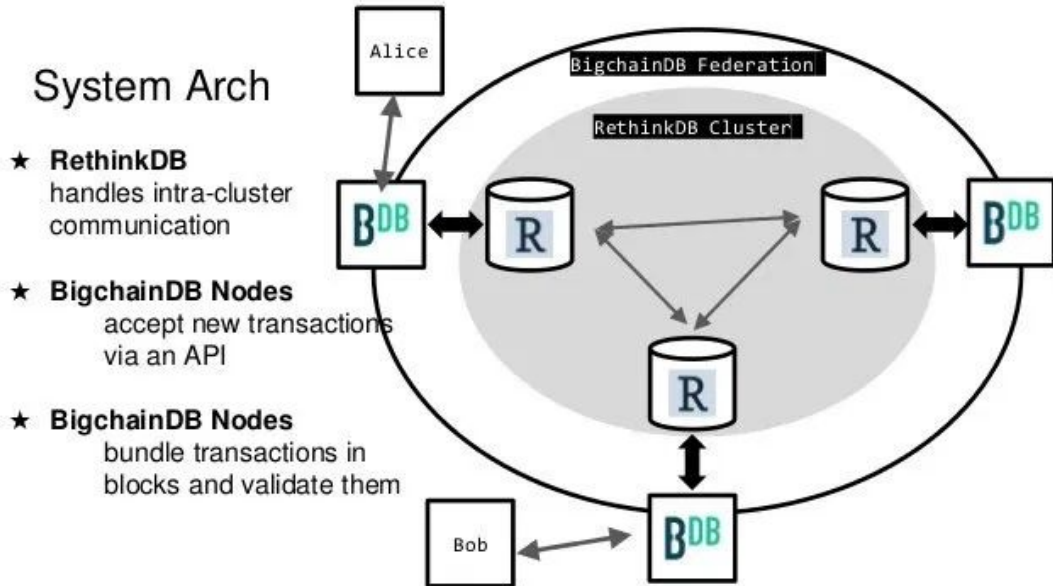


Source: [Data protection around the world](#)

Will GDPR prevent AI Innovations?

- Companies no longer be able to collect and mine user data without their clear and explicit consent.
- Companies no longer be able to test their algorithms on unsuspecting users.
- The penalties under the new rules (20 million euros or 4 percent of revenue, whichever is higher)
- GDPR will force tech companies to move toward more transparent solutions and adopt measures that provide their customers with the necessary assurances about how their data is used.
- Two solutions for sustaining innovations:
 - a. Decentralized AI***
 - b. Explainable AI***

Decentralized AI

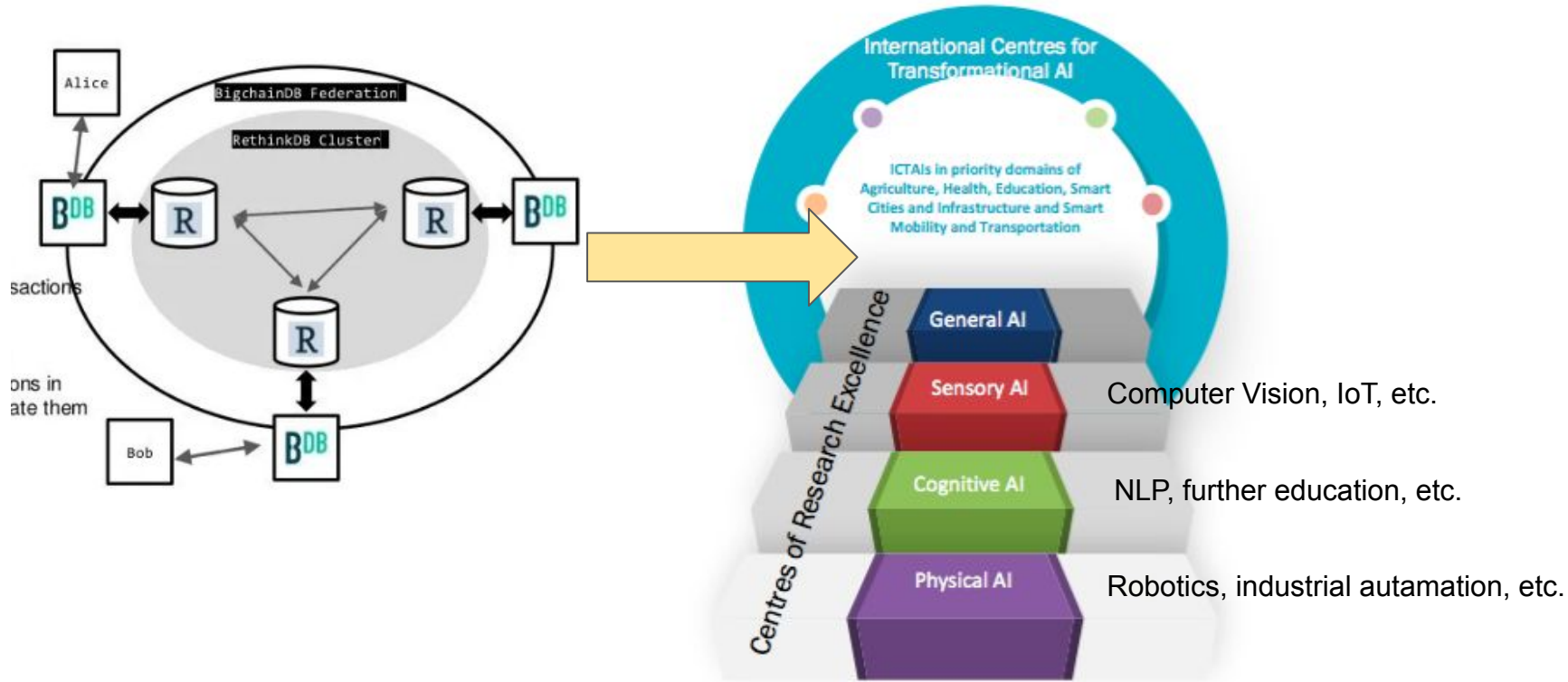


Some argue that decentralized AI will hurt competition by making everything available to everyone.

On the contrary, decentralized AI will enable more players to compete in the space. For instance, several startups can create a shared pool of data and algorithms to speed up their development of AI applications. As more companies and users join the network, they'll collectively be able to challenge the might of big tech companies.

It will help propel innovation forward by enabling companies to share expertise, knowledge and algorithms.

Indonesian Decentralized AI? (Blockchain Repo.)



