

# Statistical thinking sebagai problem solving untuk masalah pandemic COVID-19



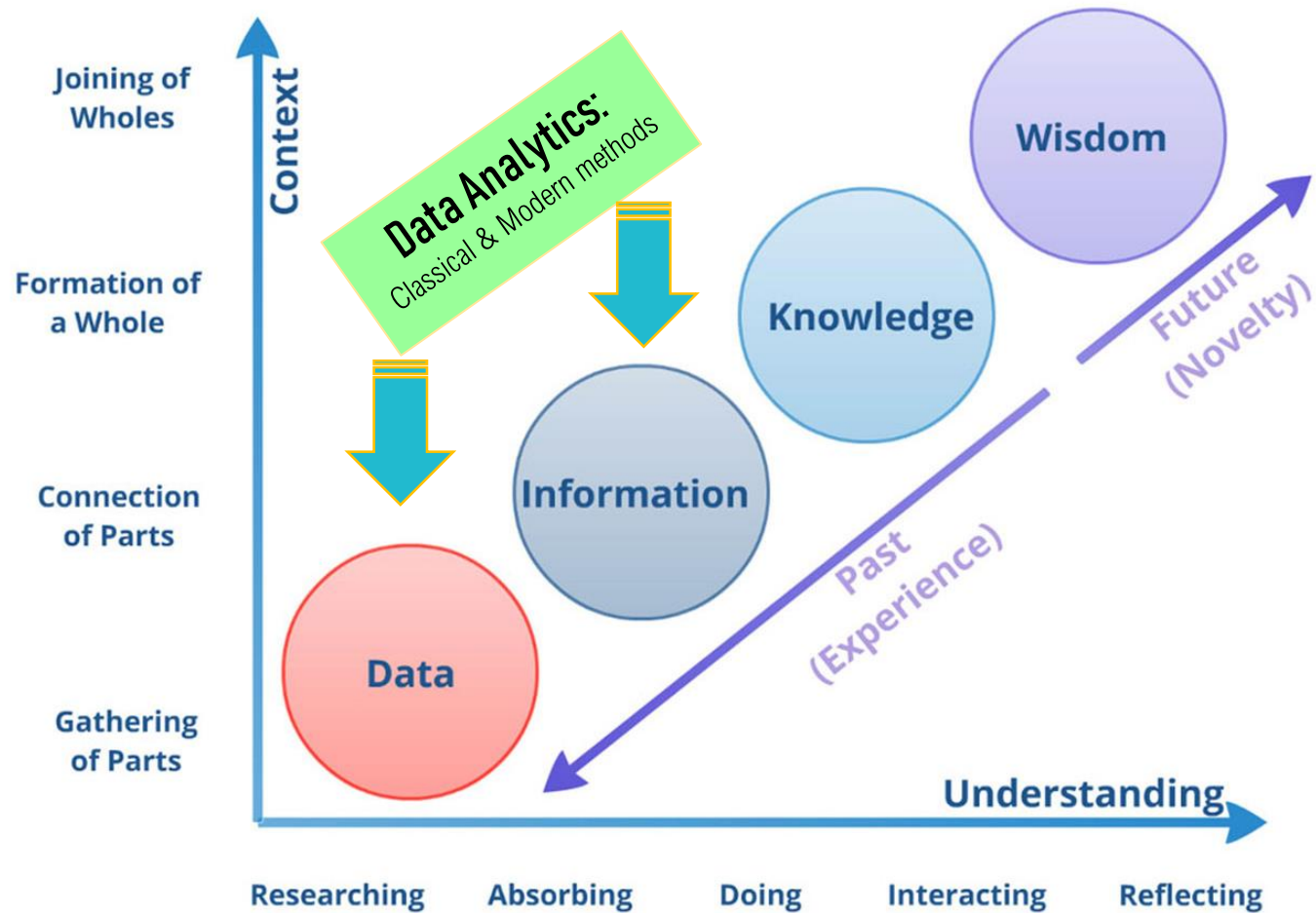
*Suhartono*

**Lab. Analitika Data Ekonomi & Finansial**

**Departemen Statistika**

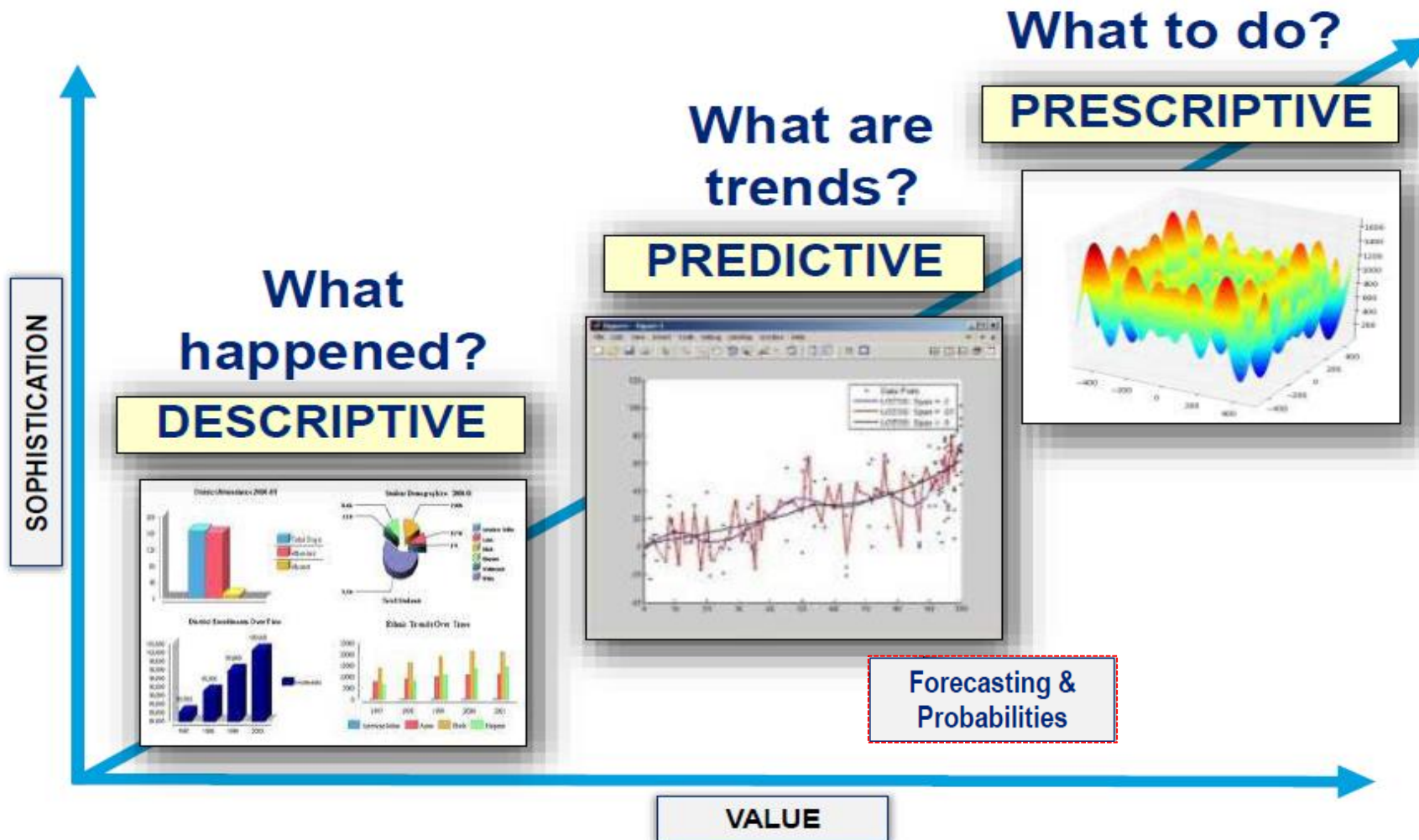
**Institut Teknologi Sepuluh Nopember**

# Statistical Thinking



DATA  
**VALID and  
RELIABLE**

# Data Analytics



# MOTIVATION



ANALYTICALLY SPEAKING

## To Explain or Predict? That Is the Question

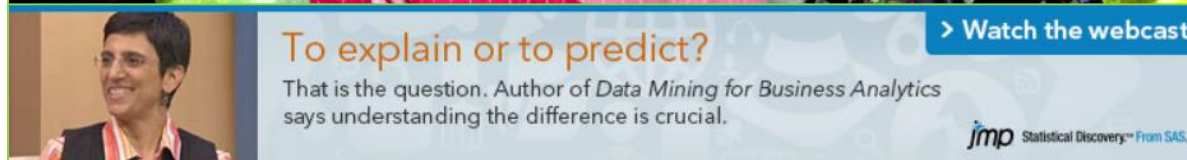
With Galit Shmueli

<http://www.galitshmueli.com/content/explain-or-predict>



**Galit Shmueli**

Distinguished Professor  
