

Machine Learning dengan Python

# PENGANTAR

Oleh: Muhamad Soleh

Semester Gasal 2019/2020



# Outline

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- Perkenalan
- Motivasi
- Apa itu komputer?
- Apa itu ilmu komputer?
- Apa itu computational thinking?
- Apa itu pemrograman?
- Apa itu Python?
- Administrasi kuliah

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- Apa itu Python?
- Administrasi kuliah

# Perkenalan: Dosen

---

**Muhamad Soleh**

(muhamad.soleh@iti.ac.id)

2013: Tamat S1 Fisika UI

2018: Tamat S2 Ilmu Komputer UI

2018: Mulai menjadi dosen di ITI

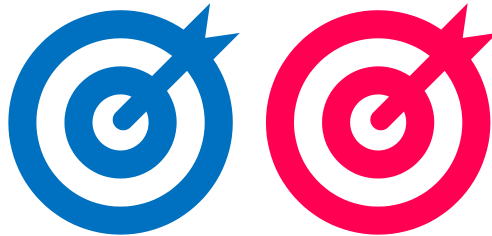
## **Topik riset:**

- Machine Learning
- Artificial Intelligent

# Perkenalan: Mahasiswa/i

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Sebutkan nama dan cita-cita setelah lulus dari Informatika ITI nanti!



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# Motivasi: Dunia industri

---



## Software Engineer

Google

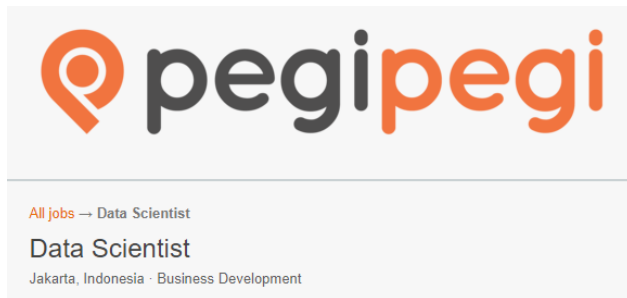
Software Engineering

Mountain View, CA, USA

Preferred qualifications:

- Experience with one or more general purpose programming languages including but not limited to: Java, C/C++, C#, Objective C, Python, JavaScript, or Go.

# Motivasi: Dunia industri



## REQUIREMENTS

- Have 2-3 years of working experience in a data science role working with large datasets
- Strong interest and knowledge in the field of mathematics, statistics, data science, machine learning
- Self-driven learner with passion to improve products and/or business with data science
- Desire to collaborate and share learnings/experiences with others
- Familiar with common programming languages relevant to data science, e.g. Python, R, SQL
- Preferable: Familiar with other programming languages (e.g. C++, Java, etc)



# Motivasi: Dunia industri

---



## Data Engineer

Jakarta, Indonesia • Full-time

### Qualifications

- Passion in big data, software engineering, and systems.
- Excellent analysis and reasoning of system behaviors
- Uphold best practices and principle around clean code, testing, continuous integration
- Strong team player and collaborator
- Having high level of responsibility and resilience in dealing with issues
- Preferably familiar with big data infrastructure (such as Kafka, Spark, etc.), cloud based infrastructure, varying databases, security concerns would be an advantage.
- Familiar with Java/JVM. Python is added advantage

# Motivasi: Dunia riset

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## Research Associate (Pre-Doctoral) Preferred Qualifications

Major in economics or finance, or in a quantitative discipline such as Electrical Engineering, Computer Science, Operations Research, Mathematics, or Statistics preferred. Advanced coursework/training in statistics and/or mathematics desired. Coursework in finance and/or economics preferable. Work experience in a research role, preferably in academic environment. Programming experience in one or more of the following languages: STATA, SAS, Mathematica, Matlab, Python, C++, or SQL preferred.

# Motivasi: Dunia riset



## Research Fellow - AiLECS

Monash University ★★★★★ 132 reviews - Caulfield VIC

[Apply On Company Site](#)



Caulfield VIC




\$97,203 - \$115,429 a year

We are seeking an outstanding qualified researcher to join our team. Ideally you will have worked in machine learning with deep neural networks for image classification or other relevant experience. The AiLECS lab has a focus on the rapid operationalisation of research work into technologies for integration with law enforcement systems. There is also a strong emphasis in the lab on international collaboration.

Additionally, any experience with the following will be highly regarded:

- Machine learning (image classification a bonus!)
- Extensive coding experience (particularly Python/.NET Core)
- A focus on applied research

# Motivasi: So many demands!

[Find Jobs](#)[Company Reviews](#)[Find Salaries](#)[Find Resumes](#)[Employers / Post Job](#)

**What**  
Job title, keywords, or company

**Where**  
City, state, or zip code

[Find jobs](#)[Advanced Job Search](#)

Python jobs in San Francisco, CA

Sort by:  
relevance - [date](#)

Distance:

Salary Estimate

- \$95,000+ (4000)
- \$110,000+ (3327)
- \$120,000+ (2681)
- \$130,000+ (1871)
- \$140,000+ (1072)

Job Type

- Full-time (4615)
- Contract (93)
- Internship (84)

**New! Join Indeed Prime** - Get offers from great tech companies

[Page 1 of 4,774 jobs](#)

**Technical Artist**  
Glyph Software  
San Francisco, CA

Knowledge of Python, C#, or similar object-oriented language. ... Glyph is seeking a 3D artist with a cinematic eye, a strong aesthetic sense of light and shadow,...

15 hours ago [save job](#) [more...](#)

**Junior Generalist San Francisco, CA**  
Industrial Light & Magic ★★★★★ 14 reviews  
San Francisco, CA

Linux and Python scripting or shader authoring preferred; ... Position at Industrial Light & Magic. ... Junior Generalists demonstrate a strong base of knowledge in 3D...

Disney 30+ days ago [save job](#) [more...](#)

# Motivasi: So many demands!

The screenshot shows the Indeed job search interface. At the top, there are navigation links: 'indeed', 'Find Jobs' (underlined), 'Company Reviews', 'Find Salaries', and 'Employers / Post Job'. Below these are two search boxes: 'What' (Job title, keywords, or company) containing 'python' and 'Where' (city, province, or region) containing 'Jakarta'. A blue 'Find jobs' button is to the right. Below the search boxes, on the left, are filters for 'Sort by:' (relevance - date), 'Job Type' (Full-time (263), Permanent (39), Internship (12), Contract (8), Fresh Graduate (4)), and 'Location' (Jakarta (455), Python jobs nationwide). On the right, there's a yellow box saying 'Page 1 of 455 jobs'. Below that, two job listings are visible. The first is 'Python Programmer' by Praxislabs Indonesia in Jakarta, with a salary of 'Rp. 4.000.000 - Rp. 6.000.000 per bulan'. The second is 'Corporate Strategy Data Analyst' by GO-JEK, with a rating of 4.5 stars and 34 reviews.