Indonesian Decentralized AI? (Federated Learning)

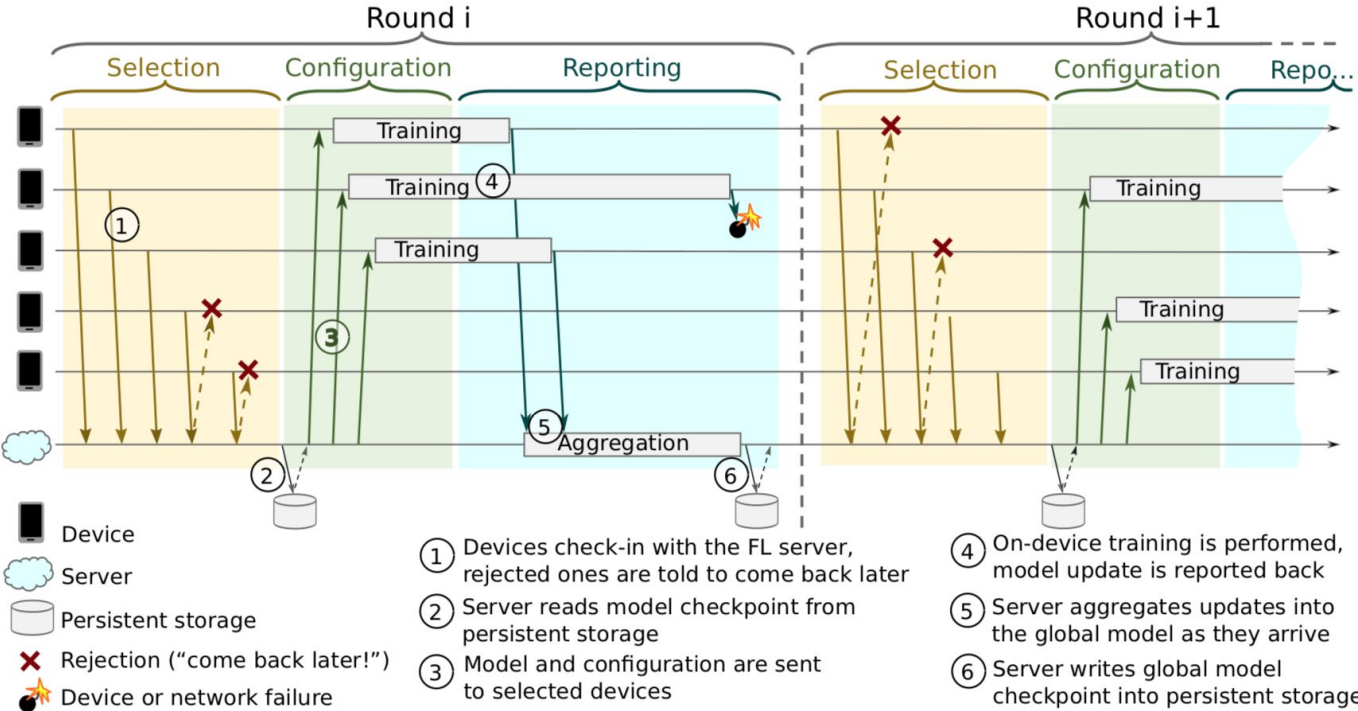


Figure 1: Federated Learning Protocol

Explainable AI (LIME)



Original Image






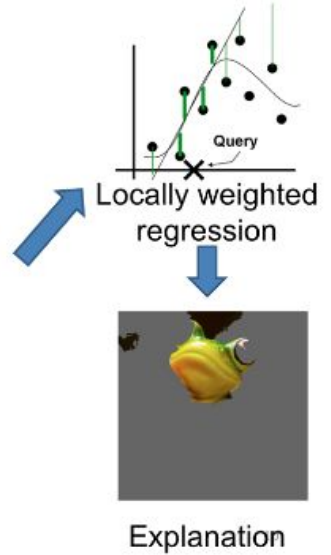
Interpretable
Components



Original Image
 $P(\text{tree frog}) = 0.54$

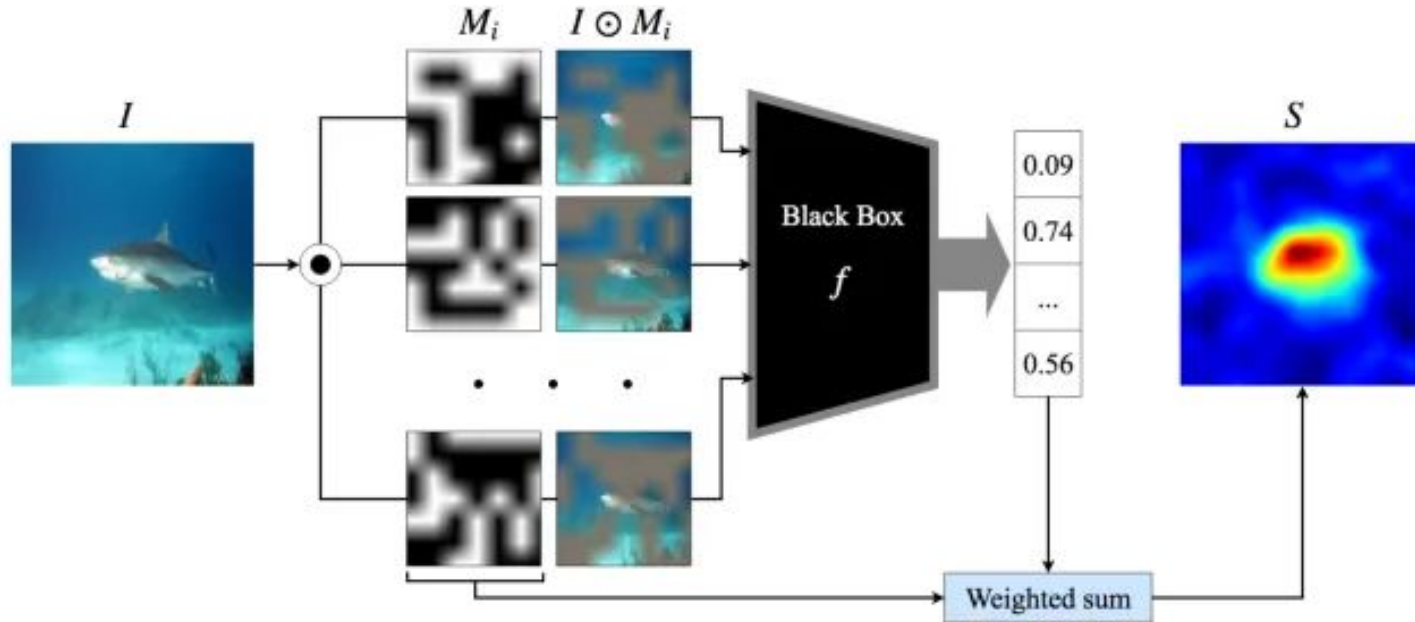


Perturbed Instances	$P(\text{tree frog})$
	<div style="width: 85%; background-color: #fde725; height: 15px;"></div> 0.85
	<div style="width: 1%; background-color: #fde725; height: 15px;"></div> 0.00001
	<div style="width: 52%; background-color: #fde725; height: 15px;"></div> 0.52



LIME relies on finding and evaluating "super pixels," After defining the super-pixels of an image, LIME masks each of them and reinserts them into the network to observe how it changes the output.

Explainable AI (RISE)



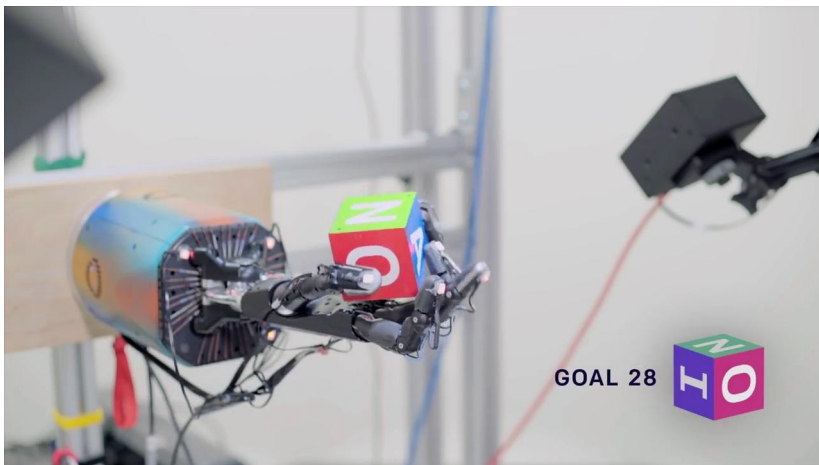
RISE applies random masks to inputs and measures the value of each pixel

Is AI research headed in the right direction?