Institute of Service Science  
National Tsing Hua University



[To explain or to predict? Author of \*Data Mining for Business\* says the difference is crucial](#)

In her highly acclaimed paper, To Explain or to Predict?, Galit Shmueli writes “statistical modeling is a powerful tool for developing and testing theories by way of causal explanation, prediction, and description.” But while it is common to conflate explanation and prediction, understanding the distinction is crucial.

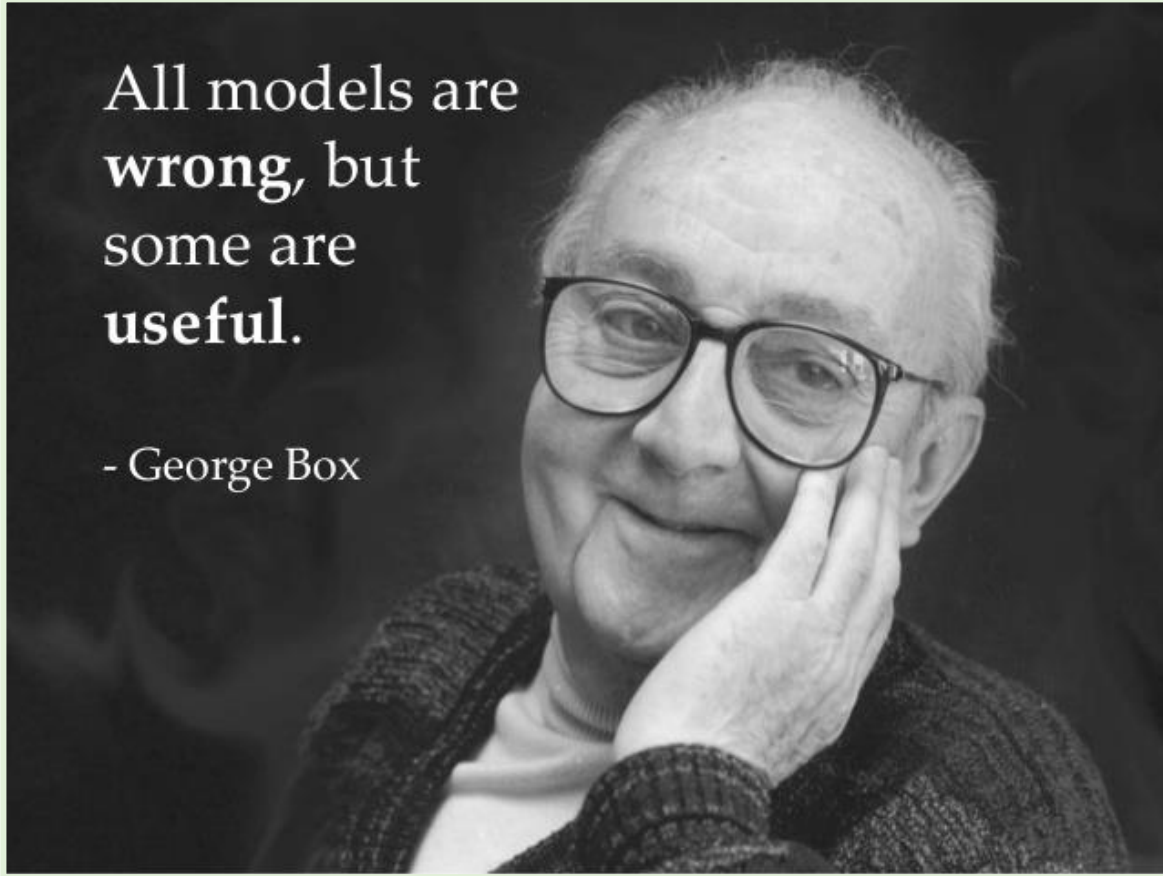


# MOTIVATION



All models are  
**wrong**, but  
some are  
**useful**.