**indeed** Find Jobs Company Reviews Find Salaries Employers / Post Job

**What**  
Job title, keywords, or company

**Where**  
city, province, or region

python Jakarta Find jobs

python jobs in Jakarta

Sort by:  
relevance - [date](#)

Job Type

- Full-time (263)
- Permanent (39)
- Internship (12)
- Contract (8)
- Fresh Graduate (4)

[+](#) more »

Location

- Jakarta (455)
- Python jobs nationwide

**Post your CV and easily apply to jobs from any device!**

Page 1 of 455 jobs

**Python Programmer**  
Praxislabs Indonesia  
Jakarta  
**Rp. 4.000.000 - Rp. 6.000.000 per bulan**  
Kami mencari Software engineer yang bersemangat untuk merancang, mengembangkan, dan menginstal solusi perangkat lunak. ... Memahami tool versioning seperti GIT.  
[Easy apply](#)  
3 days ago [save job](#) [more...](#)

**Corporate Strategy Data Analyst**  
GO-JEK ★★★★★ 34 reviews  
Jakarta

# Reading time: Why I'm learning Python in 20189?

codecademy

START CODING TODAY INSIGHTS UPDATES PARTNERSHIPS DEVELOPING STORIES\_

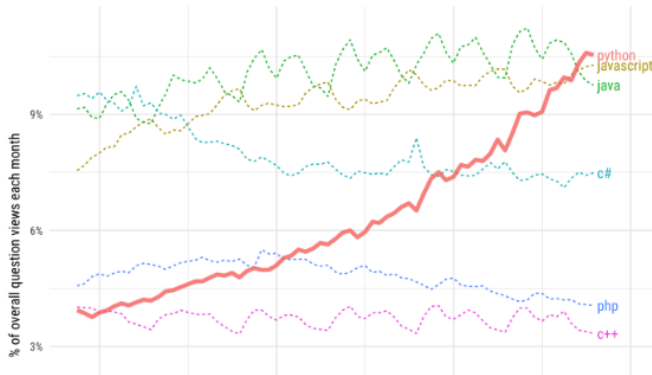
12 JANUARY 2018 / INSIGHTS

## Why I'm Learning Python in 2018

We might be tempted to say that Python "had a moment" in 2017. After all, the recent growth of the language has been hard to ignore.

### Growth of major programming languages

Based on Stack Overflow question views in World Bank high-income countries



<https://news.codecademy.com/why-learn-python/>

# Reading time: Why I'm learning Python in 2018?

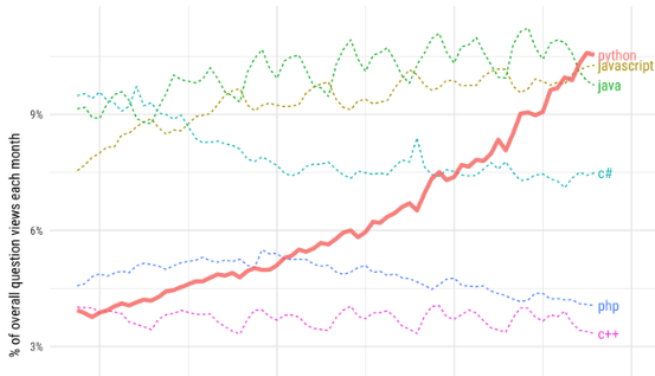
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### Growth of major programming languages

Based on Stack Overflow question views in World Bank high-income countries



- Fastest growing
- The rise of Python can be connected to the rise of data science
- Python is simple yet versatile
- Nearly 200 thousand Python libraries available!

<https://news.codecademy.com/why-learn-python/>

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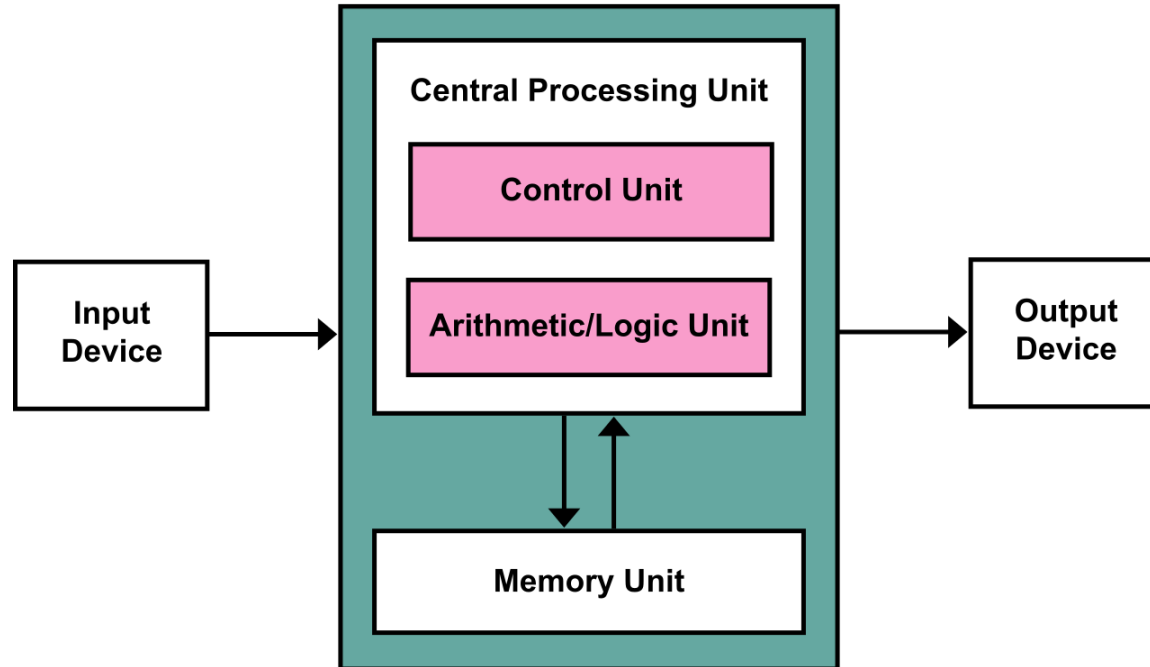
# Apa itu komputer?



Komputer adalah mesin yang dapat:

- Menyimpan data dalam bentuk angka, teks, gambar, & video
- Berinteraksi dengan perangkat (device) seperti layar monitor, speaker, dan printer
- Mengeksekusi program, misalnya program ramalan ~~asma~~ cuaca, game, web browser, serta Integrated Development Environment (IDE)

# Arsitektur komputer (von Neumann, 1945)



# Hardware vs. software: which one?



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# Apa itu ilmu komputer?