- “[The Bitter Lesson](#),” AI scientist Rich Sutton stresses the difference between human and machine intelligence. Machine is the bicycle of the mind. Let machine built its own intelligence. **Deep learning is a method that continue to scale with increased computation.**
- “[The Better Lesson](#),” AI and robotics pioneer outlines some **fundamental flaws of deep learning** (adversarial, designing networks vs hard coding logic, data hungry, computation power = more energy, specialized hardware leads to a very rigid AI models)
- New York University professor and Gary Marcus wrote “[In-depth critical of deep learning](#)” (data hungry even for simple tasks, terrible generalization, not suited for domain adaptation, new problem requires new model and training from the scratch, hard to understand) -> **DL is overhyped.**

Is AI research headed in the right direction?

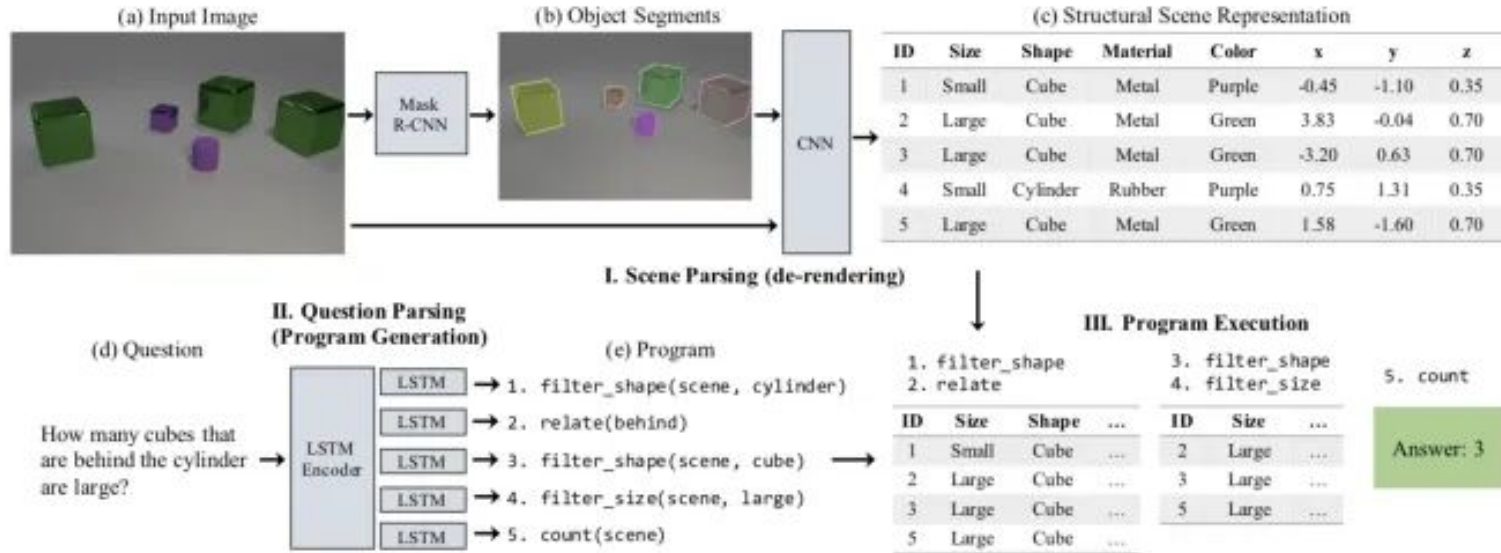
- Other AI expert, Ben Dickson debunk the criticism thrown at deep learning. What's important is that we **understand the extents and limits as well as the opportunities and advantages** that lie in deep learning, because it is one of the most influential technologies of our time. **DL is not overhyped. Perhaps it's just not well understood.**



Trained with 6144 CPUs
and 8 GPUs.

Is AI research headed in the right direction?

- Symbolist AI vs Connectionist AI
 - Symbolist AI = rule-based AI
 - Connectionist AI = statistical correlations
- Neuro-symbolic AI



The neuro-symbolic concept learner converts a visual question-answering problem into a symbolic AI program

8 Biggest AI Trends of 2020

1. AI will make healthcare more accurate and less costly
2. Explainability and trust will receive greater attention
3. AI will become less data-hungry
4. Improved accuracy and efficiency of neural networks
5. Automated AI development
6. AI in manufacturing
7. The geopolitical implications of AI
8. AI in drug discovery

Source: [8 biggest AI trends of 2020, according to experts](#)

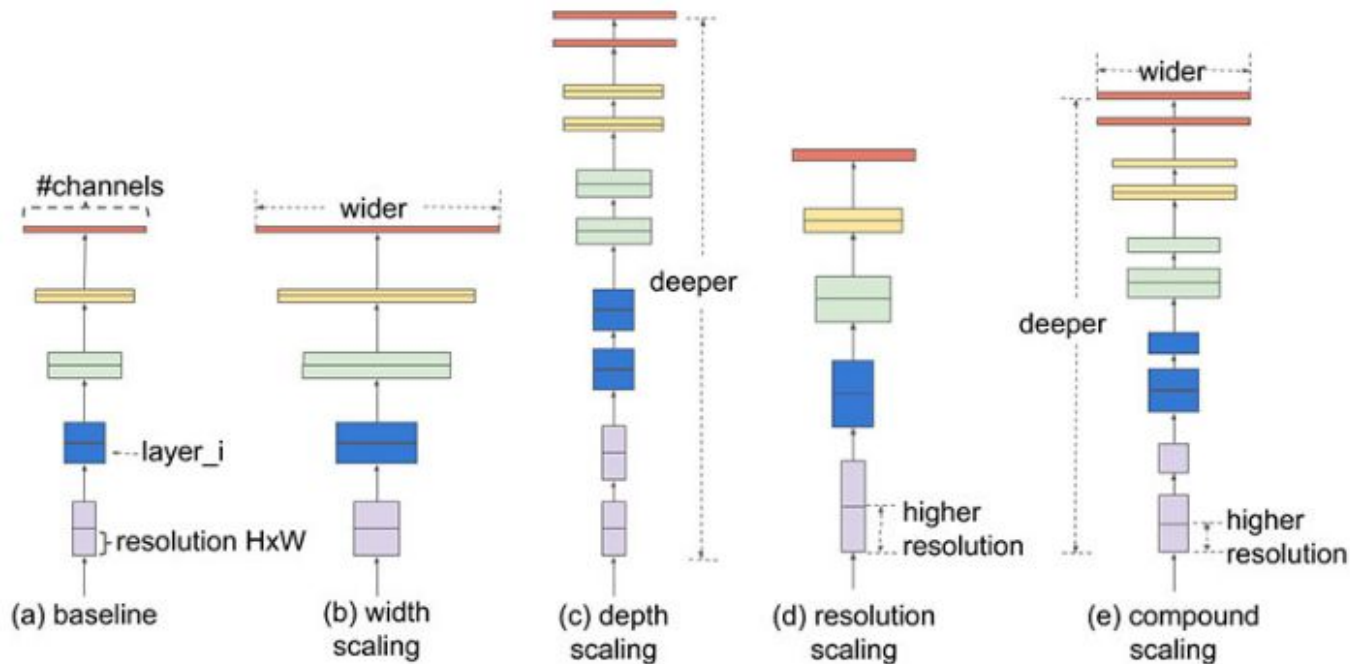
Where AI is going in 2020

1. AI community will place more value on AI model performance **beyond accuracy** (power, explainability, societal)
2. Awareness of the **real-life implications** of tech tools and technical decisions and a rejection of the idea that the makers of tools aren't responsible for what people do with them.
3. **Multimodal learning**, which is AI that relies on multiple media for training, and **multitasks learning**, which involves networks designed to complete multiple tasks at once.
4. Models that can improve through **self-training with unlabeled data**.
5. Demand for ML training **doubles every three and a half months**.
6. **Quantization** is a way to perform computation at reduced precision.

