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**MATERI SEMINAR NASIONAL TEKNOLOGI INFORMASI DAN KOMUNIKASI**

**(SENATIK 2023)**

**Oleh Pemateri 3**

**Moh Abdul Kholik, S.Kom., M.Kom**

**Kolaborasi Big Data Dan IoT Dalam Membantu Manajemen Aset Perusahaan**

**Program Studi Sistem Komputer  
Universitas Surakarta  
Surakarta**



# Perkenalan

### Pengalaman Kerja

- 2018 - 2019 : Inovasi dan Riset embedded System dan IoT
- 2020 – 2022 : Tim penanggulangan Covid-19 Yogyakarta
- 2023 – Sekarang : Dosen Sistem Komputer Universitas Surakarta

### Bidang yang digeluti

- Data Science
- Data Mining
- AI
- IoT
- Embedded system

### Riwayat Pendidikan

- MA Bina UI Muhajirin (2016)
- S1 STMIK El Rahma Yogyakarta Prodi Teknik Informatika (2016 – 2020)
- S2 Universitas Teknologi Digital Indonesia Prodi Magister Teknologi Informasi (2020 - 2022)
- Fokus Penelitian IoT dan Data Mining



## Manusia Memproduksi Data

Manusia memproduksi beragam data yang **jumlah dan ukurannya sangat besar**

Astronomi  
Bisnis  
Kedokteran  
Ekonomi  
Olahraga  
Cuaca  
Financial

...



# Pertumbuhan Data

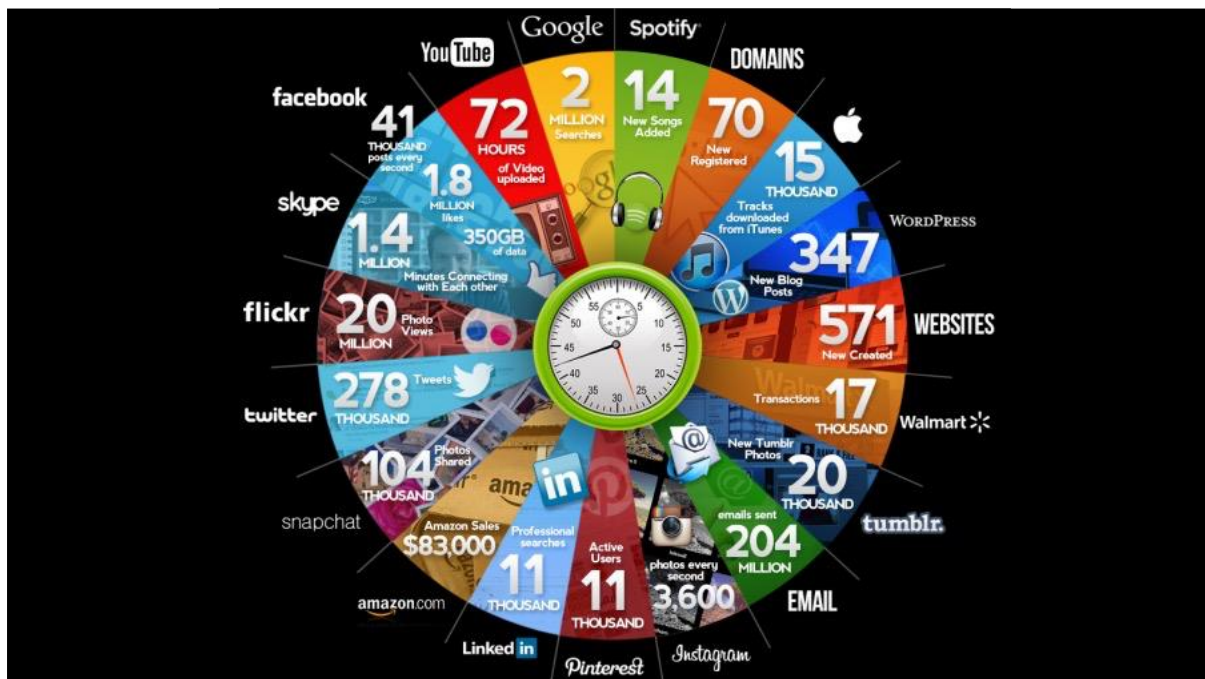
## Astronomi

- **Sloan Digital Sky Survey**
  - New Mexico, 2000
  - **140TB** over 10 years
- **Large Synoptic Survey Telescope**
  - Chile, 2016
  - Will acquire **140TB every five days**

