

# ROADMAP OF RESPIRATORY HEALTHCARE RESEARCH

## ON THE EMERGING TECHNOLOGY OF BIG DATA AND ARTIFICIAL INTELLIGENCE

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## EDUCATIONS

- Consultant in Interventional Pulmonology and Emergency Respiratory Care (Indonesian College of Pulmonology and Respiratory Medicine, 2020)
- Pulmonologist (Faculty of Medicine, Universitas Indonesia, 2018)
- Ph.D. (Hiroshima University, 2017)
- M.D. (Faculty of Medicine, Universitas Indonesia, 2008)

## RESEARCH TOPICS

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Pulmonology, COVID-19, medical bioinformatics, genomics, pulmonary infectious disease, pulmonary diagnostics, bronchoscopy

## POSITIONS

- Social Services Coordinator, Faculty of Medicine, Universitas Indonesia
- Lecturer, Faculty of Medicine, Universitas Indonesia
- Chief of Pulmonology and Respiratory Staff Group, Universitas Indonesia Hospital, Universitas Indonesia
- Researcher, Indonesian Medical Education and Research Institute, Faculty of Medicine, Universitas Indonesia
- Surveyor, Damar Husada Paripurna Institute for National Hospital Accreditation
- Committee and Assembly Members in IMA (IDI), ISR (PDPI), APSR

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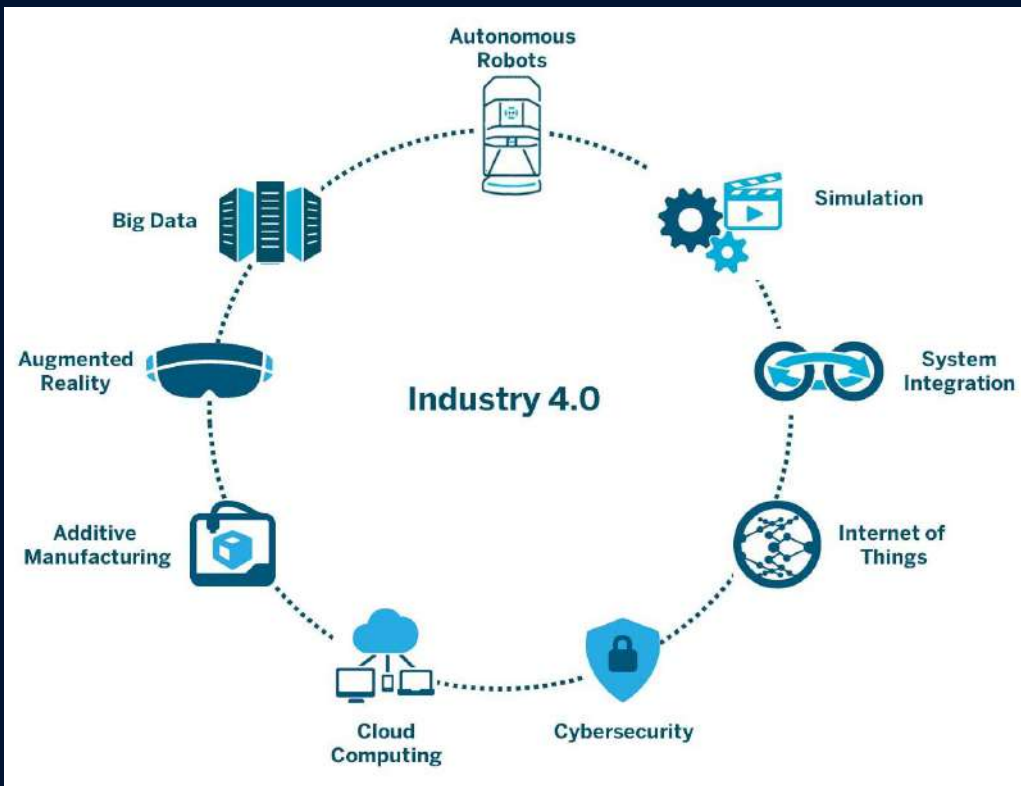
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- There are no sources of funding or conflicts of interest to be declared regarding this presentation

# WHAT WE ARE ABOUT TO DISCUSS

- Big Data and A.I. in a Nutshell
- What is Big Data and A.I. in Medicine?
- What is Big Data and A.I. in Pulmonology?
- Example for Big Data and A.I. Research
- How Much Are We Prepared?
- What Should We Prepare?
- Proposed Roadmap of Respiratory Research

# HOW DOES BIG DATA & A.I. WORK?



## “Dawn of an Era”

An era of an **autonomous** process involving an **integration of wireless cyber networks**, generating **big amount of data**

PURPOSE:

Resource **efficiency** and output **effectiveness**

INOVAATION  
DISRUPTION  
TRANSFORMATION

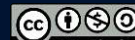
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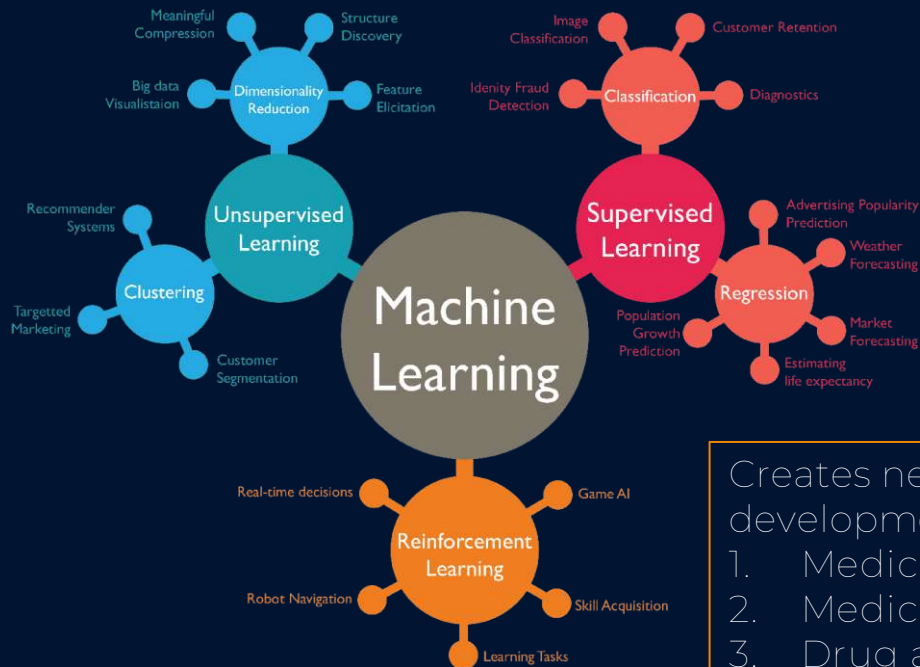


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# HOW DOES BIG DATA & A.I. WORK?