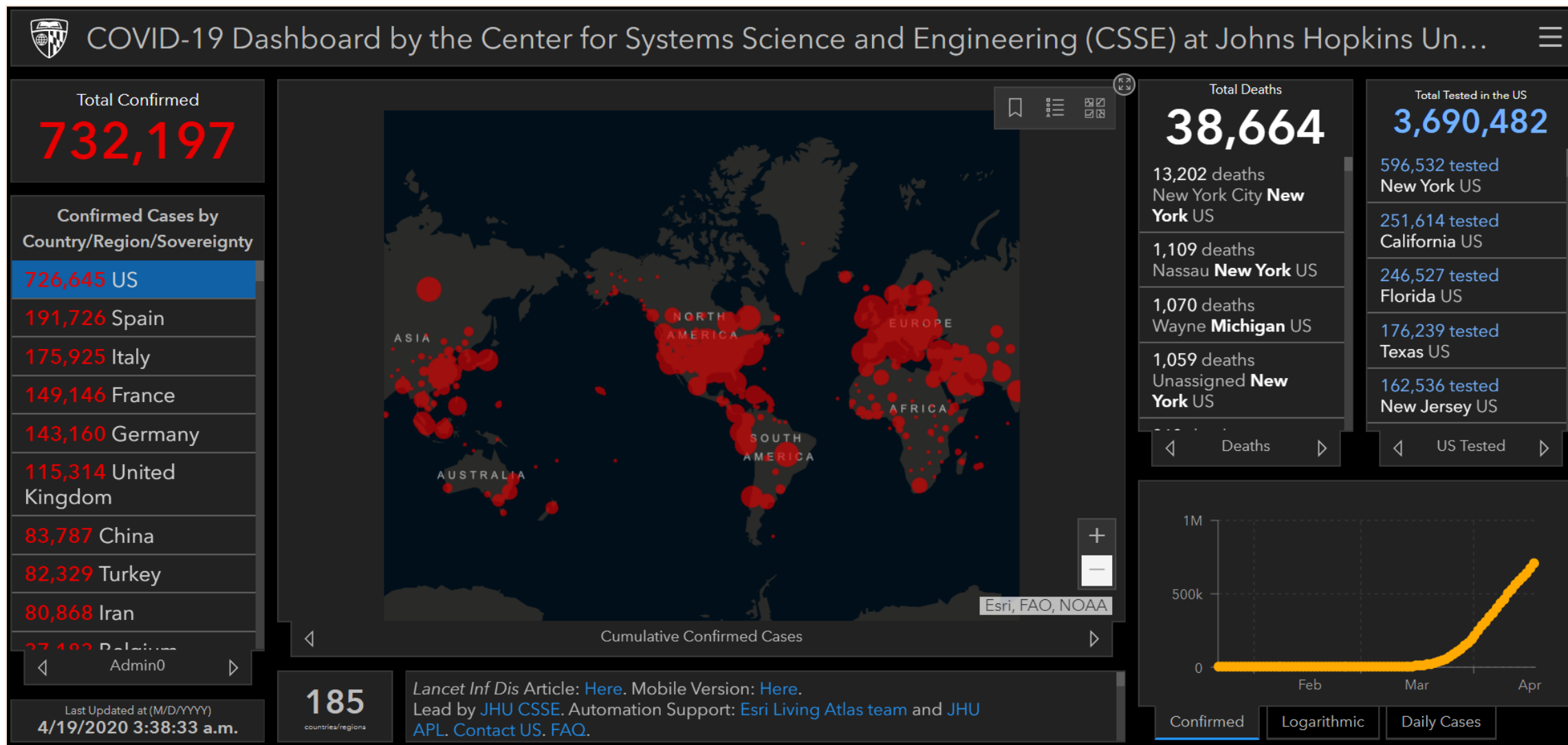
- George Box



No Single Tool  
is Right for  
Everything

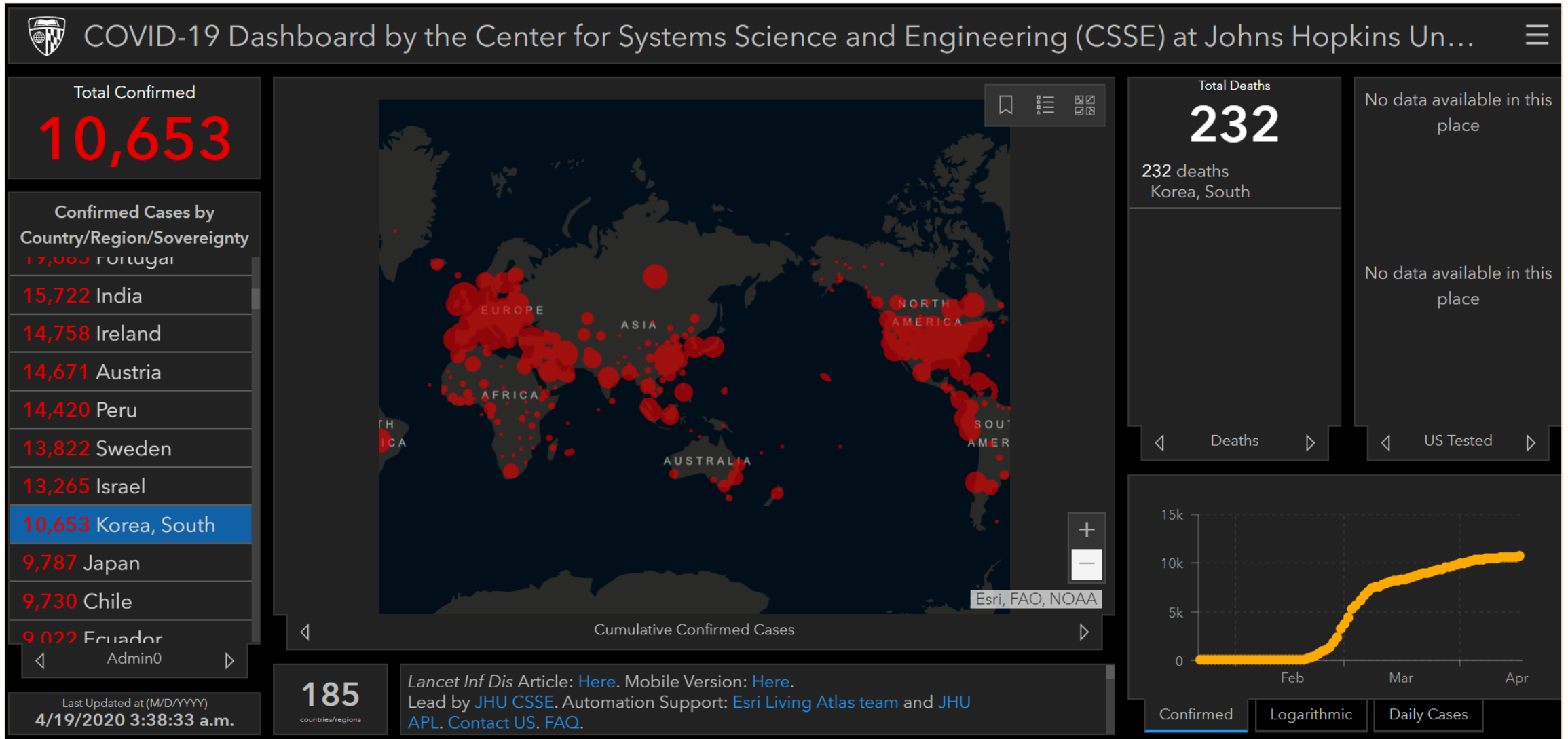