kilobyte ( <b>kB</b> )	10 <sup>3</sup>
megabyte ( <b>MB</b> )	10 <sup>6</sup>
gigabyte ( <b>GB</b> )	10 <sup>9</sup>
terabyte ( <b>TB</b> )	10 <sup>12</sup>
petabyte ( <b>PB</b> )	10 <sup>15</sup>
exabyte ( <b>EB</b> )	10 <sup>18</sup>
zettabyte ( <b>ZB</b> )	10 <sup>21</sup>
yottabyte ( <b>YB</b> )	10 <sup>24</sup>

## Biologi dan Kedokteran

- European Bioinformatics Institute (**EBI**)
  - **20PB of data** (genomic data doubles in size each year)
  - A single sequenced human genome can be around **140GB** in size



## Datangnya Tsunami D a t a

- **Mobile Electronics** market
  - 7B smartphone subscriptions in 2015
- **Web & Social Networks** generates amount of data
  - Google processes 100 PB per day, 3 million servers
  - Facebook has 300 PB of user data per day
  - Youtube has 1000PB video storage



## Kebanjiran Data tapi Miskin Pengetahuan

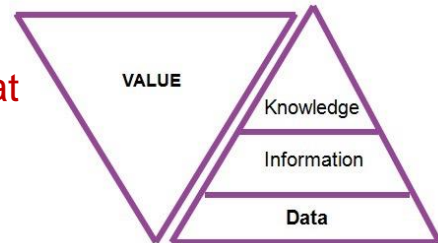
We are **drowning in data**,  
but **starving for knowledge!**

*(John Naisbitt, Megatrends, 1988)*

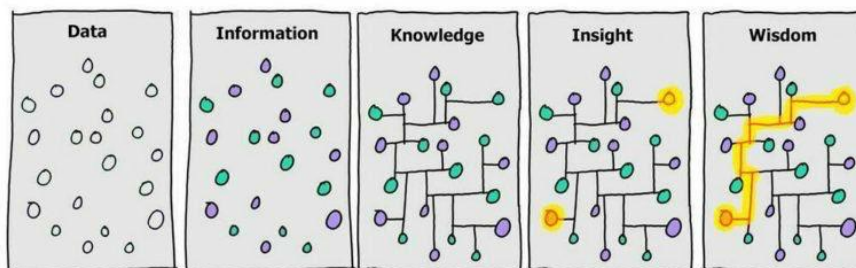


## Mengubah Data Menjadi P e n g e t a h u a n

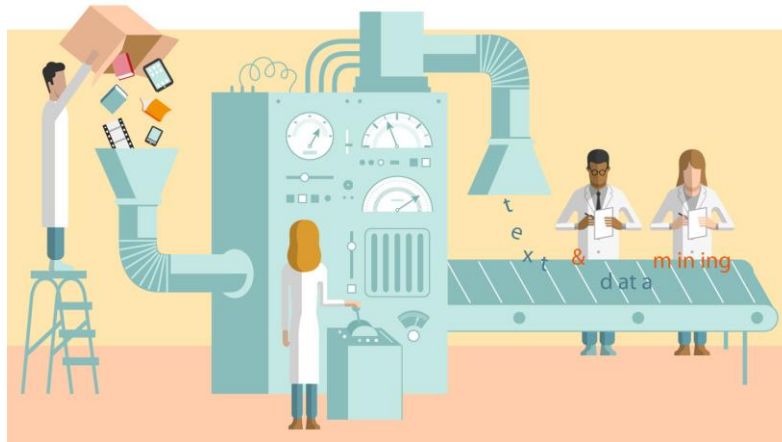
- Data harus kita olah menjadi **pengetahuan** supaya bisa **bermanfaat** bagi manusia
- Dengan **pengetahuan** tersebut, manusia dapat:
  - Melakukan **estimasi** dan **prediksi** apa yang terjadi di depan
  - Melakukan analisis tentang **asosiasi**, **korelasi** dan **pengelompokan** antar data dan atribut
  - Membantu **pengambilan keputusan** dan **pembuatan kebijakan**