## Artificial Intelligence

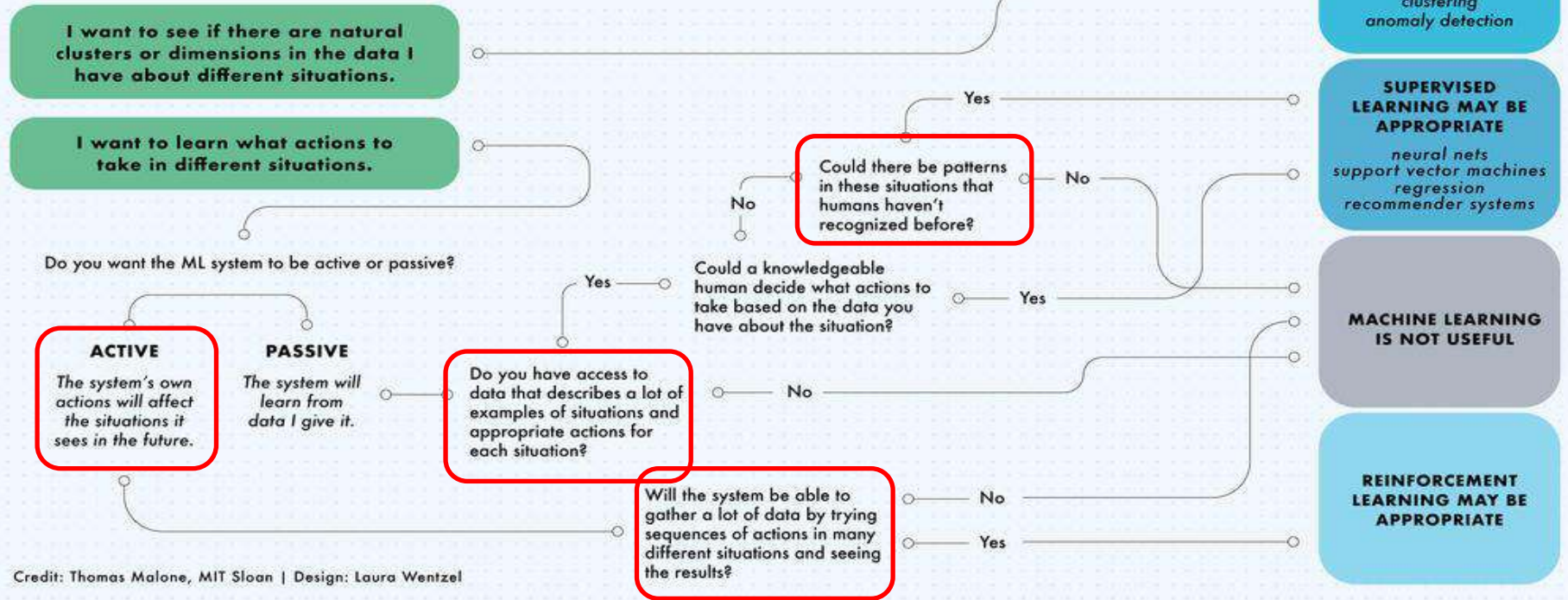
Technical disciplines that uses computer technology to research and develop the theory, method, technique, and application system for the simulation, extension, and expansion of human intelligence

A.I. research has demonstrated that the output-input ratio in medicine is more promising than that of other fields.

Creates new productivity, innovation, and development in:

1. Medical diagnosis
2. Medical treatment
3. Drug and vaccine discovery and production
4. Medical management and education

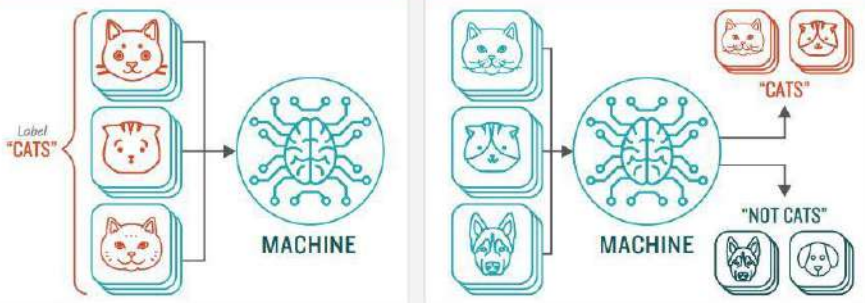
# What do you want the machine learning system to do?



Credit: Thomas Malone, MIT Sloan | Design: Laura Wentzel

## How Supervised Machine Learning Works

- STEP 1** Provide the machine learning algorithm categorized or "labeled" input and output data from to learn
- STEP 2** Feed the machine new, unlabeled information to see if it tags new data appropriately. If not, continue refining the algorithm

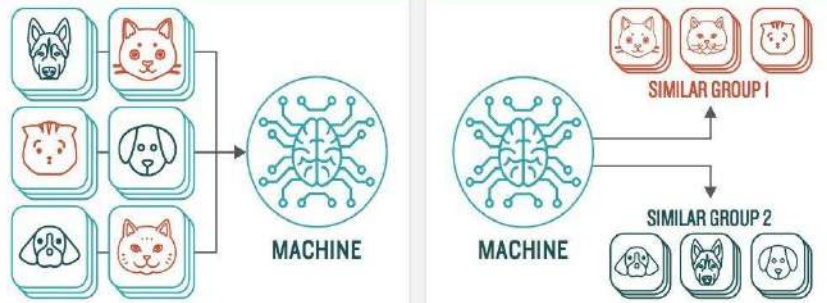


### TYPES OF PROBLEMS TO WHICH IT'S SUITED

	<b>CLASSIFICATION</b> Sorting items into categories		<b>REGRESSION</b> Identifying real values (dollars, weight, etc.)
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## How Unsupervised Machine Learning Works