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Computer Science is the study of computers and computational systems.

Unlike electrical and computer engineers, computer scientists deal mostly with software and software systems; this includes their theory, design, development, and application.

# Aspek-aspek ilmu komputer

---

Principal areas of study within Computer Science include:

- Artificial intelligence
- Computer systems and networks
- Security
- Data science
- Human computer interaction
- Vision and graphics
- Software engineering
- And many others!

# Artificial intelligence predicts which movies will succeed—and fail—simply from plot summaries

By Eva Frederick | Aug. 2, 2019, 9:00 AM



Artificial intelligence (AI) still can't see the future, but a new algorithm may come close: Using nothing but written movie summaries, the AI can consistently tell which films will play well—or rottenly—to critics and audiences. If the model can be further refined, it could one day help producers predict whether a movie will be a flop at the box office, before it's even made.

To test several models, researchers used plot summaries of 42,306 movies from all over the world, many collected from Wikipedia. The models broke up the summaries by sentence and used something called sentiment analysis to analyze each one. Sentences considered "positive," such as "Thor loves his hammer," would receive a rating closer to one. And sentences that were considered "negative," like "Thor gets in a fight," would be rated closer to negative one.

Generally, successful movies such as 1951's *Alice in Wonderland*—which scored 80% on the movie-rating website Rotten Tomatoes—have frequent fluctuations in sentiment; unsuccessful ones, such as 2009's *The Limits of Control*, fluctuate less. It's not important whether the films begin or end happily, the researchers say. What's important is that the sentiments change frequently.



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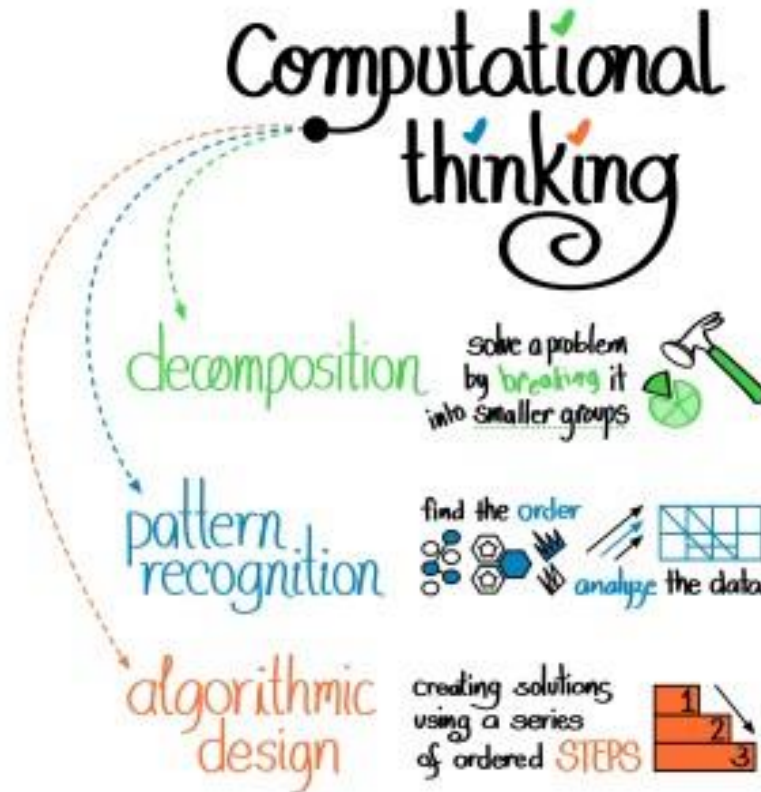
# Apa itu computational thinking?

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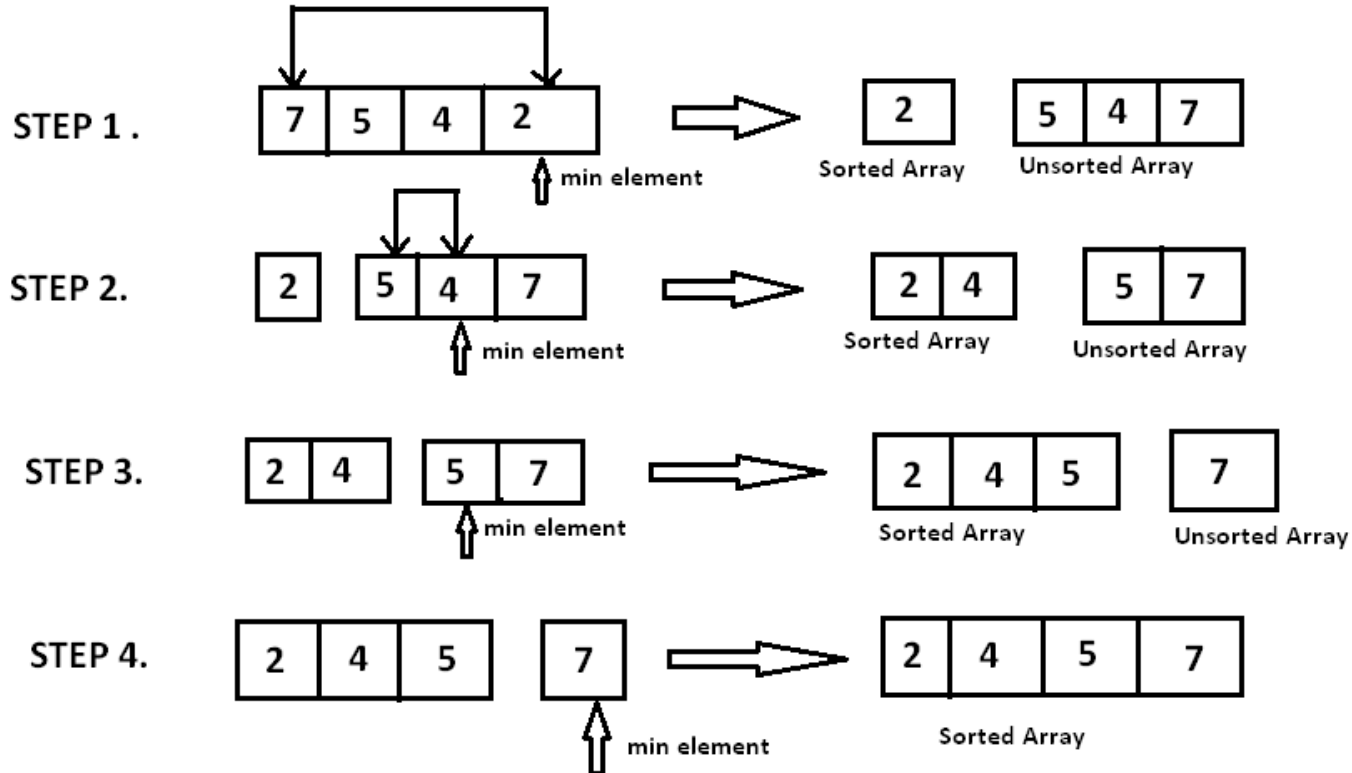
Ability to

- analyze a problem,
- identify patterns in the problem,
- provide an abstraction of the problem,
- decompose the problem,
- provide a systematic solution of the problem,
- evaluate the solution,
- optimize the solution, and
- communicate the solution in a clear and concise way.