# Covid-19 in the World: US



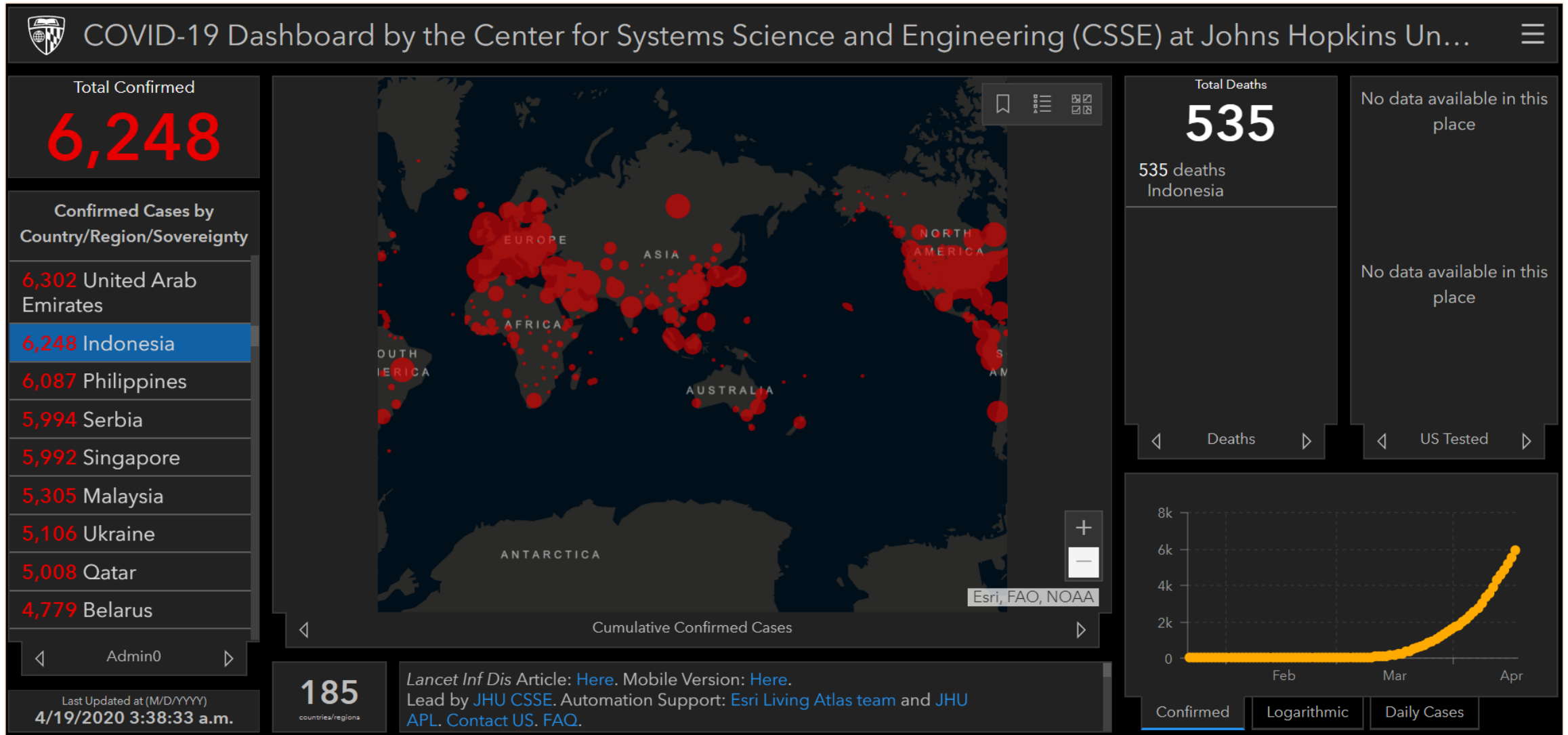
<https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>