Cutting Edge CV Research Papers

1. [EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks](#)
2. [Learning the Depths of Moving People by Watching Frozen People](#)
3. [Reinforced Cross-Modal Matching and Self-Supervised Imitation Learning for Vision-Language Navigation](#)
4. [A Theory of Fermat Paths for Non-Line-of-Sight Shape Reconstruction](#)
5. [Reasoning-RCNN: Unifying Adaptive Global Reasoning into Large-scale Object Detection](#)
6. [Fixing the Train-Test Resolution Discrepancy](#)
7. [SinGAN: Learning a Generative Model from a Single Natural Image](#)
8. [Local Aggregation for Unsupervised Learning of Visual Embeddings](#)
9. [Robust Change Captioning](#)
10. [HYPER: A Benchmark for Human eYE Perceptual Evaluation of Generative Models](#)

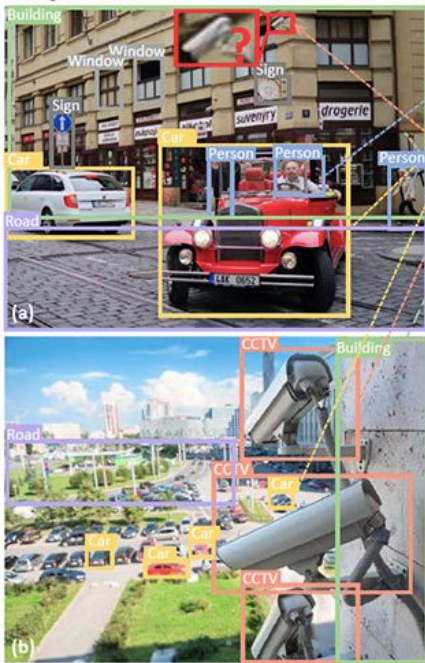
EfficientNet: Rethinking Model Scaling for CNN



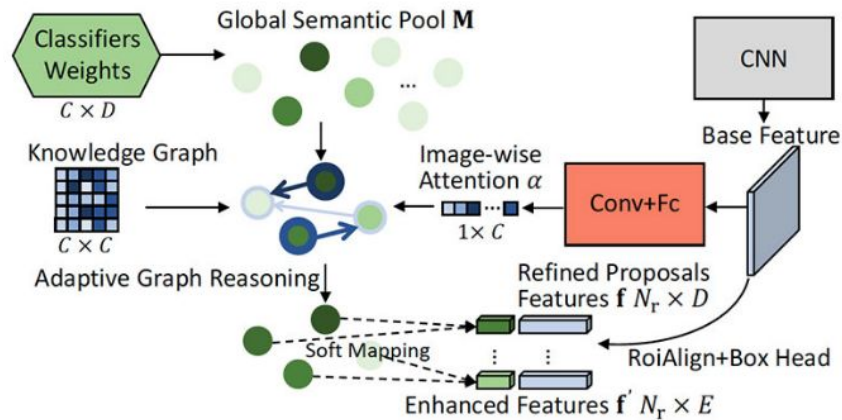
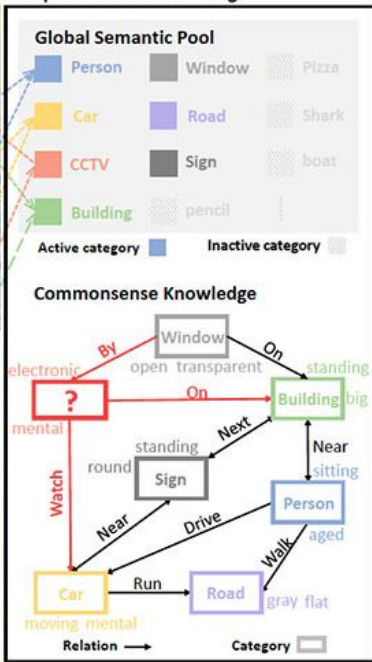
*The depth (number of layers), width and input resolution of a CNN should be scaled up at a **specific ratio** relative to each other, rather than arbitrarily.*

Reasoning-RCNN: Unifying adaptive global reasoning

Object Detection Task



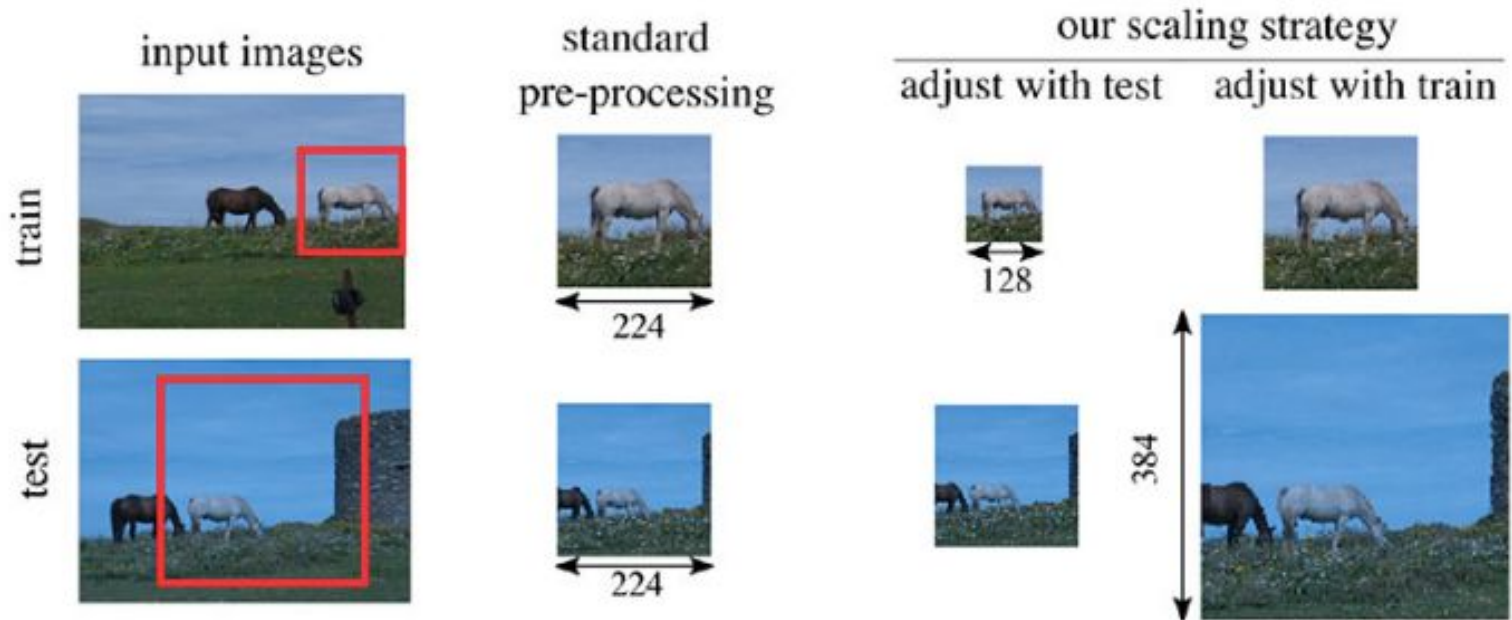
Adaptive Global Reasoning



An overview of adaptive global reasoning module

An example of how the proposed adaptive global reasoning facilitates large-scale object detection