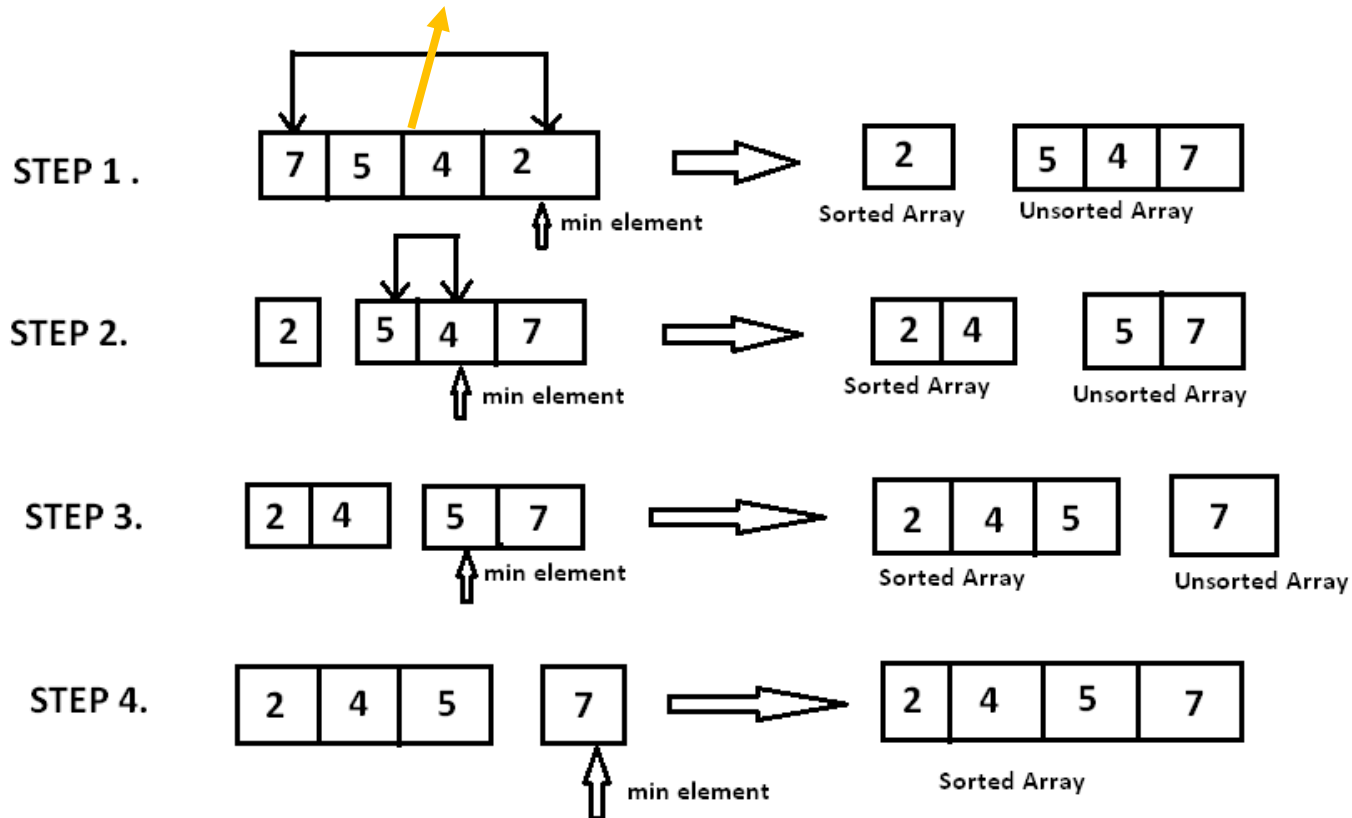
# Apa itu computational thinking?



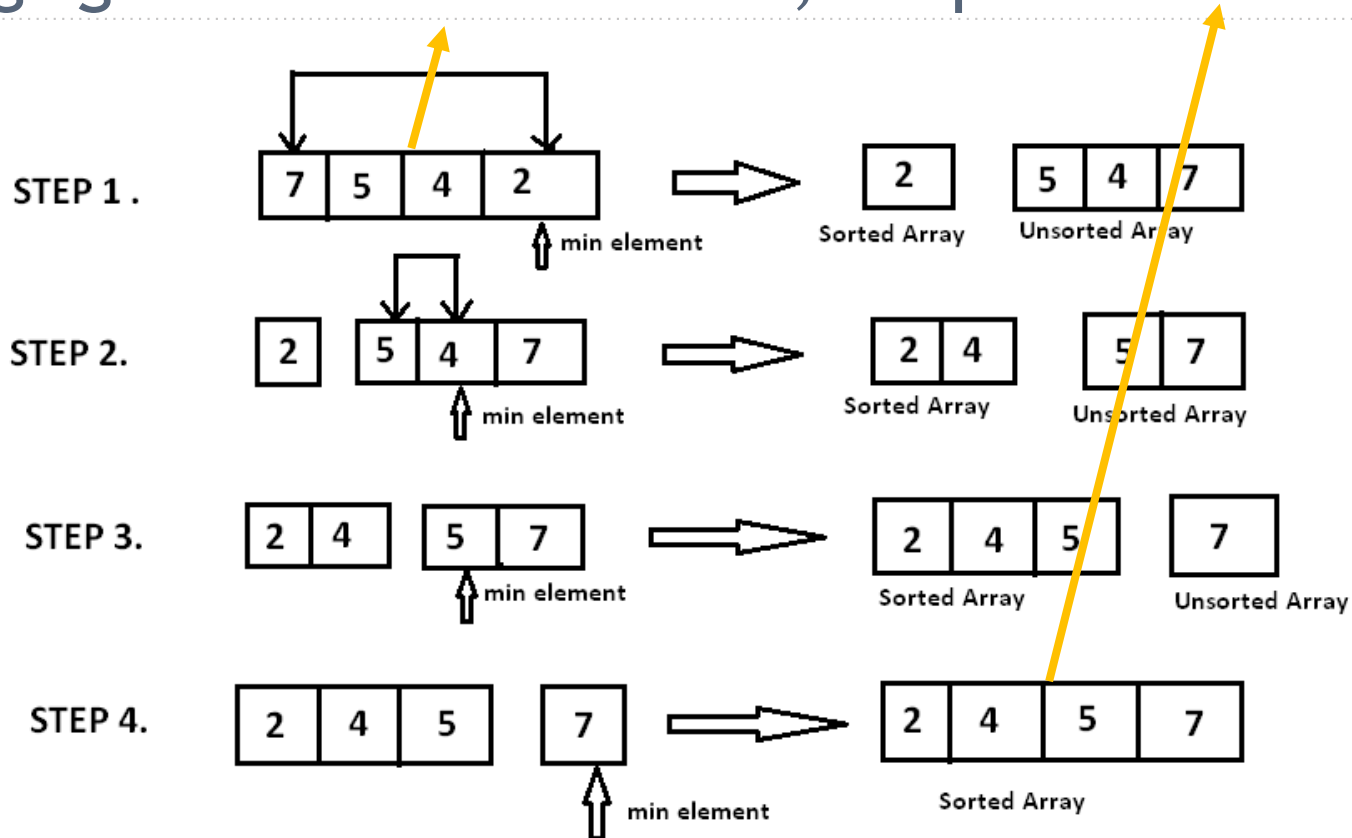
# Sorting: given unordered data, output ordered data