# Covid-19 in the World: South Korea



<https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>

# Covid-19 in the World: Indonesia



<https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>



# Covid-19 in the World



| Country, Other              | Total Cases | New Cases | Total Deaths | New Deaths | Total Recovered | Active Cases | Serious, Critical | Tot Cases/ 1M pop | Deaths/ 1M pop | Total Tests | Tests/ 1M pop |
|-----------------------------|-------------|-----------|--------------|------------|-----------------|--------------|-------------------|-------------------|----------------|-------------|---------------|
| <a href="#">USA</a>         | 734,631     | +24,896   | 38,773       | +1,619     | 67,158          | 628,700      | 13,536            | 2,219             | 117            | 3,697,990   | 11,172        |
| <a href="#">Spain</a>       | 191,726     | +887      | 20,043       | +41        | 74,797          | 96,886       | 7,371             | 4,101             | 429            | 930,230     | 19,896        |
| <a href="#">Italy</a>       | 175,925     | +3,491    | 23,227       | +482       | 44,927          | 107,771      | 2,733             | 2,910             | 384            | 1,305,833   | 21,598        |
| <a href="#">France</a>      | 151,793     | +3,824    | 19,323       | +642       | 35,983          | 96,487       | 5,833             | 2,325             | 296            | 463,662     | 7,103         |
| <a href="#">Germany</a>     | 143,172     | +1,775    | 4,452        | +100       | 85,400          | 53,320       | 2,922             | 1,709             | 53             | 1,728,357   | 20,629        |
| <a href="#">UK</a>          | 114,217     | +5,525    | 15,464       | +888       | N/A             | 98,409       | 1,559             | 1,682             | 228            | 460,437     | 6,783         |
| <a href="#">China</a>       | 82,719      | +27       | 4,632        |            | 77,029          | 1,058        | 85                | 57                | 3              |             |               |
| <a href="#">Turkey</a>      | 82,329      | +3,783    | 1,890        | +121       | 10,453          | 69,986       | 1,894             | 976               | 22             | 598,933     | 7,101         |
| <a href="#">Iran</a>        | 80,868      | +1,374    | 5,031        | +73        | 55,987          | 19,850       | 3,513             | 963               | 60             | 330,137     | 3,931         |
| <a href="#">Belgium</a>     | 37,183      | +1,045    | 5,453        | +290       | 8,348           | 23,382       | 1,119             | 3,208             | 471            | 145,997     | 12,597        |
| <a href="#">Russia</a>      | 36,793      | +4,785    | 313          | +40        | 3,057           | 33,423       | 8                 | 252               | 2              | 1,831,892   | 12,553        |
| <a href="#">Brazil</a>      | 36,599      | +2,917    | 2,347        | +206       | 14,026          | 20,226       | 6,634             | 172               | 11             | 62,985      | 296           |
| <a href="#">Canada</a>      | 33,218      | +1,291    | 1,469        | +159       | 11,168          | 20,581       | 557               | 880               | 39             | 507,701     | 13,452        |
| <a href="#">Netherlands</a> | 31,589      | +1,140    | 3,601        | +142       | 250             | 27,738       | 1,279             | 1,844             | 210            | 154,911     | 9,041         |
| <a href="#">Switzerland</a> | 27,404      | +326      | 1,368        | +41        | 17,100          | 8,936        | 386               | 3,166             | 158            | 216,400     | 25,004        |
| <a href="#">Portugal</a>    | 19,685      | +663      | 687          | +30        | 610             | 18,388       | 228               | 1,931             | 67             | 235,878     | 23,133        |
| <a href="#">India</a>       | 15,722      | +1,370    | 521          | +35        | 2,463           | 12,738       |                   | 11                | 0.4            | 335,123     | 243           |
| <a href="#">Ireland</a>     | 14,758      | +778      | 571          | +41        | 77              | 14,110       | 294               | 2,989             | 116            | 90,646      | 18,358        |
| <a href="#">Austria</a>     | 14,671      | +76       | 443          | +12        | 10,214          | 4,014        | 208               | 1,629             | 49             | 175,932     | 19,534        |
| <a href="#">Peru</a>        | 14,420      | +931      | 348          | +48        | 6,684           | 7,388        | 117               | 437               | 11             | 135,895     | 4,122         |
| <a href="#">Sweden</a>      | 13,822      | +606      | 1,511        | +111       | 550             | 11,761       | 1,054             | 1,369             | 150            | 74,600      | 7,387         |

| Country, Other               | Total Cases | New Cases | Total Deaths | New Deaths | Total Recovered | Active Cases | Serious, Critical | Tot Cases/ 1M pop | Deaths/ 1M pop | Total Tests | Tests/ 1M pop |
|------------------------------|-------------|-----------|--------------|------------|-----------------|--------------|-------------------|-------------------|----------------|-------------|---------------|
| <a href="#">Israel</a>       | 13,265      | +283      | 164          | +13        | 3,456           | 9,645        | 164               | 1,533             | 19             | 187,250     | 21,634        |
| <a href="#">S. Korea</a>     | 10,653      | +18       | 232          | +2         | 7,937           | 2,484        | 55                | 208               | 5              | 546,463     | 10,659        |
| <a href="#">Japan</a>        | 10,296      | +509      | 222          | +32        | 1,069           | 9,005        | 221               | 81                | 2              | 111,325     | 880           |
| <a href="#">Chile</a>        | 9,730       | +478      | 126          | +10        | 4,035           | 5,569        | 360               | 509               | 7              | 108,891     | 5,696         |
| <a href="#">Ecuador</a>      | 9,022       | +572      | 456          | +35        | 1,008           | 7,558        | 168               | 511               | 26             | 30,922      | 1,753         |
| <a href="#">Poland</a>       | 8,742       | +363      | 347          | +15        | 981             | 7,414        | 160               | 231               | 9              | 192,960     | 5,098         |
| <a href="#">Romania</a>      | 8,418       | +351      | 421          | +10        | 1,730           | 6,267        | 248               | 438               | 22             | 90,991      | 4,730         |
| <a href="#">Saudi Arabia</a> | 8,274       | +1,132    | 92           | +5         | 1,329           | 6,853        | 78                | 238               | 3              | 150,000     | 4,309         |
| <a href="#">Pakistan</a>     | 7,638       | +613      | 143          | +8         | 1,832           | 5,663        | 46                | 35                | 0.6            | 92,548      | 419           |
| <a href="#">Denmark</a>      | 7,242       | +169      | 346          | +10        | 3,847           | 3,049        | 76                | 1,250             | 60             | 91,437      | 15,786        |
| <a href="#">Norway</a>       | 7,036       | +99       | 164          | +3         | 32              | 6,840        | 63                | 1,298             | 30             | 139,668     | 25,763        |
| <a href="#">Mexico</a>       | 6,875       | +578      | 546          | +60        | 2,125           | 4,204        | 207               | 53                | 4              | 48,365      | 375           |
| <a href="#">Czechia</a>      | 6,606       | +57       | 181          | +8         | 1,227           | 5,198        | 86                | 617               | 17             | 162,533     | 15,177        |
| <a href="#">Australia</a>    | 6,565       | +32       | 69           | +4         | 4,163           | 2,333        | 55                | 257               | 3              | 406,510     | 15,942        |
| <a href="#">UAE</a>          | 6,302       |           | 37           |            | 1,188           | 5,077        | 1                 | 637               | 4              | 767,000     | 77,550        |
| <a href="#">Indonesia</a>    | 6,248       | +325      | 535          | +15        | 631             | 5,082        |                   | 23                | 2              | 39,422      | 144           |
| <a href="#">Philippines</a>  | 6,087       | +209      | 397          | +10        | 516             | 5,174        | 1                 | 56                | 4              | 56,048      | 511           |
| <a href="#">Serbia</a>       | 5,994       | +304      | 117          | +7         | 637             | 5,240        | 126               | 686               | 13             | 36,028      | 4,123         |
| <a href="#">Singapore</a>    | 5,992       | +942      | 11           |            | 740             | 5,241        | 23                | 1,024             | 2              | 94,796      | 16,203        |
| <a href="#">Malaysia</a>     | 5,305       | +54       | 88           | +2         | 3,102           | 2,115        | 49                | 164               | 3              | 100,794     | 3,114         |
| <a href="#">Ukraine</a>      | 5,106       | +444      | 133          | +8         | 275             | 4,698        | 45                | 117               | 3              | 52,534      | 1,201         |