Fixing the Train-Test Resolution Discrepancy

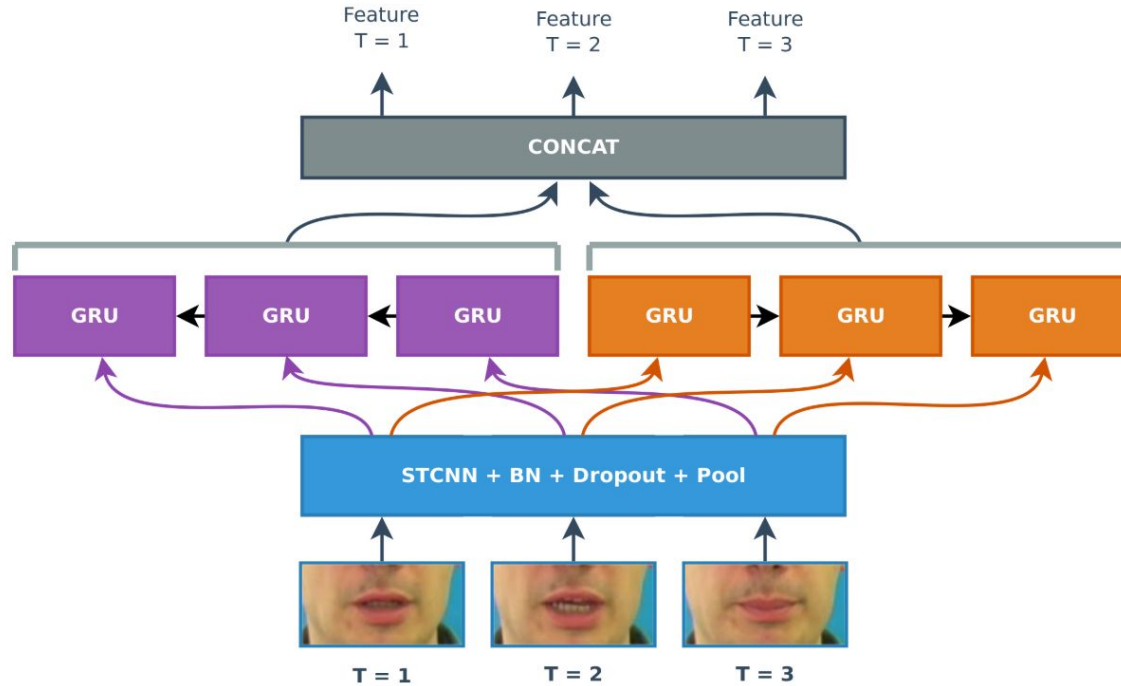


*The difference in image preprocessing procedures at training and at testing has a detrimental effect on the performance of the image classifier. To address this problem, the researchers suggest **joint optimization** of resolutions and scales of images at training and at test time*

AI Research in Indonesia (Lip Reading in Bahasa)

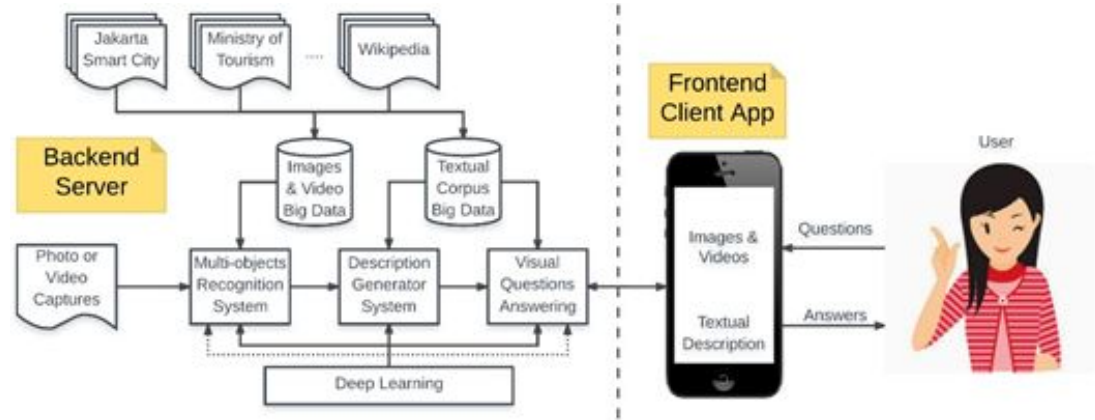
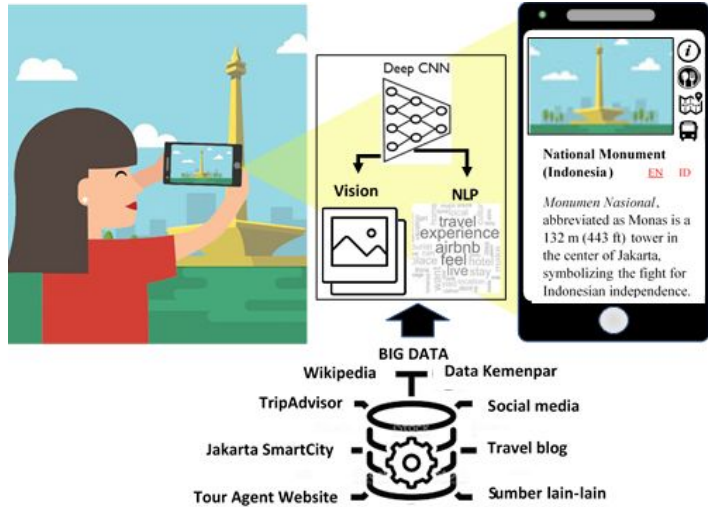


AI Research in Indonesia (Lip Reading in Bahasa)

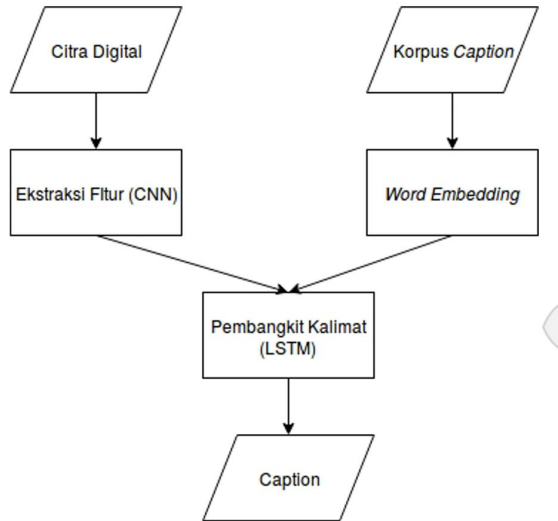


Gambar 3.3: Ilustrasi kinerja Bi-GRU.