# Sorting: given unordered data, output ordered data



# Sorting: given unordered data, output ordered data



# Pada apa saja CT dapat diterapkan?





# Video time: Thinking like a computer



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# Apa itu program?

---

Suatu urutan instruksi yang dilakukan komputer dalam pemecahan masalah.

Program terbentuk dari kumpulan instruksi-instruksi sederhana pada komputer:

- Taruh titik biru pada lokasi tertentu di layar monitor
- Kirim huruf B ke printer
- Dapatkan nilai dari suatu lokasi pada RAM
- Tambahkan dua angka
- **Jika** nilai X kurang dari 0, stop programnya
- **Ulangi** suatu instruksi satu juta kali

# Apa itu programming?

---

Proses pembuatan program, yang meliputi:

- **Mendesain** solusi dari masalah yang akan dipecahkan program komputer (misalnya flowchart, pseudocode)
- **Mengimplementasikan** program di suatu bahasa pemrograman tertentu (seperti Python, C, Java)
- **Memeriksa dan memperbaiki** error yang muncul (debugging)

# Apa itu programming?

TOP DEFINITION

## Programming



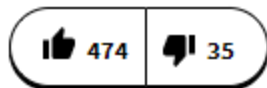
drugs

The art of turning caffeine into Error Messages.

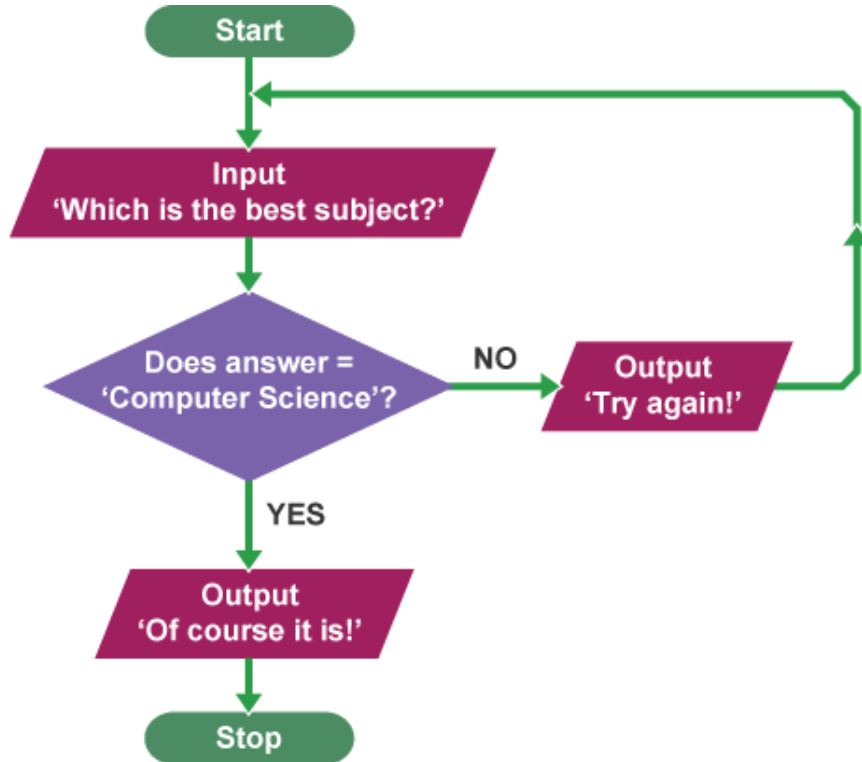
*12-midnight is the critical point for programming, at which time the relationship of errors vs caffeine increases exponentially.*

#programing #coding #code #software engineering #computer programming

by **JessTicular** September 18, 2006



# Contoh flowchart



# Contoh pseudocode

---

*Write down the first number in the list, and call it 'max'*

*For each number in the list*

*if it's bigger than 'max'*

*replace the value of 'max' by the larger value*

*When we're all done, 'max' is the largest number we found*





## The very first recorded computer bug

by [BORIS VELDHUIJZEN VAN ZANTEN](#) — Sep 18, 2013 in [SHAREABLES](#)

9/9

0800 Anttan started

1000 " stopped - anttan ✓

1300 (032) MP-MC ~~1.482167000~~ 2.130476415 (2) 4.615925059(-2)

(032) PRO 2 2.130476415

conv 2.130676415

Relays 6-2 in 033 failed special speed test

In Relay 10,000 test.