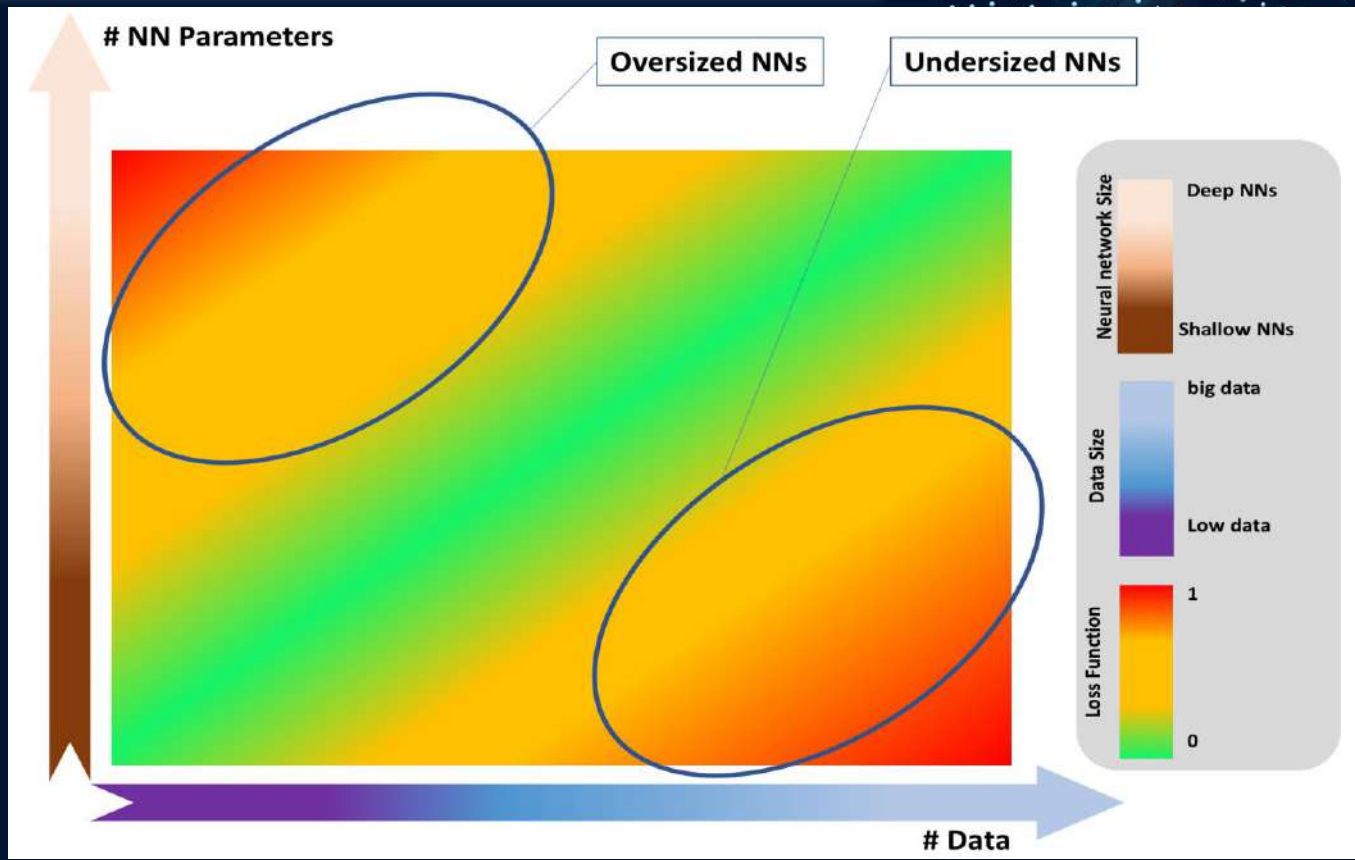
- STEP 1** Provide the machine learning algorithm uncategorized, unlabeled input data to see what patterns it finds
- STEP 2** Observe and learn from the patterns the machine identifies



### TYPES OF PROBLEMS TO WHICH IT'S SUITED

	<b>CLUSTERING</b> Identifying similarities in groups <i>For Example:</i> Are there patterns in the data to indicate certain patients will respond better to this treatment than others?		<b>ANOMALY DETECTION</b> Identifying abnormalities in data <i>For Example:</i> Is a hacker intruding in our network?
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# HOW DOES A.I. AND BIG DATA WORK?



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# HOW DOES A.I. AND BIG DATA WORK?

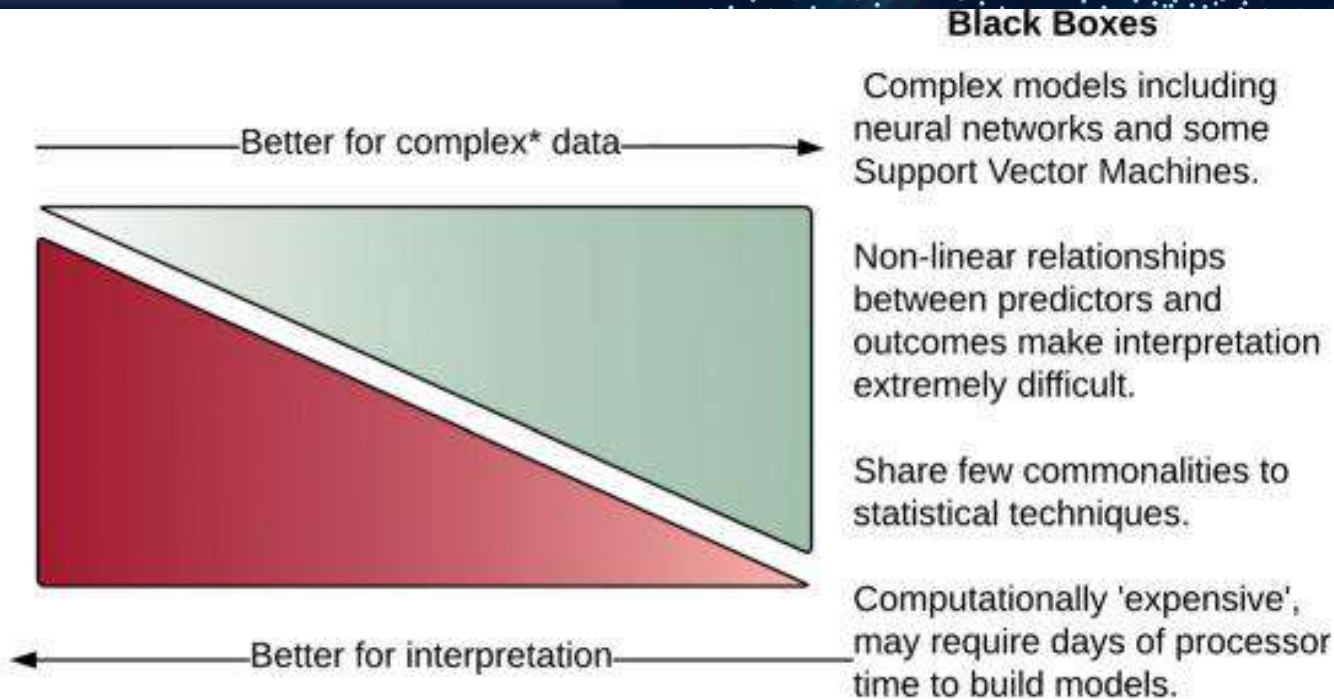
## Auditable Algorithms

Simpler models including multiple regression and decision trees.

Linear relationships between predictors and outcomes facilitate interpretation.

Many commonalities to statistical techniques.

Computationally 'cheap' can often be run on a consumer PC.



## Black Boxes

Complex models including neural networks and some Support Vector Machines.