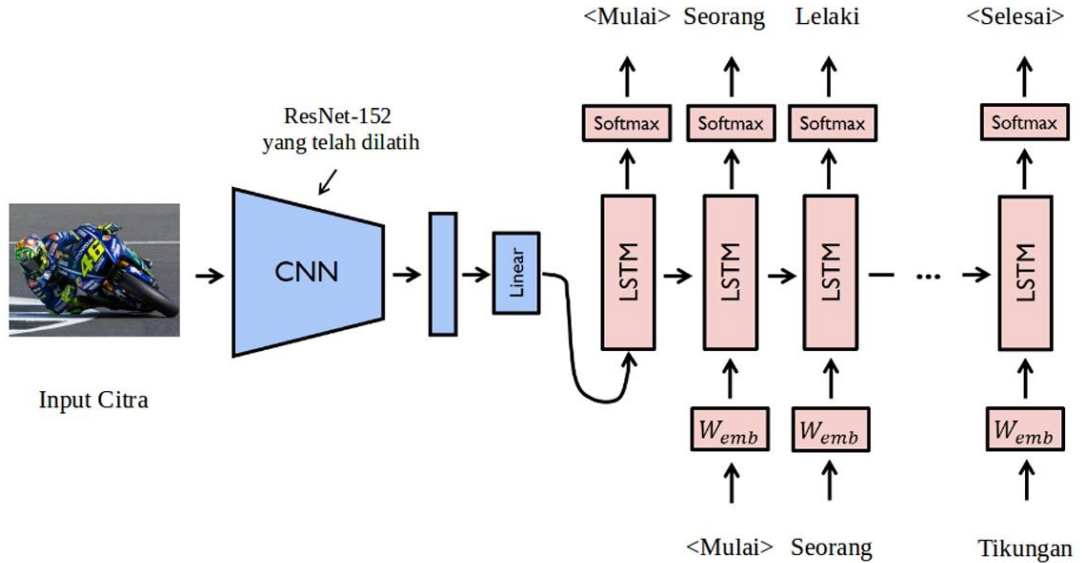
AI Research in Indonesia (Caption Gen. & VQA)



AI Research in Indonesia (Caption Generation)



Gambar 3.1: Arsitektur pembangkit *caption* otomatis



Gambar 3.7: Arsitektur lengkap pembangkit *caption* otomatis pada citra digital

AI Research in Indonesia (Caption Generation)

Tabel 3.1: Detil dataset

	Flickr8k	Flickr30k
Total	8091	31783
Jumlah Kosa Kata	3059	8091
Caption Terpanjang (kata)	33	67

Tabel 4.3: Properti dataset

	Data Pelatihan	Data Validasi	Data Tes
Flickr8k	6000	1000	1000
Flickr30k	28000	1000	1000



Flickr8k : sebuah pesawat terbang di udara

Flickr30k: sebuah pesawat terbang menembus langit biru jernih dengan awan putih



Flickr8k : seorang pria mengendarai sepeda motor di jalan

Flickr30k: seorang pengendara motor sedang berbelok di tikungan



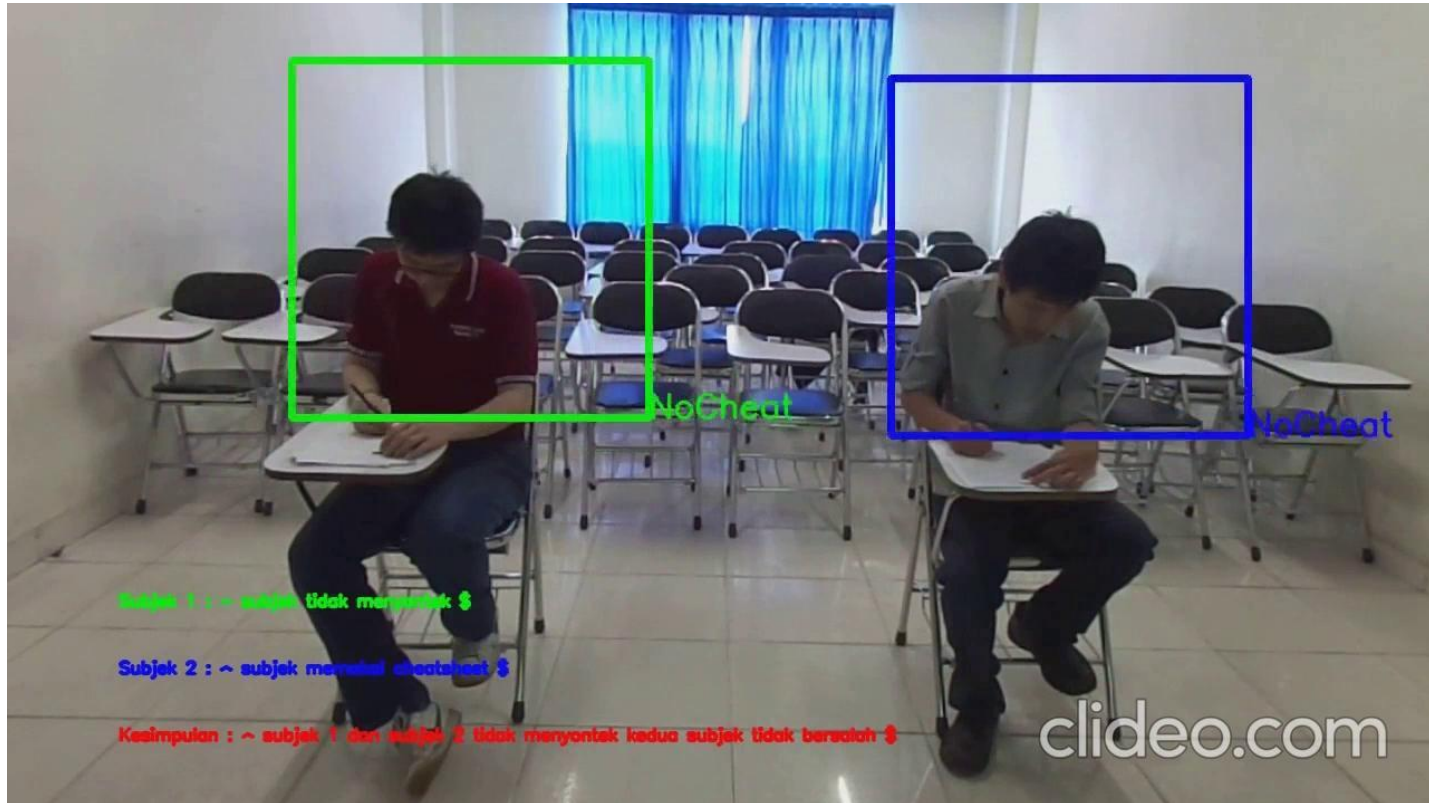
Dengan Attention

sekelompok anak
bermain di lapangan

Tanpa Attention

seorang pelari bisbol
bisbol di lapangan

AI Research in Indonesia (Action Recognition)



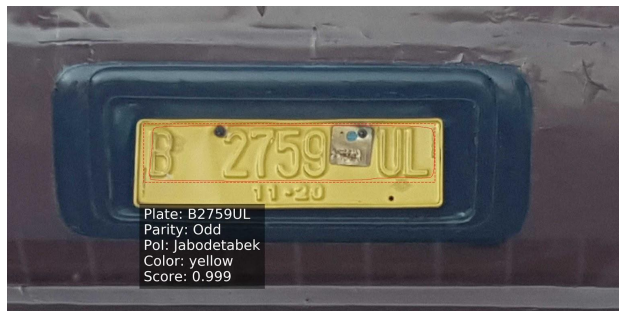
AI Research in Indonesia (People Recognition)



AI Research in Indonesia (Vehicle Recognition)