<https://www.worldometers.info/coronavirus/#countries> data at 19 April 2020

# Covid-19 in Indonesia



## COVID-19 DI INDONESIA

**INFO TERKINI:** Jumlah Orang Dalam Pemantauan (ODP) mencapai 176.344 orang. Pasien Dalam Pengawasan (PDP) mencapai 12.979 orang. Uji PCR sebanyak 39.422 spesimen sudah diperiksa dan hasil negatif sebanyak 33.174 orang. Terkonfirmasi positif COVID-19 mencapai 6.248 orang, sembuh 631 orang dan meninggal dunia 535 orang, yang tersebar di 34 provinsi dan 221 kabupaten/kota. Pengujian antigen berbasis real time Polymerase Chain Reaction (PCR) dilakukan di 35 laboratorium di seluruh Indonesia. Gunakan masker untuk lindungi diri dan lindungi sesama, Masker kain sebaiknya dipakai maksimal 4 jam.

#BersatuLawanCovid19 #CuciTangan #MaskerUntukSemua #JagaJarak #DiRumahAja

| DAERAH TELAH MENETAPKAN |                        |                                           |                        |                           |
|-------------------------|------------------------|-------------------------------------------|------------------------|---------------------------|
| STATUS SIAGA DARURAT    | STATUS TANGGAP DARURAT | KEADAMAN TERTENTU TANGGAP DARURAT BERKALA | GUGUS TUGAS PENANGANAN | PEMBATASAN SOSIAL BERKALA |
| 7                       | 91                     | 13                                        | 33                     | 4                         |
| Provinsi                | Kab / Kota             | Provinsi                                  | Kab / Kota             | Provinsi                  |
| 2                       | 20                     | 28                                        | 162                    | 2                         |
| Provinsi                | Kab / Kota             | Provinsi                                  | Kab / Kota             | Provinsi                  |

Sumber: Gugus Tugas COVID-19, 18 April 2020

### SEBARAN KASUS COVID-19 DI INDONESIA



### GRAFIK KASUS HARIAN



## JUMLAH TERPAPAR COVID-19 DI INDONESIA

Update 18 April 2020 Pkl. 12.00 WIB

**325** **24** **15**  
**6.248** **631** **535**  
 POSITIF SEMBUH MENINGGAL DUNIA

### TERSEBAR DI 34 PROVINSI

Sumber: Kementerian Kesehatan

## UPDATE TERPAPAR COVID-19 DI DUNIA

TERSEBAR DI 213 NEGARA DAN WILAYAH/TERITORIAL

Update 18 April 2020 Pkl. 07.00 WIB

| Negara          | Total Kasus | Meninggal | Jumlah Penduduk | Kematian/1 Juta Penduduk |
|-----------------|-------------|-----------|-----------------|--------------------------|
| Dunia           | 2,078,605   | 139,515   | 7,794,798,739   | 18                       |
| Amerika Serikat | 632,781     | 28,221    | 331,002,651     | 85                       |
| Spanyol         | 182,816     | 19,130    | 46,754,778      | 409                      |
| Italia          | 168,941     | 22,172    | 60,461,826      | 367                      |
| Jerman          | 133,830     | 3,868     | 83,783,942      | 46                       |
| Prancis         | 107,778     | 17,899    | 65,273,511      | 274                      |
| Inggris Raya    | 103,097     | 13,729    | 67,886,011      | 202                      |
| China           | 84,149      | 4,642     | 1,439,323,776   | 3                        |
| Iran            | 79,494      | 4,958     | 83,992,949      | 59                       |
| Turki           | 74,193      | 1,643     | 84,339,067      | 19                       |
| Belgia          | 34,809      | 4,857     | 11,589,623      | 419                      |
| Indonesia       | 6,248       | 535       | 269,603,400     | 2                        |

Sumber: World Health Organization (WHO), worldometers.info (UN Population Division), BPS