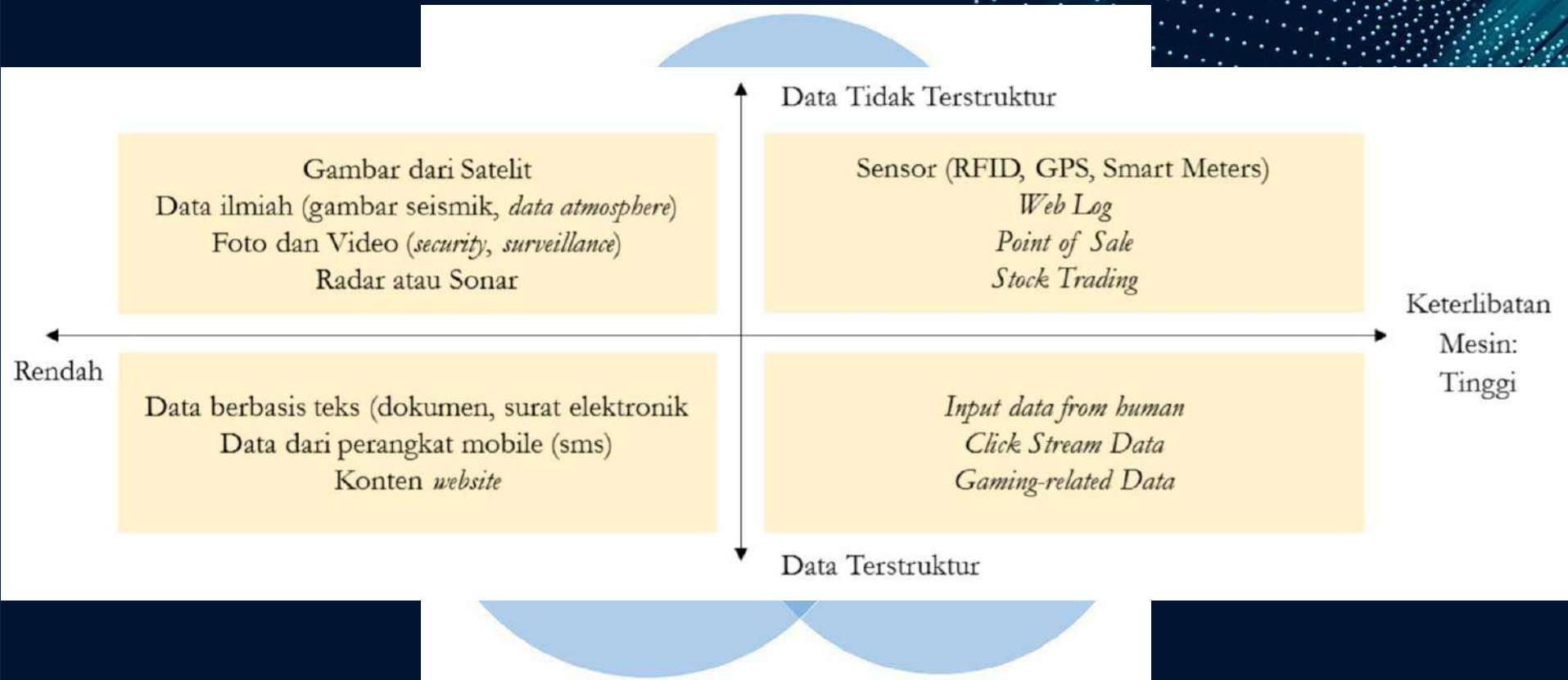
Non-linear relationships between predictors and outcomes make interpretation extremely difficult.

Share few commonalities to statistical techniques.

Computationally 'expensive', may require days of processor time to build models.

\* 'Complex' data could refer to data which do not have a linear relationship with the outcome, such as a pixel in an image, the frequency of a wave in a sound bite, or movement data captured by a smart phone.

# WHAT IS BIG DATA & A.I. IN MEDICINE?





- Different drug responses
- Corticosteroid dependence
- Corticosteroid resistance
- Cancer histopathology & progress
- Cancer chemoth/radioth resistance
- Persistent progress in regards treatments/avoidance
- Different culture background
- Different human susceptibility
- Different lifestyle





## Physiological:

- Static & dynamic lung function (spirometry)
- Diffusion capacity
- Polysomnography
- VQ scan

## Anatomical: radiological, etc.

## Other: med record, public database, etc.







**Table 5** The top-30 of hit compounds from LBDD methods

No	Compound Name	No	Compound Name
1	Kaempferol 3- $\alpha$ -D-arabinopyranoside	16	Catalpol
2	Isoforskolin	17	Cyanidin-3-sophoroside-5-glucoside
3	Glucoputranjivin	18	(+)-2,3-Dihydro-9-hydroxy-2 [1-(6-sinapoyl) beta-D-glucosyloxy-1-methylethyl]-7H-propanoat
4	Loganic Acid	19	Myricetin 3-glucoside
5	Majoroside	20	Hesperidin
6	Oleoside	21	Azadirachtin A
7	Geniposide	22	1-Caffeoyl-beta-D-glucose
8	Glucobrassicin	23	Sinigrin
9	Spiraeoside	24	Theviridoside
10	Alizarin	25	Quercetin 3-(2G-rhamnosylrutinoside)
11	Morindone	26	Peonidin 3-(4'arabinosylglucoside)
12	Casuarinin	27	trans-p-Sinapoyl-b-D-glucopyranoside
13	Scutellarein-6,4'-dimethyl ether-7-(6"-acetylglucoside)	28	6,8-Di-C-beta-D-arabinopyranosyl apigenin
14	Scandoside methyl ester	29	8-Methylthio-octyl glucosinolate
15	beta-Glucogallin	30	Amaranthine

**Table 6** Molecular docking results of 14 hit (overlapped) compounds against the main protease of SARS-CoV-2

No	Compound name	Binding Energy ( $\Delta G$ ) (kcal/mol)	Sources
1	Cyanidin-3-sophoroside-5-glucoside	-6.52	<i>Brassica Oleracea</i> [52]; <i>Ipomoea Batatas</i> [53]; <i>Raphanus Sativus</i> [54]
2	Geniposide	-7.04	<i>Gardenia jasminoides</i> [55]
3	Hesperidin	-8.72	<i>Psidium guajava</i> [56] <i>Citrus aurantium</i> [56]
4	Isoforskolin	-6.88	<i>Coleus forskohlii</i> [57]
5	Kaempferol 3,4'-di-O-methylether (Ermanin)	-8.51	<i>Zingiber aromaticum</i> [58]
6	Majoroside	-7.03	<i>Plantago major</i> [59]
7	Myricetin-3-glucoside	-8.26	<i>Moringa oleifera</i> [60]
8	Oleoside	-6.52	<i>Oleaceae familia (e.g. Jasminum sambac)</i> [61]
9	Peonidine 3-(4'-arabinosylglucoside)	-8.52	<i>Ipomoea fistulosa</i> [62]
10	Quercetin 3-(2G-rhamnosylrutinoside)	-8.56	<i>Clitoria Tematea</i> [63]
11	Rhamnetin 3-mannosyl-(1-2)-alloside	-8.48	<i>Moringa oleifera</i> [64] <i>Cassia alata</i> [65]
12	Sinigrin	-5.19	<i>Brassica nigra</i> [66]
13	Spiraeoside	-7.97	<i>Filipendula ulmaria</i> [67]
14	Theviridoside	-7.13	<i>Thevetia peruviana</i> [68]
15	Lopinavir	-9.41	Antiviral drug (positive control)

Hindawi  
International Journal of Inflammation  
Volume 2022, Article ID 1490408, 7 pages  
<https://doi.org/10.1155/2022/1490408>



## Research Article

### Differentially Expressed Genes Study Shown Potential for BCG Stimulation in Reducing the Severity of COVID-19

Irandi Putra Pratomo<sup>1,2,3</sup>, Aryo Tedjo<sup>4,5,6</sup>, Dimas R Noor,<sup>7</sup>  
and Wisnu Ananta Kusuma<sup>8,9</sup>

The COVID-19 gene expression data set (GSE164805) was selected from the GEO database (<https://www.ncbi.nlm.nih.gov/geo/>) based on the GPL26963 platform (Agilent-085982 Arraystar human lncRNA V5 microarray). GSE164805 consisted of 15 peripheral blood mononuclear cells (PBMCs) from patients with severe symptoms

## Six group of comparison:

1. adults (severe COV+) vs healthy controls
2. adults vaccinated with BCG vs BCG naive/unvaccinated
3. PBMC of BCG vaccinated infants stimulated with BCG vs healthy control
4. PBMC of BCG vaccinated infants stimulated with PPD vs healthy control
5. adults vaccinated with BCG stimulated with BCG vs unstimulated
6. adults BCG naive stimulated with BCG vs unstimulated

Differently expressed genes in each data set were identified using the online tools of GEO2R (<https://www.ncbi.nlm.nih.gov/geo/geo2r/>) provided by the NCBI

DEGs → STRING application version 11.0 (<https://string-db.org/cgi/input.pl>)

TABLE 1: Gene expression in PBMCs severe COVID-19 patients with PBMCs subject to BCG stimulation of PBMCs. Data that experienced upregulation were marked with green, downregulation with red, and not significant were marked with white lines.