Relays changed

1100 Started Cosine Tape (Sine check)

1525 Started Multi-Adder Test.

1545

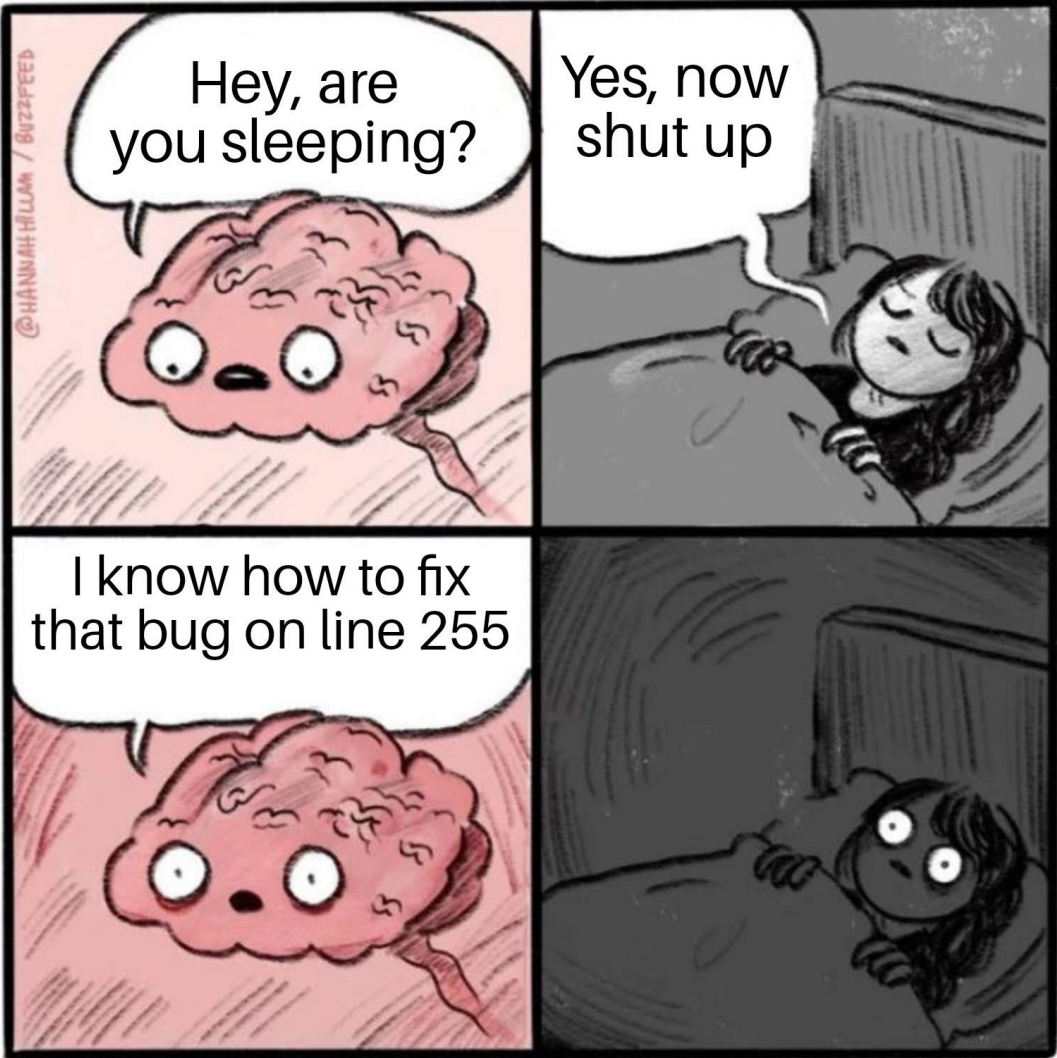
Relay #70 Panel F  
(moth) in relay.

First actual case of bug being found.

1630 Anttan started.

1700 closed down.

Relay 2145  
Relay 3370



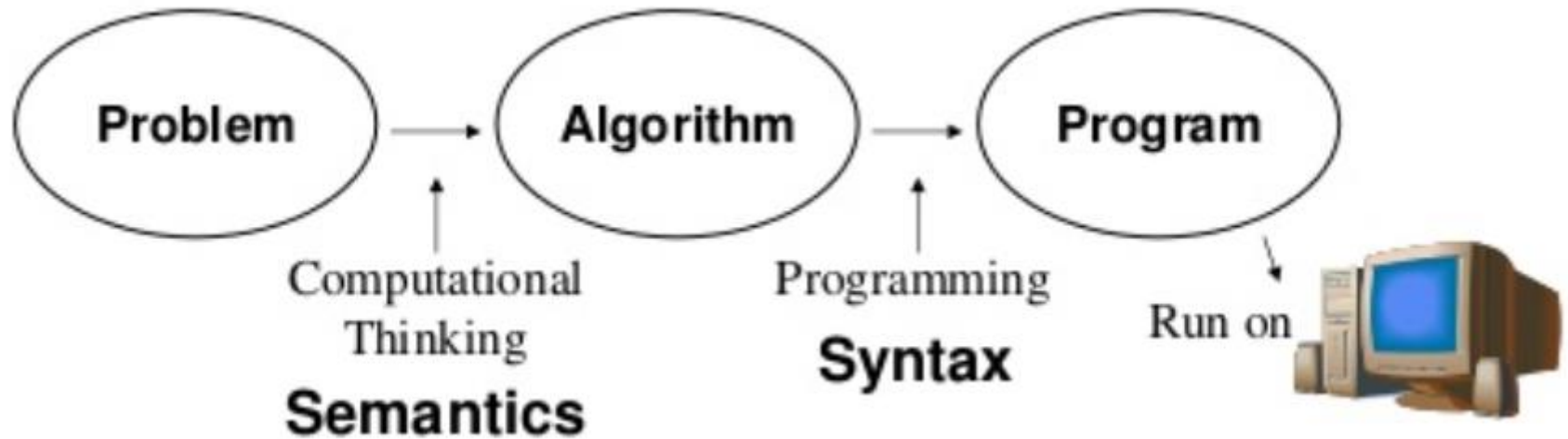
# Sintaks dan semantik

---

Pemrograman memiliki dua aspek pokok:

- **Sintaks:** bagaimana menulis program dengan struktur yang benar dan rapi (analogi layaknya sistem ejaan untuk Bahasa Indonesia)
- **Semantik:** bagaimana program berjalan dengan benar (correct) sesuai dengan apa yang kita maksud

# Sintaks dan semantik



# Syntax vs Semantics

form of an utterance  $\neq$  meaning

"Colorless green ideas sleep furiously!"

Idea is the noun; sleep is the verb.