### DANA YANG MASUK

REKENING DALAM NEGERI **Rp 33,3M**  
 REKENING LUAR NEGERI **Rp 224,5Juta**  
 DONASI **Rp 65M**  
**TOTAL Rp 98,5M**

Sumber: Gugus Tugas COVID-19 18 April 2020



Protokol Kesiapsiagaan COVID-19

### INFORMASI COVID-19

SITUS RESMI **www.covid19.go.id**  
 CALL CENTER **119**

No : 117/U26/099/COVID-19/BNPB/18042020

## UPDATE TERPAPAR COVID-19 DI DUNIA

TERSEBAR DI 213 NEGARA DAN WILAYAH/TERITORIAL

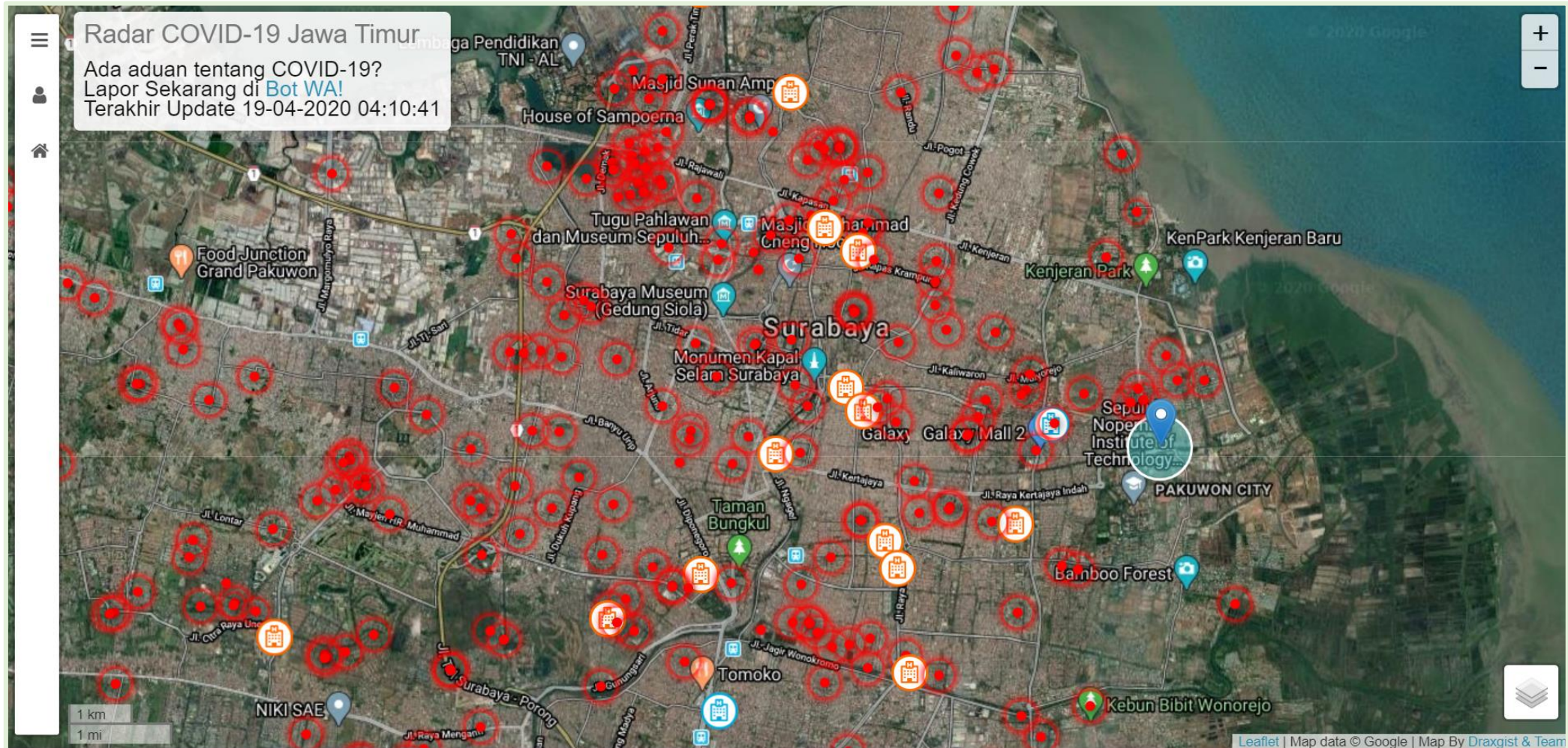
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| Inggris Raya    | 103,097     | 13,729    | 67,886,011      | 202                      |
| China           | 84,149      | 4,642     | 1,439,323,776   | 3                        |
| Iran            | 79,494      | 4,958     | 83,992,949      | 59                       |
| Turki           | 74,193      | 1,643     | 84,339,067      | 19                       |
| Belgia          | 34,809      | 4,857     | 11,589,623      | 419                      |
| Indonesia       | 6,248       | 535       | 269,603,400     | 2                        |

Sumber: World Health Organization (WHO), worldometers.info (UN Population Division), BPS



# Covid-19 in Surabaya

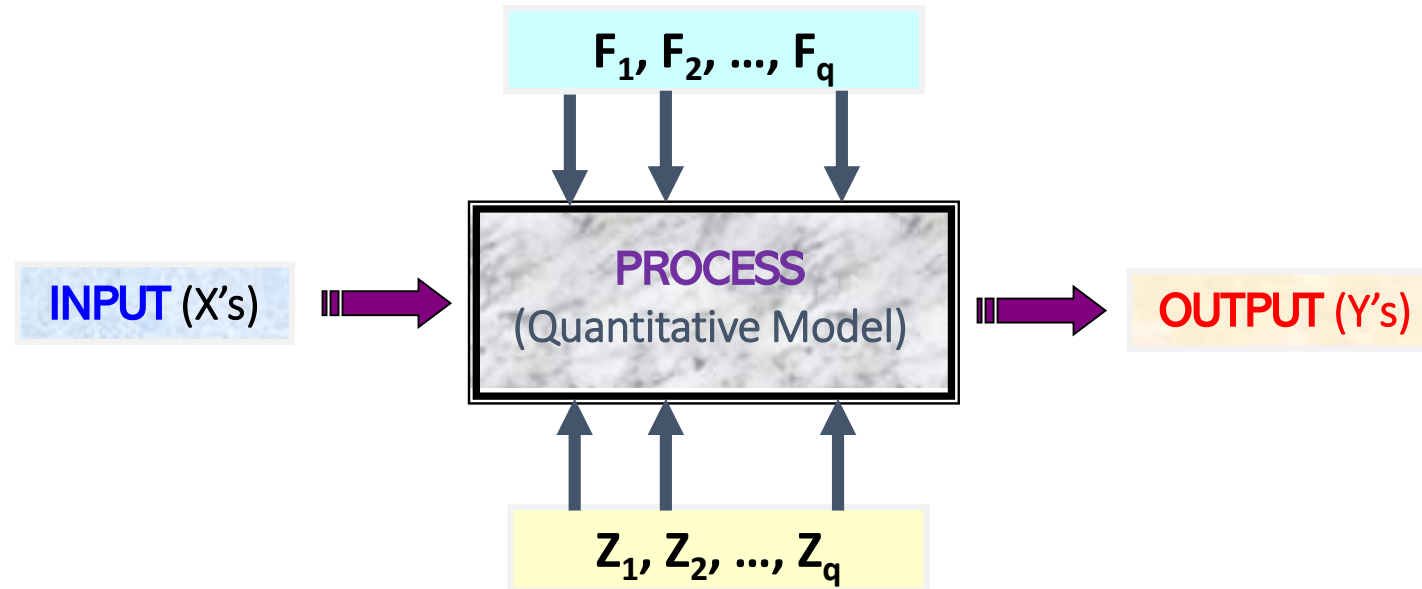


<https://radarcovid19.jatimprov.go.id/>

# Data Analytics for Covid-19 in Indonesia



## Controllable Factors



Different **regions** have different demography, health facility, social structures, and cultures.

- The **number of confirmed** cases will be **less than** the **number of actual cases**.
- **Delay time** between test conducted and the results.
- **Trust in public statistics is vital.** Misinformation can damage people's health.