## Data - Informasi – Pengetahuan - Kebijakan

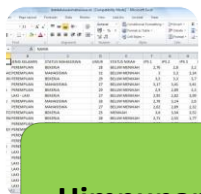


# Apa itu Data Mining?



Disiplin ilmu yang mempelajari **metode** untuk **mengekstrak pengetahuan** atau **menemukan pola** dari suatu data yang besar

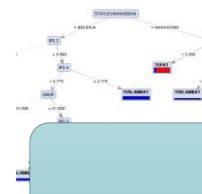
## Konsep Proses Data Mining



**Himpunan Data**

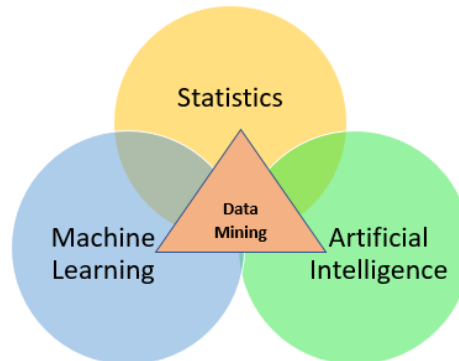
$$f(x) = \int_{-\infty}^{\infty} \delta(x-a) \sum_{k=0}^{\infty} \left( a + \frac{b-a}{n} k \right) \delta(x-a - \frac{b-a}{n} k) dx$$
$$= \int_{-\infty}^{\infty} \delta(x-a) \left[ a + \frac{b-a}{n} \cos(2\pi n(x-a)) \right] dx$$
$$= a + \frac{b-a}{n} \cos(2\pi n(x-a))$$

**Metode Data Mining**



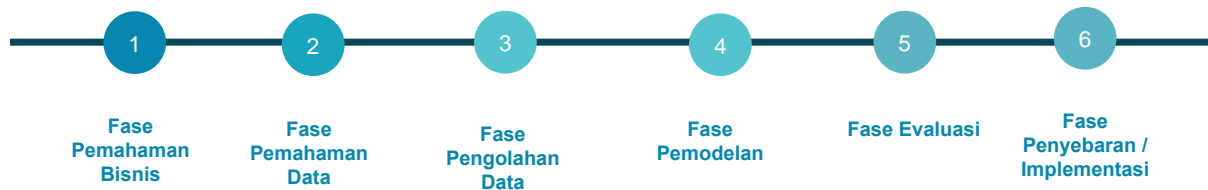
**Pengetahuan**

# Data Mining di Posisi mana?



## Fase Data Mining

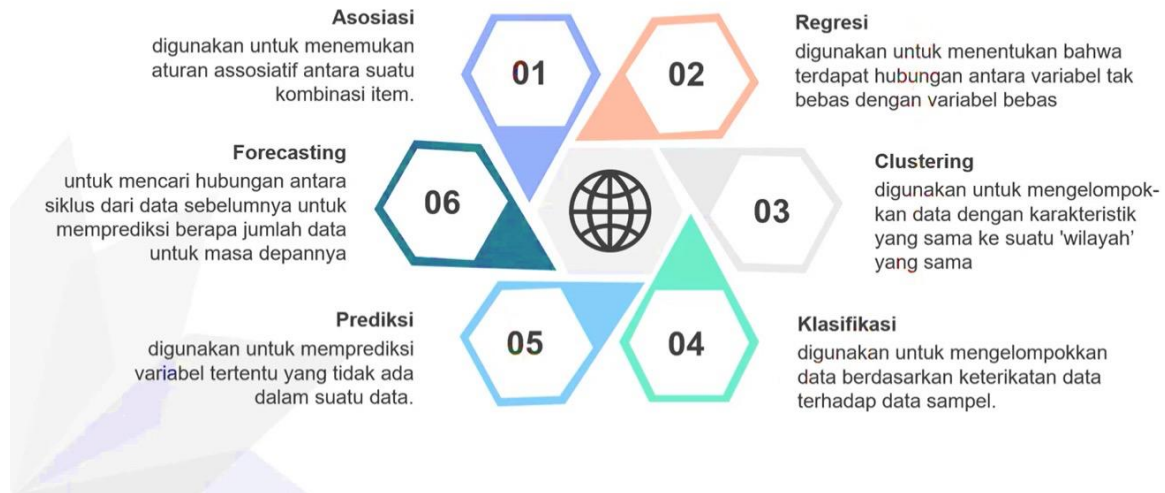
Enam fase CRISP-DM (Cross-Industry Standard Process for Data Mining) (Larose, 2006)