Gene.symbol	(1) padj <0.05	(2) padj <0.05	(3) padj <0.05	(4) padj <0.05	(5) padj <0.05	(6) padj <0.05	
BIRC3	↓	Not significant	↑	↑	Not significant	Not significant	
CCL3	↓		↑	↑	Not significant	Not significant	
CCL3L1	↓		↑	↑	Not significant	Not significant	
CCL4	↓		↑	↑	Not significant	Not significant	
CSF2	↓		↑	↑	Not significant	Not significant	
CSF3	↑		↑	↑	Not significant	Not significant	
CXCL1	↑		↑	↑	Not significant	Not significant	
CXCL2	↑		↑	↑	Not significant	Not significant	
CXCL8	↑		↑	↑	Not significant	Not significant	
IL1B	↓		↑	↑	Not significant	Not significant	
LTA	↓		↑	↑	Not significant	Not significant	
LIF	↓		↑	↑	Not significant	Not significant	Not significant
LTBR	↓		↑	↑		Not significant	Not significant
NFKBIA	↑		DOWN ↓	↑	↑	Not significant	Not significant
OSM	↑		Not significant	↑	↑	Not significant	Not significant
TNF	↑	Not significant	↑	↑	Not significant	Not significant	

# BIG DATA & A.I. IN PULMONARY MEDICINE?

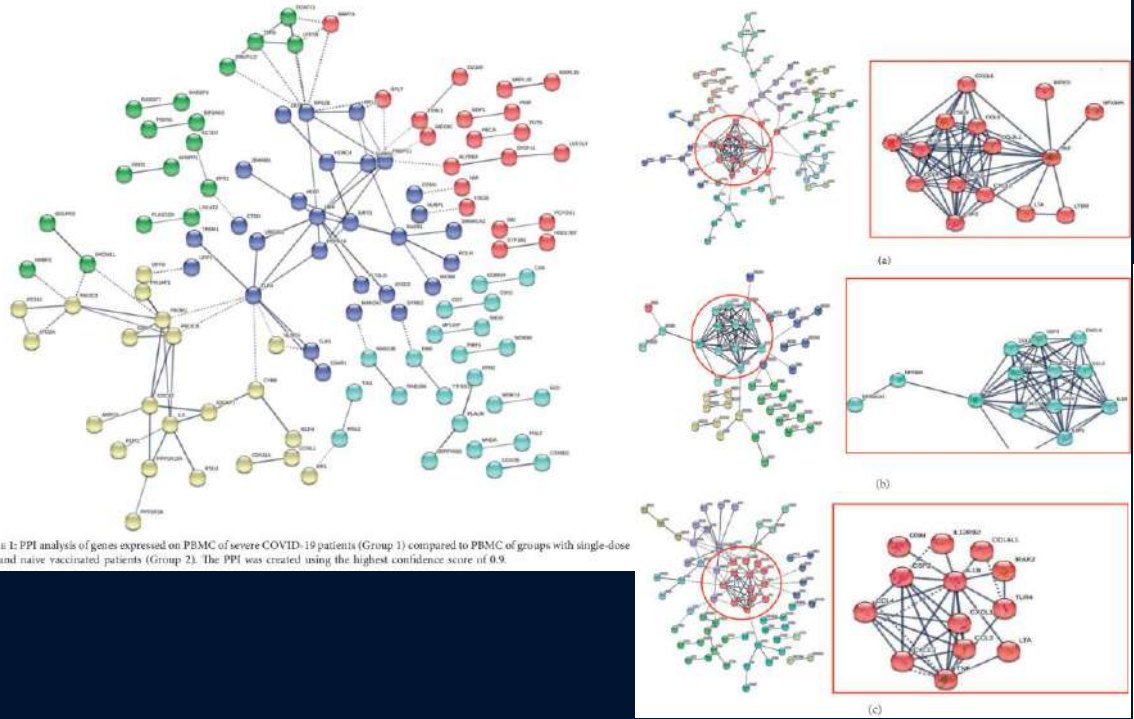


FIGURE 1: PPI analysis of genes expressed on PBMC of severe COVID-19 patients (Group 1) compared to PBMC of groups with single-dose BCG and naive vaccinated patients (Group 2). The PPI was created using the highest confidence score of 0.9.

No.	Term	Adjusted p-value	Genes
1	Lung fibrosis WP3624	4,13E-12	CSF2;IL1B;CCL4;CCL3
2	SARS-CoV-2 innate immunity evasion and cell-specific immune response WP5039	6,88E-10	CSF2;CCL4;CCL3
3	Selective expression of chemokine receptors during T-cell polarization WP4494	6,90E-10	CSF2;CCL4;CCL3
4	Toll-like Receptor Signaling Pathway WP75	2,42E-09	IL1B;CCL4;CCL3
5	COVID-19 adverse outcome pathway WP4891	7,21E-09	IL1B;CCL3
6	Regulation of toll-like receptor signaling pathway WP1449	2,83E-07	IL1B;CCL4;CCL3
7	Cytokines and Inflammatory Response WP530	2,72E-06	CSF2;IL1B
8	Oligodendrocyte specification and differentiation leading to myelin components for CNS WP4304	6,25E-06	IL1B;LIF
9	Photodynamic therapy-induced NF-KB survival signaling WP3617	1,13E-04	CSF2;IL1B
10	miRNAs involvement in the immune response in sepsis WP4329	1,43E-04	CCL4;CCL3

# Digitalisasi Kesehatan dari Awal Kehidupan



Pertemuan Ilmiah Khusus  
Perhimpunan Dokter Paru Indonesia (PIK PDDPI 2022)  
in Conjunction With  
The 2<sup>nd</sup> Indonesian Chronic Lung Disease International Meeting (ICLIME)



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# Situasi dan Tantangan Kesehatan di Indonesia