0:29 / 2:33



# Outline

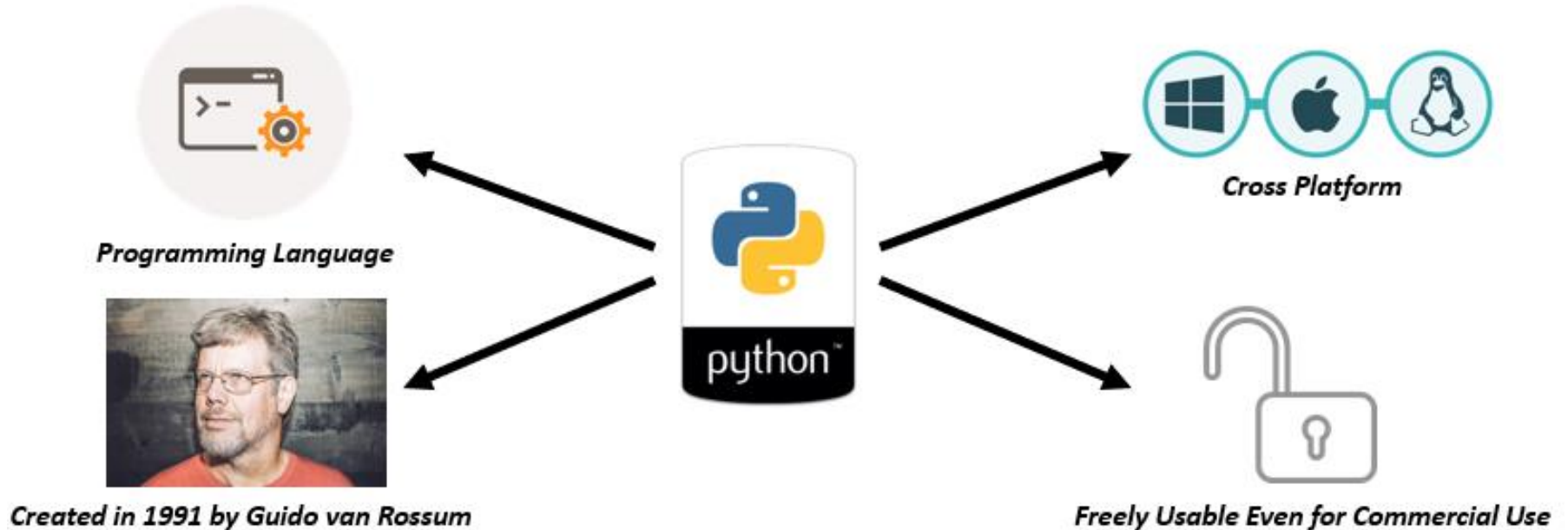
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# Apa itu Python?

---

# Apa itu Python?





# The first program: hello world

---

Permasalahan: Cetak "hello world" pada layar.

# The first program: hello world

---

Permasalahan: Cetak "hello world" pada layar.

```
print("hello world")
```

# The first program: hello world

---

- Used to illustrate the basic syntax of a programming language
- Often first program by people learning to code
- Also traditionally used in a sanity test to make sure that a computer language is correctly installed, and that the operator understands how to use it
- First known version of hello world was in 1972

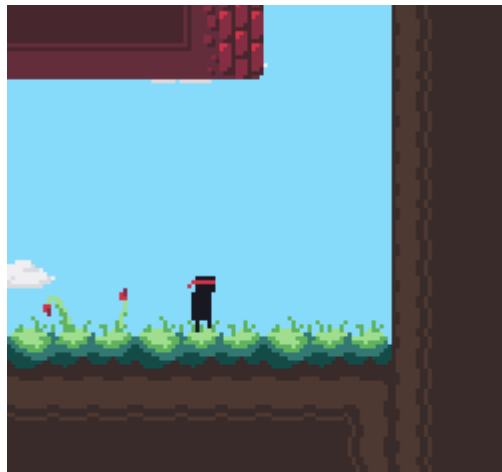
# Python is versatile: useful for various purposes



<https://opencv.org/>  
*Image Processing using **Python***

# Python is versatile: useful for various purposes

---



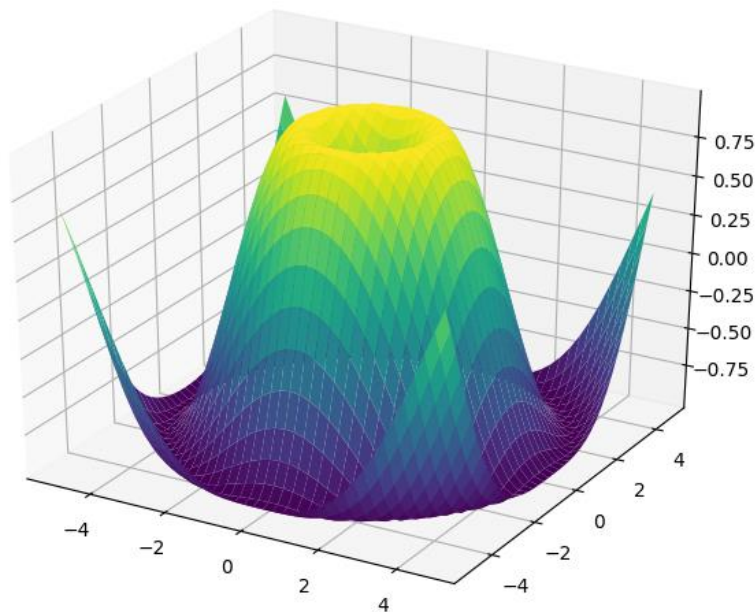
<https://www.pygame.org>  
*Game Development using **Python***

# Python is versatile: useful for various purposes

Python.io



# Python is versatile: useful for various purposes



<https://matplotlib.org/>  
*Data Science using **Python***

# Python is versatile: useful for various purposes



[https://github.com/amueller/word\\_cloud](https://github.com/amueller/word_cloud)

# Natural Language Processing (NLP) and Text Mining using **Python**



# Python is versatile: useful for various purposes

---



<https://flask.palletsprojects.com>  
*Web development using **Python***

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# Administrasi kuliah

---

**4 SKS:** what does this mean?

- 4x50 menit/minggu: tatap muka
- 4x50 menit/minggu: tugas terstruktur
- 4x50 menit/minggu: **belajar mandiri**

Total: 12 jam/minggu

# Administrasi kuliah

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Materi: <https://scele.cs.ui.ac.id/course/view.php?id=684>

Diskusi: WA/Line dengan asdos, WA/email dengan dosen

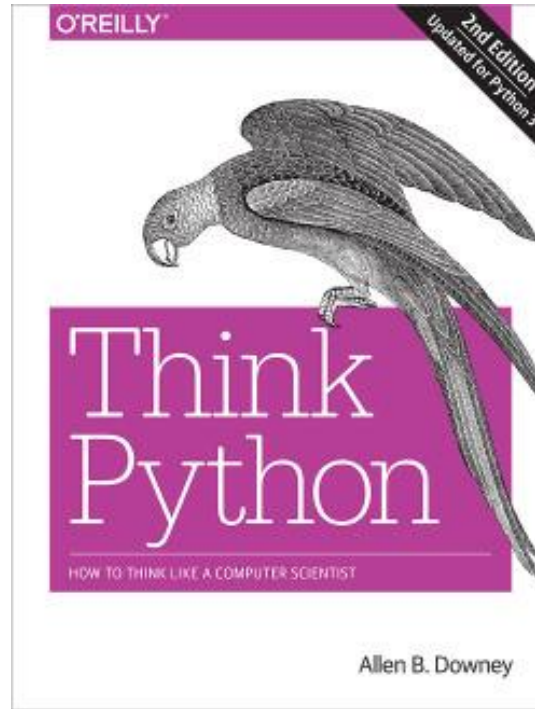
Referensi utama:

William F. Punch and Richard Enbody.