## Uncontrollable Factors

Adalah mudah bagi statistisi untuk membuat prediksi, tetapi sangat sulit untuk bisa membuat eksplanasi yang valid dan reliable tentang angka-angka prediksi itu. Terlebih kalau datanya sendiri yang digunakan untuk pemodelan belum mencerminkan kebenaran fakta yang sesungguhnya.



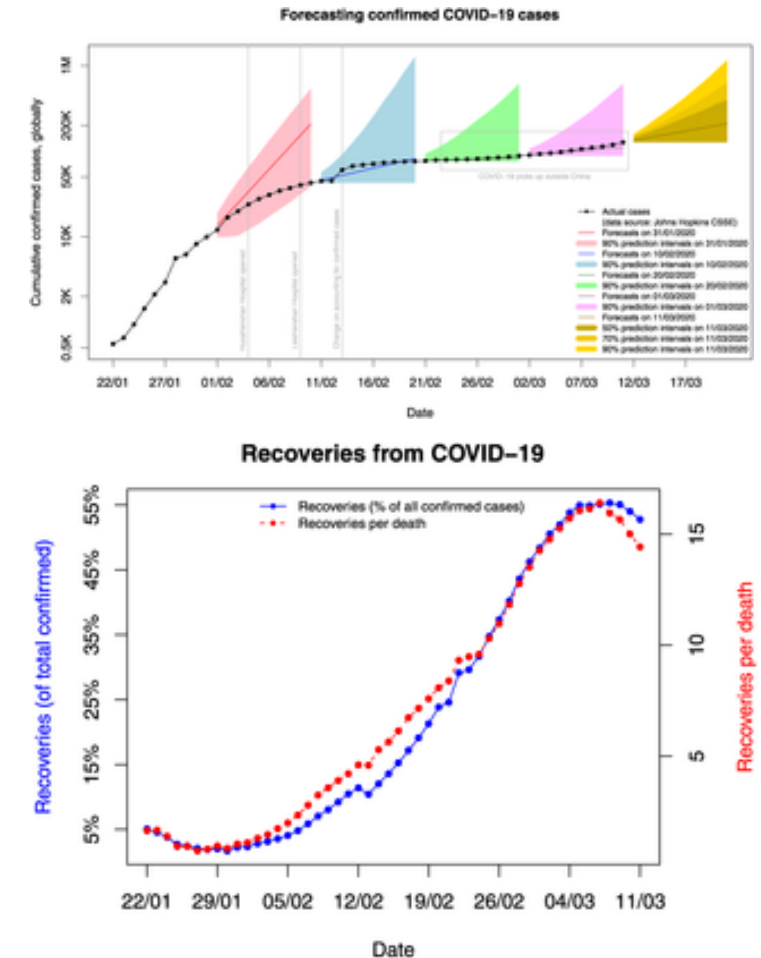
# Forecasting the novel coronavirus COVID-19

Fotios Petropoulos , Spyros Makridakis

Published: March 31, 2020 • <https://doi.org/10.1371/journal.pone.0231236>

## Abstract

What will be the global impact of the novel coronavirus (COVID-19)? Answering this question requires accurate forecasting the spread of confirmed cases as well as analysis of the number of deaths and recoveries. Forecasting, however, requires ample historical data. At the same time, no prediction is certain as the future rarely repeats itself in the same way as the past. Moreover, forecasts are influenced by the reliability of the data, vested interests, and what variables are being predicted. Also, psychological factors play a significant role in how people perceive and react to the danger from the disease and the fear that it may affect them personally. This paper introduces an objective approach to predicting the continuation of the COVID-19 using a simple, but powerful method to do so. Assuming that the data used is reliable and that the future will continue to follow the past pattern of the disease, our forecasts suggest a continuing increase in the confirmed COVID-19 cases with sizable associated uncertainty. The risks are far from symmetric as underestimating its spread like a pandemic and not doing enough to contain it is much more severe than overspending and being over careful when it will not be needed. This paper describes the timeline of a live forecasting exercise with massive potential implications for planning and decision making and provides objective forecasts for the confirmed cases of COVID-19.



<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0231236>

# Recommendation



- ❖ Misinformation can damage people's health.
  - ✓ Please check your sources before sharing stats.
  - ✓ If a number does not look correct, see if a trustworthy organisation has reported that number → “**garbage in garbage out**”.
  - ✓ One statistic may not tell the whole story. News items and social media posts could present numbers out of context.
  - ✓ Graphs can mislead. Check for clear labels, which show where the data comes from. Graphs should represent the numbers in a proportionate way.
- Data builds evidence. Evidence informs decisions. Accuracy matters: in print, on television and radio, and online. **Share statistics, not misinformation.**



DATA

**VALID** and  
**RELIABLE**



<https://www.bps.go.id/sp2020/faq/kategori/1>

# Pertanyaan SP-2020



Variabel **individu** terdiri dari:

1. Nama lengkap
2. NIK
3. Jenis Kelamin
4. Tempat dan tanggal lahir
5. Status hubungan dengan kepala keluarga
6. Alamat
7. Lama tinggal pada alamat saat ini
8. Kepemilikan akta kelahiran
9. Kewarganegaraan
10. Suku bangsa
11. Agama
12. Status perkawinan
13. Kemampuan berbahasa Indonesia

Variabel **Pekerjaan**:

14. Aktivitas yang biasa dilakukan
15. Pekerjaan
16. Status Pekerjaan

Variabel **Pendidikan**:

17. Ijazah/pendidikan tertinggi

Variabel **Perumahan**:

18. Status Kepemilikan rumah yang ditempati saat ini
19. Listrik
20. Sumber air minum
21. Kepemilikan jamban
22. Jenis lantai terluas



DATA

**VALID and  
RELIABLE**



<https://www.bps.go.id/sp2020/faq/kategori/1>



# References

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- <https://rss.org.uk/news-publication/news-publications/2020/general-news/a-statistician%E2%80%99s-guide-to-coronavirus-numbers/>
- <https://www.covid19.go.id/situasi-virus-corona/>
- <https://www.worldometers.info/coronavirus/#countries>
- <https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>
- <https://www.bps.go.id/sp2020/faq/kategori/1>
- <https://robjhyndman.com/hyndsight/forecasting-covid19/>
- <https://forecasting.svetunkov.ru/en/2020/03/23/forecasting-for-the-sake-of-forecasting/>