## Jutaan Data & Ratusan Aplikasi

Kebijakan **belum** berbasis pada data dan pelayanan yang **kurang efisien**



270 Juta penduduk Indonesia **memiliki catatan rekam medis** baik secara digital atau masih dalam bentuk kertas



**Ratusan aplikasi yang mengelola data** berbasis informasi individu



**Jutaan klaim diterbitkan berbasis informasi individu** terkait pelayanan kesehatan masyarakat



**Ribuan penyedia layanan kesehatan mengelola data** kesehatan berbasis individu



**Jutaan resep diterbitkan** berbasis informasi individu baik dalam digital atau masih dalam bentuk kertas

**400+**

**Aplikasi Pemerintah Sektor Kesehatan terpetakan** dan masih banyak lainnya di tingkat pusat dan daerah

## Kendala Kapasitas Kesehatan

Rasio **tenaga kesehatan dan tempat tidur rumah sakit** dengan jumlah penduduk



Indonesia  
**0,38 dokter**  
per 1000 populasi



Indonesia  
**1,2 tempat tidur Rumah Sakit**  
per 1000 populasi

Sumber : Riset Kementerian Kesehatan 2020

# Sekarang waktunya melakukan Transformasi Kesehatan

**Krisis** merupakan waktu yang tepat untuk melakukan perubahan



## Pandemi menyadarkan pentingnya **Resiliensi Sektor Kesehatan**

- Pandemi menunjukkan **permasalahan sistemik** yang harus diperbaiki
- **Peningkatan kapasitas dan resiliensi** sistem kesehatan perlu dilakukan



## Sistem kesehatan Indonesia siap untuk **Bertransformasi**

- Teknologi digital tersedia **luas** dan **publik lebih terbuka** akan perubahan
- Pandemi mendorong **percepatan implementasi** transformasi digital kesehatan untuk segera dilakukan



## Perlu adanya **Kolaborasi Menuju Indonesia Sehat**

- Menuju Indonesia Sehat tidak dapat ditangani sendiri oleh Kemenkes sehingga **perlu kerjasama** dengan seluruh pelaku industri kesehatan
- Kemenkes harus membangun platform untuk **menghubungkan berbagai data dan sistem** di ekosistem kesehatan dalam satu kesatuan

# Kegiatan Prioritas Teknologi Transformasi Teknologi Kesehatan

## A. Integrasi dan Pengembangan Sistem Data Kesehatan

**1. Satu Data Kesehatan Nasional**

Implementasi Sistem kesehatan Nasional Berbasis Individu (*Single Identity Health Record*)

**2. Integrasi Sistem Data Kesehatan**

Integrasi **Layanan Sistem Elektronik** Antar Instansi Kesehatan, Pemerintah, dan Industri Kesehatan

**3. Pembangunan Sistem Analisa Big Data Kesehatan**

Pembangunan Ekosistem Sistem **Big Data** Berbasis Analisa **Kecerdasan Buatan (AI)** Pada Pemerintah Pusat dan Daerah

**4. Aplikasi Kesehatan Terintegrasi**

**Digitalisasi** dan Integrasi **Sistem Informasi** Layanan Kesehatan (Puskesmas, Klinik, RS, Lab, dan Apotek)

**5. Integrasi Proses Bisnis dan Peningkatan SDM**

Integrasi Proses Bisnis dan Peningkatan Kapasitas **SDM** Terkait Kemampuan **Health Informatics**

**6. Helpdesk Aplikasi Kesehatan**

Ketersediaan **Helpdesk** dan **Sistem Customer Management** Aplikasi Kesehatan

**7. Perluasan Teklonogi Telemedicine**

Perluasan Implementasi **Telemedicine** dari Fasilitas Kesehatan ke Masyarakat

**8. Ekosistem untuk Informasi Teknologi Kesehatan dan Bioteknologi Kesehatan**

Regulasi dan Implementasi **Regulatory Sandbox** Dengan Prioritas Produk berbasis Teknologi Kesehatan 4.0

**9. Integrasi Riset Bioteknologi Kesehatan**

**Integrasi** riset pengembangan produk **biotechnology** dengan penyedia pelayanan kesehatan

### OUTCOME

Meningkatkan mutu kebijakan kesehatan berbasis Data yang akurat, mutakhir, dan lengkap.

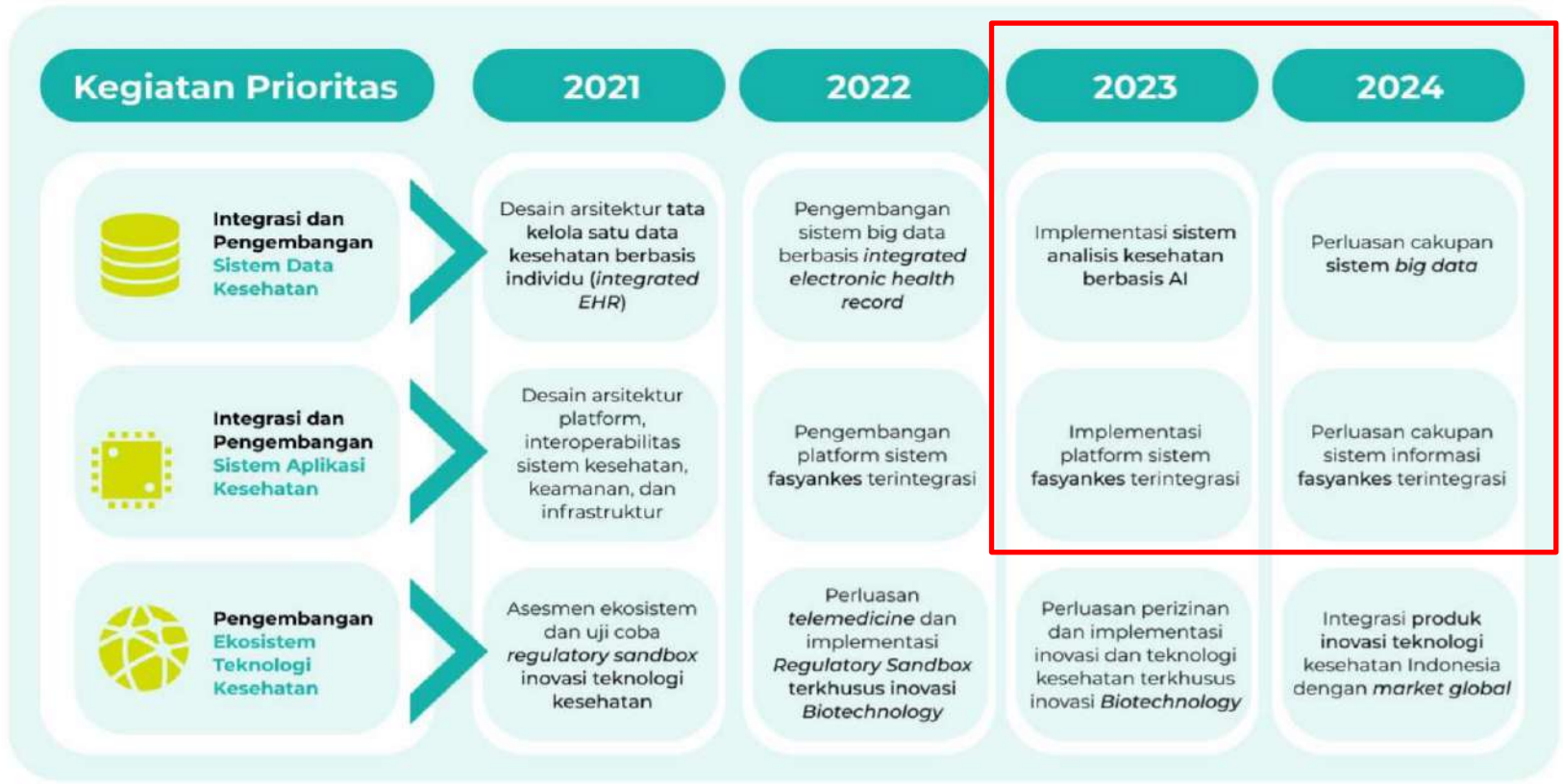
### OUTCOME

Efisiensi Pelayanan Kesehatan pada tingkat Puskesmas, Klinik, Rumah Sakit, Lab, dan Apotek.