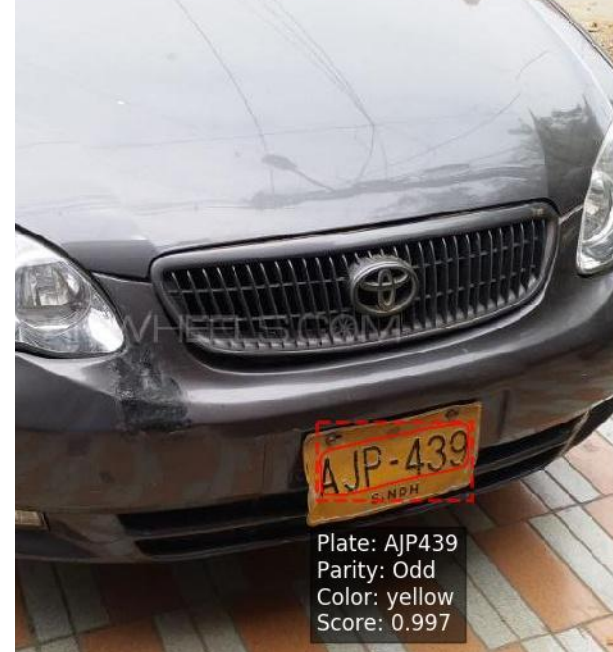
DeepALPR performance on various plates



DeepALPR performance on international plates



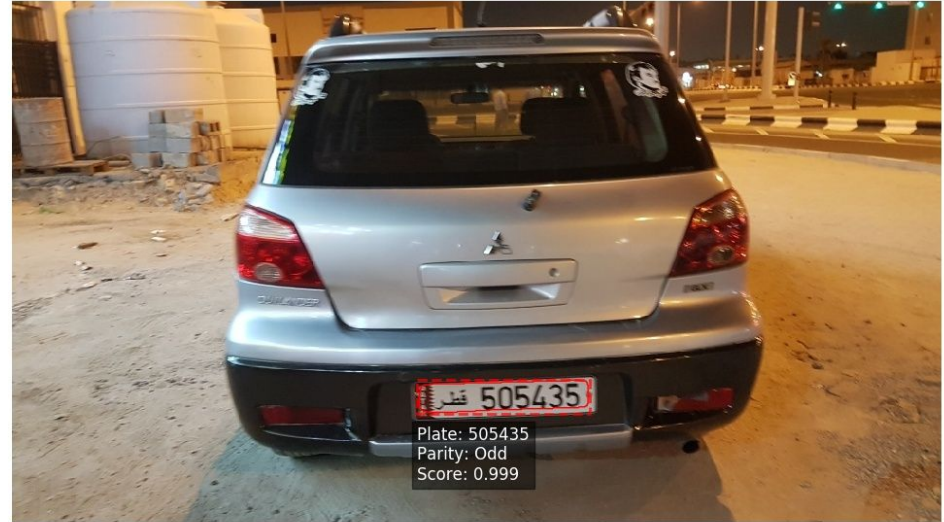
DeepALPR performance on international plates



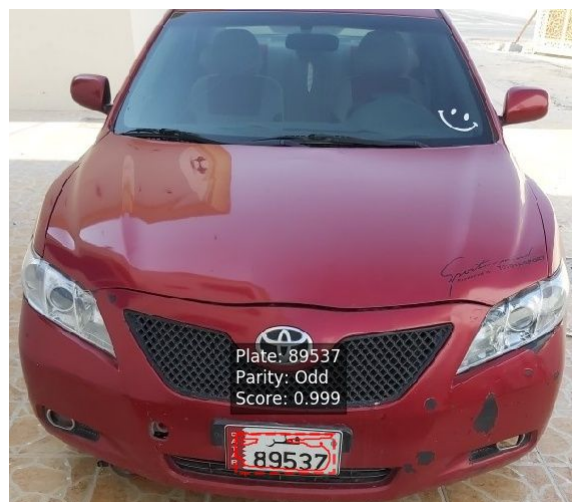
DeepALPR performance on international plates