**Note**

Setiap fase memiliki peranan yang penting untuk mencapai tujuan data mining, sehingga berurut tidak boleh melompati fase tertentu

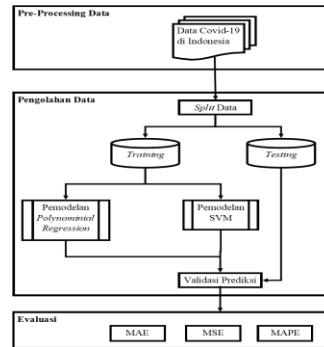
# Metode Data Mining



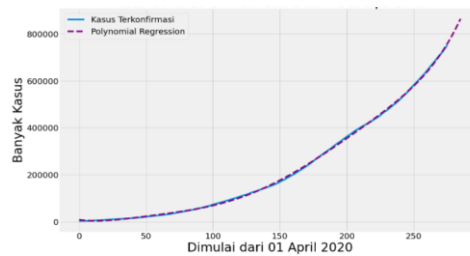
		Kasus harian	Total kasus	Kasus aktif	% kasus aktif	sembuh(baru)	Sembuh	Tingkat kesembuhan (seluruh kasus)	Tingkat kesembuhan (closed cases)	tinggal(barringgalDuni)	Tingkat kematian (seluruh kasus)	Tingkat kematian (closed cases)	Jumlah spesimen diperiksa	Jumlah orang diperiksa	Negatif	
98	7-Jun	672	31.186	18.837	60.40%	591	10.498	33.66%	85.01%	50	1.851	5.94%	14.99%	405.992	269.146	237.960
99	8-Jun	847	32.033	19.246	60.08%	406	10.904	34.04%	85.27%	32	1.883	5.88%	14.73%	412.980	274.430	242.397
100	9-Jun	1.043	33.076	19.739	59.68%	510	11.414	34.51%	85.58%	40	1.923	5.81%	14.42%	429.161	281.653	248.577
101	10-Jun	1.240	34.316	20.228	58.95%	715	12.129	35.35%	86.09%	36	1.959	5.71%	13.91%	446.918	287.478	253.162
102	11-Jun	979	35.295	20.659	58.53%	507	12.636	35.80%	86.34%	41	2.000	5.67%	13.66%	463.620	294.671	259.376
103	12-Jun	1.111	36.406	21.145	58.08%	577	13.213	36.29%	86.58%	48	2.048	5.63%	13.42%	478.953	302.147	265.741
104	13-Jun	1.014	37.420	21.553	57.60%	563	13.776	36.81%	86.82%	43	2.091	5.59%	13.18%	495.527	313.275	275.855
105	14-Jun	857	38.277	21.612	56.46%	755	14.531	37.96%	87.19%	43	2.134	5.58%	12.81%	514.287	322.933	284.656
106	15-Jun	1.017	39.294	21.973	55.92%	592	15.123	38.49%	87.31%	64	2.198	5.59%	12.69%	523.063	329.190	289.896
107	16-Jun	1.106	40.400	22.466	55.61%	580	15.703	38.87%	87.56%	33	2.231	5.52%	12.44%	540.115	339.309	298.909
108	17-Jun	1.031	41.431	22.912	55.30%	540	16.243	39.20%	87.71%	45	2.276	5.49%	12.29%	559.872	348.278	306.847
109	18-Jun	1.331	42.762	23.625	55.25%	555	16.798	39.28%	87.78%	63	2.339	5.47%	12.22%	580.522	358.659	315.897
110	19-Jun	1.041	43.803	24.081	54.98%	551	17.349	39.61%	87.97%	34	2.373	5.42%	12.03%	601.239	366.581	322.778
111	20-Jun	1.226	45.029	24.717	54.89%	534	17.883	39.71%	88.04%	56	2.429	5.39%	11.96%	621.156	374.458	329.429
112	21-Jun	862	45.891	25.022	54.52%	521	18.404	40.10%	88.19%	36	2.465	5.37%	11.81%	639.385	383.105	337.214
113	22-Jun	954	46.845	25.610	54.67%	331	18.735	39.99%	88.23%	35	2.500	5.34%	11.77%	650.311	393.117	346.272
114	23-Jun	1.051	47.896	26.120	54.53%	506	19.241	40.17%	88.36%	35	2.535	5.29%	11.64%	666.219	401.681	353.785
115	24-Jun	1.113	49.009	26.778	54.64%	417	19.658	40.11%	88.43%	38	2.573	5.25%	11.57%	689.452	413.919	364.910
116	25-Jun	1.178	50.187	27.118	54.03%	791	20.449	40.75%	88.64%	47	2.620	5.22%	11.36%	708.962	427.158	376.971
117	26-Jun	1.240	51.427	27.411	53.30%	884	21.333	41.48%	88.83%	63	2.683	5.22%	11.17%	731.781	439.907	388.480
118	27-Jun	1.385	52.812	28.183	53.36%	576	21.909	41.48%	88.96%	37	2.720	5.15%	11.04%	753.370	449.569	396.757
119	28-Jun	1.198	54.010	28.320	52.43%	1.027	22.936	42.47%	89.28%	34	2.754	5.10%	10.72%	770.600	456.636	402.626
120	29-Jun	1.082	55.092	28.487	51.71%	864	23.800	43.20%	89.46%	51	2.805	5.09%	10.54%	782.383	465.683	410.591
121	30-Jun	1.293	56.385	28.783	50.91%	1.005	24.806	43.99%	89.61%	71	2.876	5.10%	10.39%	803.898	477.318	420.333
122	1-Jul	1.385	57.770	29.241	50.62%	789	25.595	44.31%	89.72%	58	2.934	5.08%	10.28%	825.636	482.318	434.548
123	2-Jul	1.624	59.394	29.740	50.07%	1.072	26.667	44.90%	89.93%	53	2.987	5.03%	10.07%	849.155	503.132	443.738