### OUTCOME

Terciptanya kolaborasi dan ekosistem inovasi digital kesehatan antara Pemerintah, Industri, dan Masyarakat

# Peta Jalan Transformasi dan Digitalisasi Kesehatan



PERATURAN MENTERI KESEHATAN REPUBLIK INDONESIA  
 NOMOR 18 TAHUN 2022  
 TENTANG  
 PERVELENGGARAAN SATU DATA BIDANG KESEHATAN MELALUI  
 SISTEM INFORMASI KESEHATAN  
 DENGAN RAHMAT TUHAN YANG MAHA ESA  
 MENTERI KESEHATAN REPUBLIK INDONESIA,

Meningkatkan : bahwa untuk melaksanakan ketentuan Pasal 7, Pasal 9, Pasal 12, Pasal 25, dan Pasal 49 Peraturan Pemerintah nomor 46 Tahun 2014 tentang Sistem Informasi Kesehatan, dan Pasal 14 ayat (3) dan Pasal 15 ayat (2) Peraturan Presiden Nomor 39 Tahun 2019 tentang Satu Data Indonesia, perlu menetapkan Peraturan Menteri Kesehatan tentang Pengeleengaraan Satu Data Bidang Kesehatan melalui Sistem Informasi Kesehatan;

Mengingat : 1. Pasal 17 ayat (3) Undang-Undang Dasar Negara Republik Indonesia Tahun 1945;  
 2. Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik (Lembaran Negara Republik Indonesia Tahun 2008 Nomor 58, Tambahan Lembaran Negara Republik Indonesia Nomor 4843);  
 3. Undang-Undang Nomor 14 Tahun 2008 tentang Keterbukaan Informasi Publik (Lembaran Negara Republik Indonesia Tahun 2008 Nomor 61, Tambahan Lembaran Negara Republik Indonesia Nomor 4846);  
 4. Undang-Undang Nomor 36 Tahun 2009 tentang Kesehatan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 114, Tambahan Lembaran Negara Republik Indonesia

PMK 18/2022  
 Sistem Informasi  
 Kesehatan

PERATURAN MENTERI KESEHATAN REPUBLIK INDONESIA  
 NOMOR 24 TAHUN 2022  
 TENTANG  
 REKAM MEDIS  
 DENGAN RAHMAT TUHAN YANG MAHA ESA  
 MENTERI KESEHATAN REPUBLIK INDONESIA,

Meningkatkan : 1. a. bahwa perkembangan teknologi digital dalam masyarakat mengakibatkan transformasi digitalisasi pelayanan kesehatan sebagai eKesean medis perlu diintegrasikan secara elektronik dengan prinsip keamanan dan kerahasiaan data dan informasi;  
 b. bahwa Peraturan Menteri Kesehatan Nomor 269/MEH/KE/S/PER/III/2006 tentang Rekam Medis sudah tidak sesuai dengan perkembangan Ilmu pengetahuan dan teknologi, kebutuhan pelayanan kesehatan, dan kebutuhan hukum masyarakat sehingga perlu diganti;  
 c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan huruf b, serta untuk melaksanakan ketentuan Pasal 47 ayat (3) Undang-Undang Nomor 29 Tahun 2004 tentang Praktik Kedokteran dan Pasal 72 Undang-Undang Nomor 36 Tahun 2014 tentang Tenaga Kesehatan, perlu menetapkan Peraturan Menteri Kesehatan tentang Rekam Medis;

Mengingat : 1. 1. Pasal 17 ayat (3) Undang-Undang Dasar Negara Republik Indonesia Tahun 1945;  
 2. Undang-Undang Nomor 29 Tahun 2004 tentang Praktik Kedokteran (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 116, Tambahan Lembaran Negara Republik Indonesia Nomor 4431);  
 3. Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik (Lembaran Negara Republik Indonesia Tahun 2008 Nomor 58, Tambahan Lembaran Negara Republik Indonesia Nomor 4843) sebagaimana telah diubah dengan Undang-Undang Nomor 19 Tahun 2016 tentang Perubahan atas Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik (Lembaran Negara Republik Indonesia Tahun 2016

PMK 24/2022  
 Rekam Medis



# WE NEED TO PARTICIPATE NOW

The government has mandated the acceleration of IT transformation of digital healthcare; and the global market has responded greatly due to the demand of digital healthcare

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# OUR POTENTIAL

Right now, we have twelve universities with pulmonology study program established across the nation, which expected to initiate a collaborative education and research with other disciplines



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**SATREPS**  
地球規模課題対応国際科学技術協力プログラム



# FUNDING

There are many internal and external grant funding schemes available from government and private bodies, nationally or internationally





# Kerangka Kompetensi Abad 21

Sumber: 21st Century Skills, Education, Competitiveness. Partnership for 21st Century, 2008

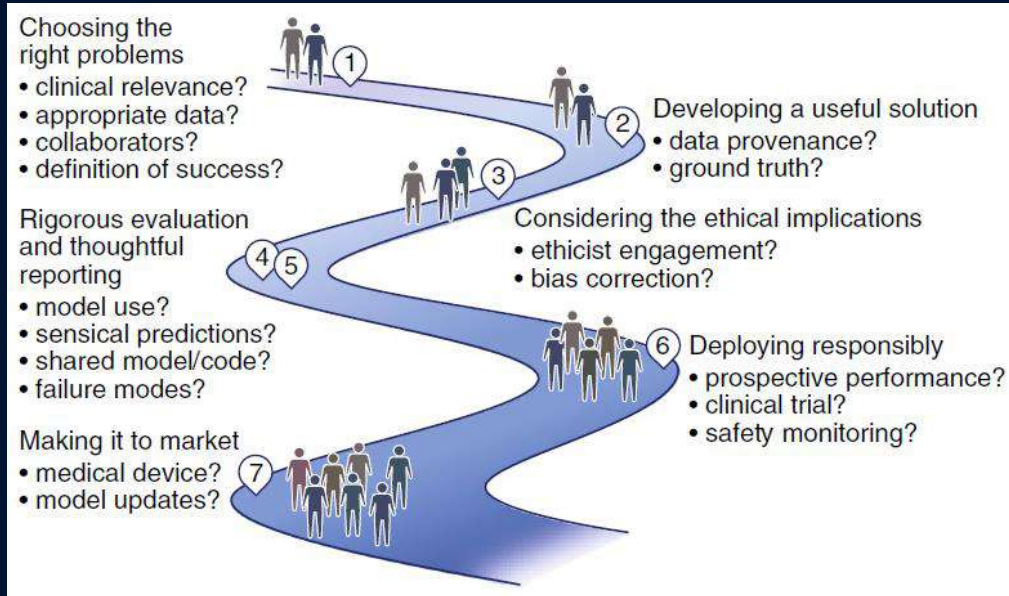


Partnership: Perusahaan, Asosiasi Pendidikan, Yayasan,...