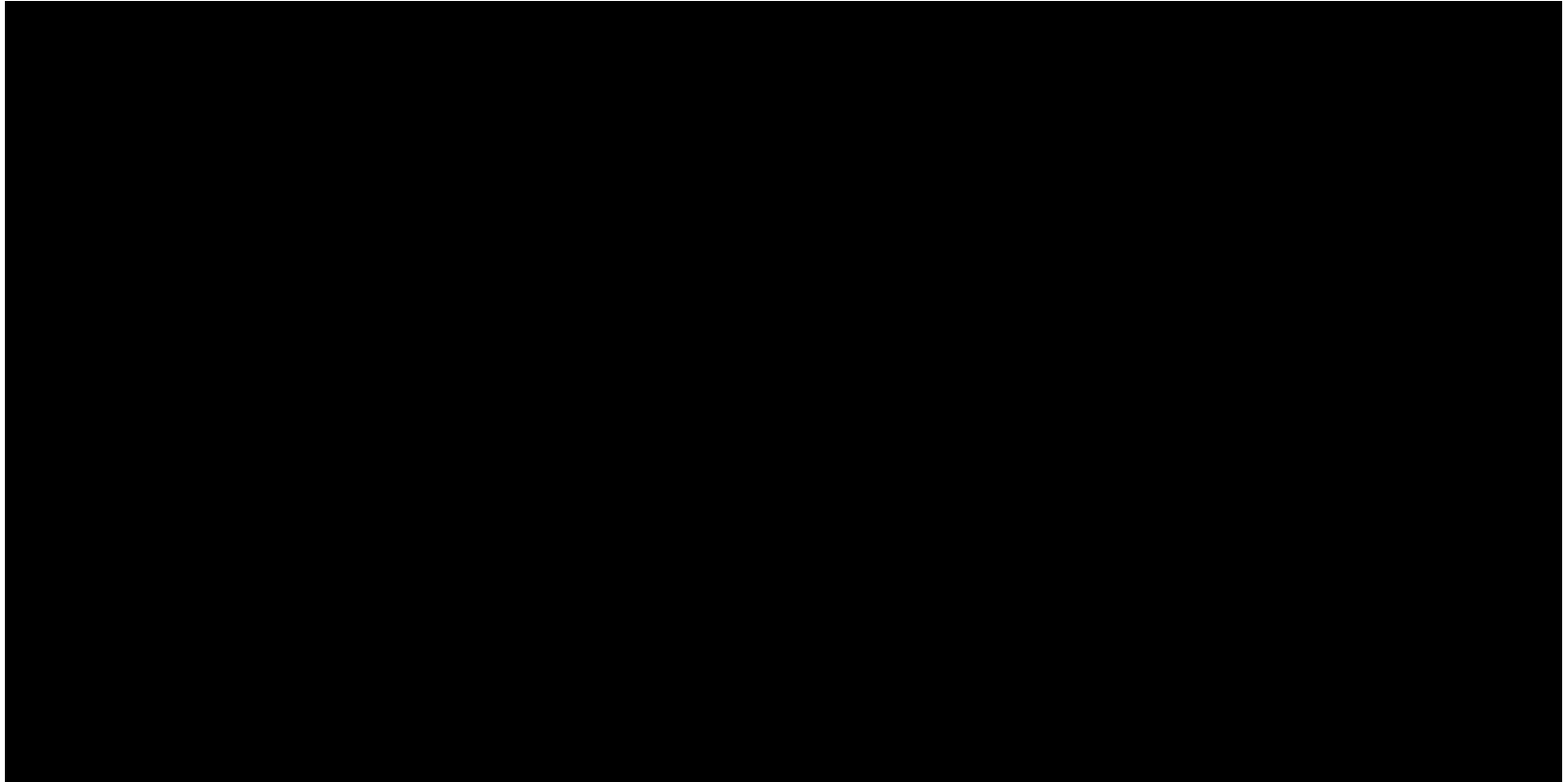
DeepALPR performance on Qatar plates



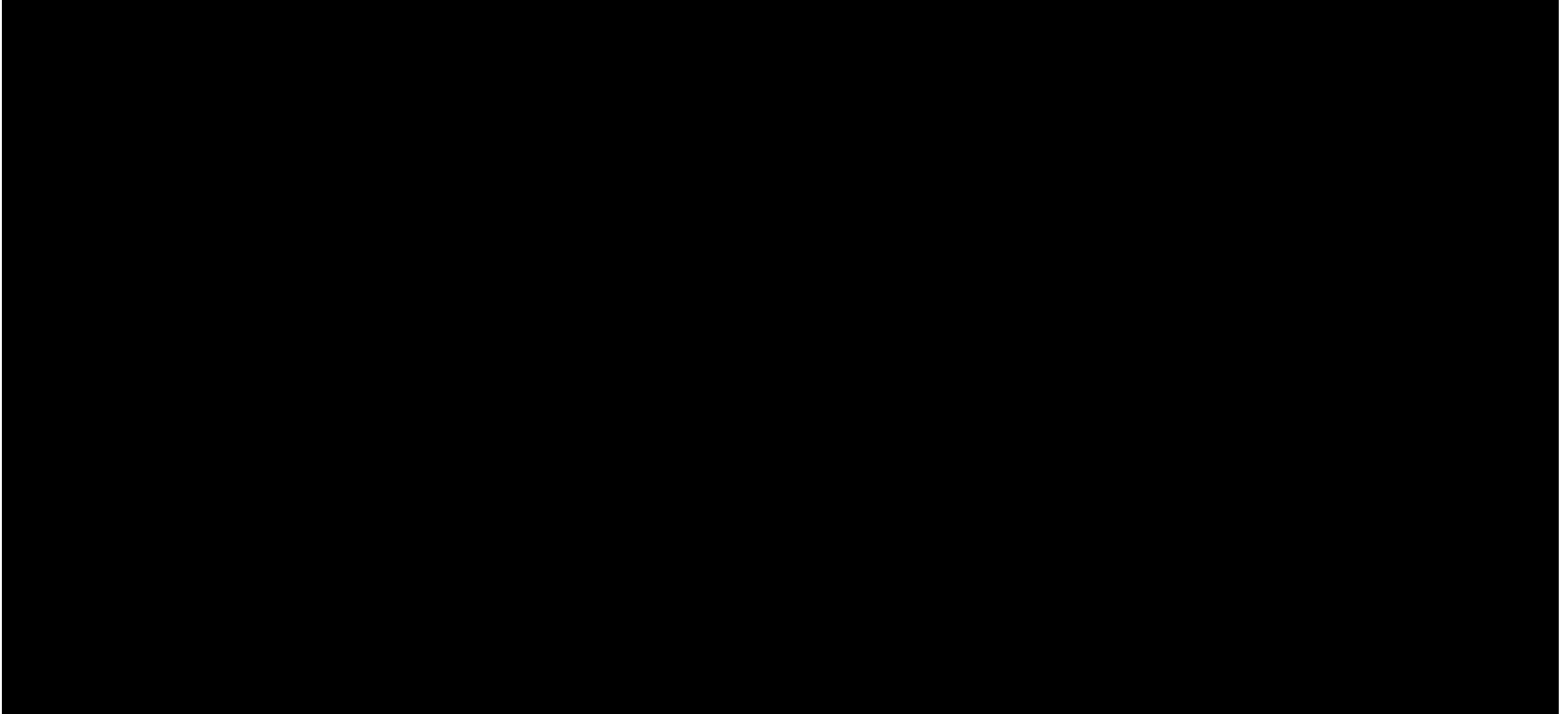
DeepALPR performance on Qatar plates



AI Research in Indonesia (Dent Recognition)



AI Research in Indonesia (Road Recognition)



AI Research in Indonesia (Motorcycle Recognition)




AI Research in Indonesia (Safety Recognition)



AI Research in Indonesia (Safety Recognition)



Collaboration Platforms



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WELCOME TO THE AI4EU PLATFORM

PLEASE LOG IN

The image shows a banner for the AI4EU platform. On the left is a solid green profile of a human head. On the right is a wireframe green profile of a human head. The text 'WELCOME TO THE AI4EU PLATFORM' is centered in white. Below it is a red button that says 'PLEASE LOG IN'. Above the banner are the AI4EU logo, navigation links, and social media icons.



BE INFORMED

Keep up-to-date with all the AI news from around the project and the whole AI community, learn through Web Cafes and available Tools and Community resources

LEARN MORE



GET CONNECTED

Get introduced and stay in touch with the community of AI professionals, where you can network meet up virtually, at webinars and during events

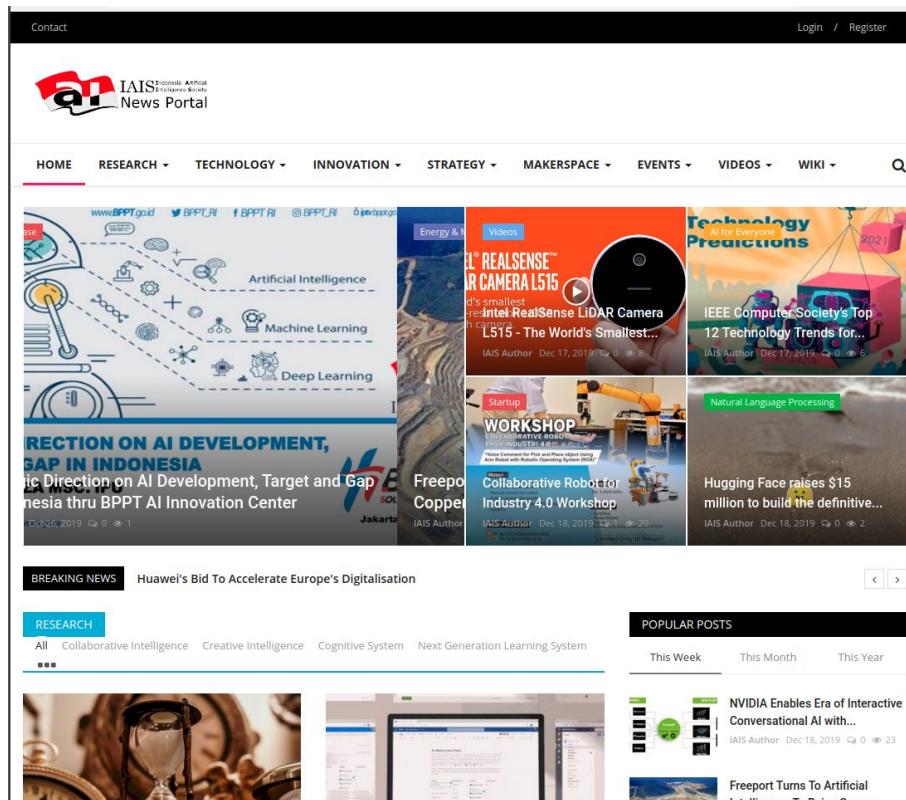
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WORK TOGETHER

Share the AI expertise with other experts and work together to develop unique solutions, algorithms and tools to make AI available to all.

LEARN MORE



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The screenshot shows the IAIS News Portal website. It features a navigation bar with categories like HOME, RESEARCH, TECHNOLOGY, INNOVATION, STRATEGY, MAKERSPACE, EVENTS, VIDEOS, and WIKI. The main content area includes a large article about AI development in Indonesia, several video thumbnails, and a 'POPULAR POSTS' section with articles on NVIDIA and Freepoint. The website has a clean, modern design with a dark header and a light main content area.