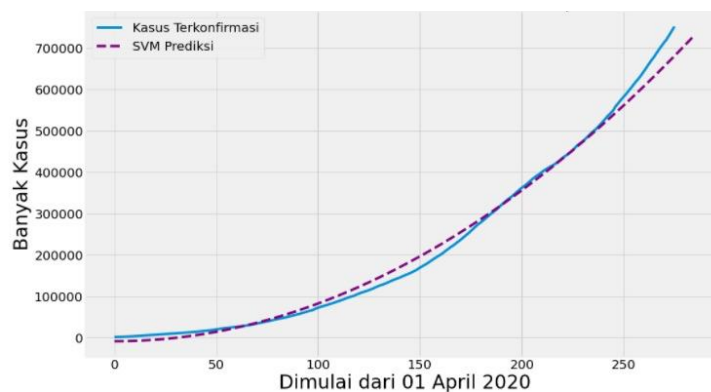
## Contoh Kasus Covid-19 di Yogyakarta



## Contoh Kasus Covid-19



## Contoh Kasus Covid-19



## Contoh Kasus Covid-19

SVM	Tanggal	Kasus terkonfirmasi	Polynomial Regression	Tanggal	Kasus terkonfirmasi di
	1/2/2021	685		1/2/2021	766
	1/3/2021	690		1/3/2021	776
	1/4/2021	695		1/4/2021	786
	1/5/2021	700		1/5/2021	796
	1/6/2021	705		1/6/2021	807
	1/7/2021	710		1/7/2021	817
	1/8/2021	715		1/8/2021	829
	1/9/2021	720		1/9/2021	840
	1/10/2021	725		1/10/2021	852
	1/11/2021	731		1/11/2021	864
Akurasi		Akurasi			
MAE	48683,01806620	MAE	4134,60144809708		
MSE	2528778193,67	MSE	18925603,834182523		
MAPE	7%	MAPE	0,6%		

## Contoh Kasus Covid-19

Polynomial Regression	Metode Uji	Hasil	Degree
	Mean Absolute Error	4146,025749867596	6
Mean Squared Error	19031800,02642069	6	
Support Vector Machine	Metode Uji	Hasil	Degree
	Mean Absolute Error	48683,01806620052	2
	Mean Squared Error	2528778193,6754	2
Mean Absolute Percentage Error	7%.	2	