## How should we prepare?

1. Integrated curriculum: I.T., technological preparedness, digital medicolegal and ethics, marketing & business in lecturers and students
2. I.T.-based community services
3. Academic strengthening between pulmonology study centers
4. Collaborative academic strengthening between other disciplines
5. Collaborative industrial engagement
6. Professional engagement with governing bodies and private sectors
7. Fundraising

# PROPOSED ROADMAP FOR BIG DATA AND A.I. IN PULMONARY RESEARCH



**Fig. 1 | A roadmap for deploying effective ML systems in health care.**  
 By following these steps and engaging relevant stakeholders early in the process, many issues stemming from the complexity of adopting ML in practice can be successfully avoided.

**Table 1 | Interdisciplinary teams may consist of stakeholders from different categories**

Stakeholder categories	Examples
Knowledge experts	<ul style="list-style-type: none"> <li>• Clinical experts</li> <li>• ML researchers</li> <li>• Health information and technology experts</li> <li>• Implementation experts</li> </ul>
Decision-makers	<ul style="list-style-type: none"> <li>• Hospital administrators</li> <li>• Institutional leadership</li> <li>• Regulatory agencies</li> <li>• State and federal government</li> </ul>
Users	<ul style="list-style-type: none"> <li>• Nurses</li> <li>• Physicians</li> <li>• Laboratory technicians</li> <li>• Patients</li> <li>• Friends and family (family)</li> </ul>



# PROPOSED ROADMAP FOR BIG DATA AND A.I. IN PULMONARY RESEARCH

Ongoing

2022

2023

2024

- Pilot projects: COPD, COVID-19, ILD
- Development of infrastructures: pulmo.id
- Collaboration w/ other disciplines
- Active engagements w/ stockholders: DTO MOH, private sectors, communities
- Training of experts: ISR HCIT workshops, seminar, etc.

- Soft-launching /prototyping of current pilot projects
- Soft-launching of pulmo.id
- Identification of potential collaborators
- Identification of HR potentials
- Identification of other "niche" projects
- Academic writing
- Active exploration of grant/fund opportunities
- Active engagements
- Training of experts

- Curriculum adjustment to meet the digital health transformation demands
- Identification of other potential theme for project
- Initiate industrialization
- Academic writing
- Grant/fund opportunities
- Active engagements
- Training of experts

- Initialization of next project
- Curriculum implementation in study programs
- Initiate industrialization
- Academic writing
- Grant/fund opportunities
- Active engagements
- Training of experts

# RENCANA INDUK RISET NASIONAL TAHUN 2017-2045

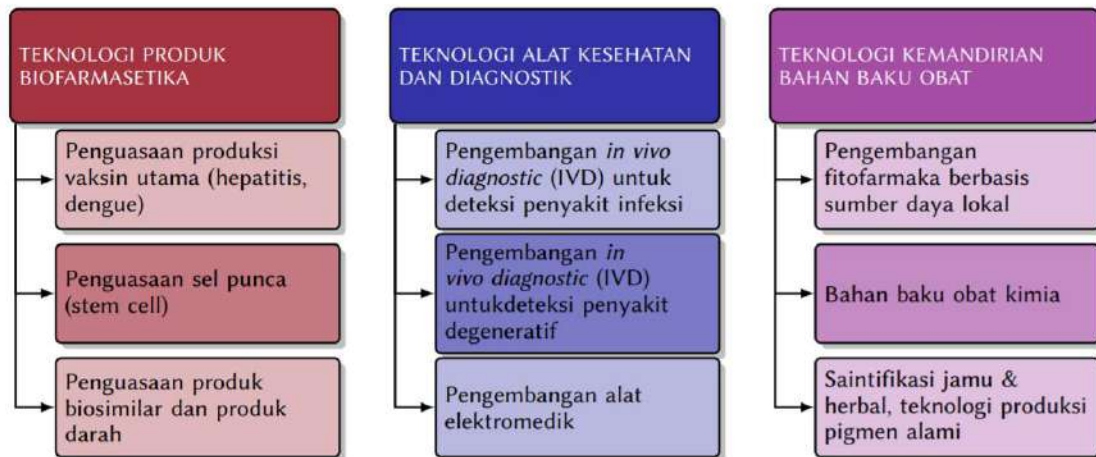
(Edisi 28 Pebruari 2017)



KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI  
2017

Dokumen RIRN

## KESEHATAN - OBAT



Gambar 4.4: Tema dan topik untuk fokus riset Kesehatan - Obat



# FKUI miliki big data center Imeri-Idealab kelola mahadata kesehatan

<https://bdc-imeri-idealab.ui.ac.id/>

🕒 Kamis, 3 Februari 2022 11:18 WIB

“Imeri diharapkan dapat memfasilitasi peneliti dengan suatu platform yang dapat mengolah mahadata biologis, klinis, sosial, maupun lingkungan, untuk mengembangkan suatu pelayanan kesehatan baru agar memberikan manfaat bagi pelayanan kesehatan untuk ma”

Depok (ANTARA) - Indonesian Medical Education and Research Institute (Imeri) Fakultas Kedokteran Universitas Indonesia (FKUI) bersama venture builder UMG Idealab mewujudkan Big data Center Imeri-Idealab, layanan terintegrasi dalam pengelolaan mahadata di bidang kesehatan.

Direktur Imeri Prof. dr. Badriul Hegar, Ph.D., SpA(K). dalam keterangan tertulisnya, Kamis mengatakan bahwa Imeri memiliki visi untuk mengembangkan penelitian di bidang Medical Education dan Medical Science terutama melibatkan big data kesehatan.

“Imeri diharapkan dapat memfasilitasi peneliti dengan suatu platform yang dapat mengolah mahadata biologis, klinis, sosial, maupun lingkungan, untuk mengembangkan suatu pelayanan kesehatan baru agar memberikan manfaat bagi pelayanan kesehatan untuk masyarakat Indonesia,” ujarnya.



Pertemuan Ilmiah Khusus  
Perhimpunan Dokter Paru Indonesia (PIK PDPI 2022)  
in Conjunction With  
The 2<sup>nd</sup> Indonesian Chronic Lung Disease International Meeting (ICIME)



Big Data Center Imeri-Idealab

OPEN DATA PORTAL  
Pusat Mahadata Kesehatan IMERI - IDEALAB

type search keywords Search

Topics

- Drug Development
- Human Cancer
- Human Genetics
- Human Nutrition

IRANDI PUTRA PRATOMO, M.D., PH.D., FAPSR



@dokterparu <https://s.id/dokterparu>







Adapt or perish, now as ever, is nature's  
inexorable imperative.

(H. G. Wells)

# THANKS!

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This presentation slide will be made available at

<https://s.id/dokterparu>

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