Practice of Computing Using Python, 3rd edition.

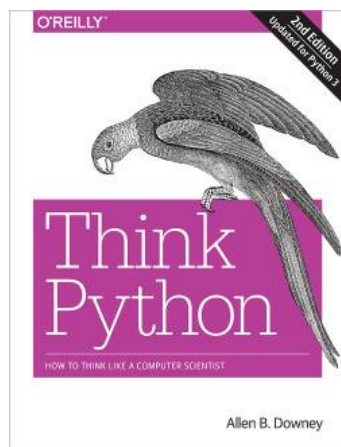
# Administrasi kuliah

Referensi penunjang:



<https://greenteapress.com/wp/think-python-2e/>

## Chapter 1 The way of the program



The goal of this book is to teach you to think like a computer scientist. This way of thinking combines some of the best features of mathematics, engineering, and natural science. Like mathematicians, computer scientists use formal languages to denote ideas (specifically computations). Like engineers, they design things, assembling components into systems and evaluating tradeoffs among alternatives. Like scientists, they observe the behavior of complex systems, form hypotheses, and test predictions.

The single most important skill for a computer scientist is **problem solving**. Problem solving means the ability to formulate problems, think creatively about solutions, and express a solution clearly and accurately. As it turns out, the process of learning to program is an excellent opportunity to practice problem-solving skills. That's why this chapter is called, "The way of the program".

On one level, you will be learning to program, a useful skill by itself. On another level, you will use programming as a means to an end. As we go along, that end will become clearer.

### 1.1 What is a program?

A **program** is a sequence of instructions that specifies how to perform a computation. The computation might be something mathematical, such as solving a system of equations or finding the roots of a polynomial, but it can also be a symbolic computation, such as searching and replacing text in a document or something graphical, like processing an image or playing a video.

# Software tools

---

Python 3.5+

Anaconda: <https://www.anaconda.com/download/>

IDE: Spyder

Cloud:

<https://colab.research.google.com>



Editor - C:\Users\Fariz\.spyder-py3\temp.py

temp.py

```
1 what_to_print = "hello, world"
2 print(what_to_print)
```

Variable explorer

Name	Type	Size	Value
what_to_print	str	1	hello, world

Variable explorer

File explorer

Help

IPython console

Console 1/A

```
Python 3.7.3 (default, Mar 27 2019, 17:13:21) [MSC v.1915 64
bit (AMD64)]
Type "copyright", "credits" or "license" for more information.
```

```
IPython 7.4.0 -- An enhanced Interactive Python.
```

```
In [1]: runfile('C:/Users/Fariz/.spyder-py3/temp.py',
wdir='C:/Users/Fariz/.spyder-py3')
hello, world
```



# Google Colab

The screenshot shows a Google Colab notebook interface. At the top is a browser address bar with the URL `https://colab.research.google.com/drive/14UITJ3BCjfxP7LtI3rvB5s1VdI9J7IUR#scrollTo=fpxl35Oa4RX`. Below the address bar is the notebook title `PY0101EN-1-1-Types.ipynb` with a star icon. A menu bar contains `File Edit View Insert Runtime Tools Help`. On the right, there are icons for `Comment`, `Share`, and a user profile. Below the menu bar, there are tabs for `+ Code` and `+ Text`, and a `Connect` button. The main content area has a title `Python - Writing Your First Python Code!` and a `Welcome!` message. Below the message is a `Table of Contents` section with a list of links. A small toolbar with icons for `Up`, `Down`, `Link`, `Comment`, `Edit`, `Delete`, and `More` is visible on the right side of the content area.

**Python - Writing Your First Python Code!**

**Welcome!** This notebook will teach you the basics of the Python programming language. Although the information presented here is quite basic, it is an important foundation that will help you read and write Python code. By the end of this notebook, you'll know the basics of Python, including how to write basic commands, understand some basic types, and how to perform simple operations on them.

**Table of Contents**

- [Say "Hello" to the world in Python](#)
  - [What version of Python are we using?](#)
  - [Writing comments in Python](#)
  - [Errors in Python](#)
  - [Does Python know about your error before it runs your code?](#)
  - [Exercise: Your First Program](#)
- [Types of objects in Python](#)
  - [Integers](#)
  - [Floats](#)
  - [Converting from one object type to a different object type](#)
  - [Boolean data type](#)
  - [Exercise: Types](#)

# Assessment

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Tugas pemrograman (4)	20%
Tutorial di lab (10)	15%
Quiz + independent initiatives	10%
UTS	25%
UAS	30%
Bonus Kehadiran (80%)	5%
<b>TOTAL</b>	<b>105%</b>

# Independent initiatives

---

## Cara Belajar Pemrograman Yang Cepat dan Efisien



Riza Fahmi [Follow](#)

Sep 17, 2018 · 9 min read

Karena satu dan lain hal, saya tidak akan menerbitkan artikel di medium lagi. Teman-teman bisa cek ke [rizafahmi.com](http://rizafahmi.com) untuk artikel-artikel terbaru dari saya.

Artikel ini akan memaparkan beberapa tips buat teman-teman yang ingin belajar pemrograman dengan efisien. Seluruh tips disini murni adalah

# Independent initiatives



# Independent initiatives



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# Peraturan kuliah

---

## **Kehadiran**

Minimum 75% kehadiran peserta kuliah dari kehadiran dosen supaya dapat mengikuti ujian akhir.

## **Tidak dapat mengikuti ujian (mid & final)**

Ada aturan yang membatasi siapa yang berhak ujian susulan  
Surat sakit dari rumah sakit

# Peraturan kuliah

---

## **Terlambat menyerahkan tugas**

Tugas terlambat tidak akan diterima (so, plan ahead)

Pada kasus sangat khusus (lomba/sakit keras), lapor dosen

## **Tidak dapat mengikuti laboratorium**

Menghubungi asisten untuk menjelaskan penyebabnya

# Cheating

---

## **What is cheating (“curang”, KKN)?**

Belajar bersama dalam bentuk grup adalah hal yang baik.

Tapi hasil pekerjaan harus merupakan buah karya sendiri.

**Contoh curang:** salin pekerjaan dari teman (running out of time),  
“meminjam” dan melihat hasil pekerjaan teman, menyogok teman untuk mengerjakan tugas sendiri

**Avoid risks:** Jangan sekali-kali memberi code (via email/jalur lain) ke orang lain, rentan disalahgunakan



# Cheating

---

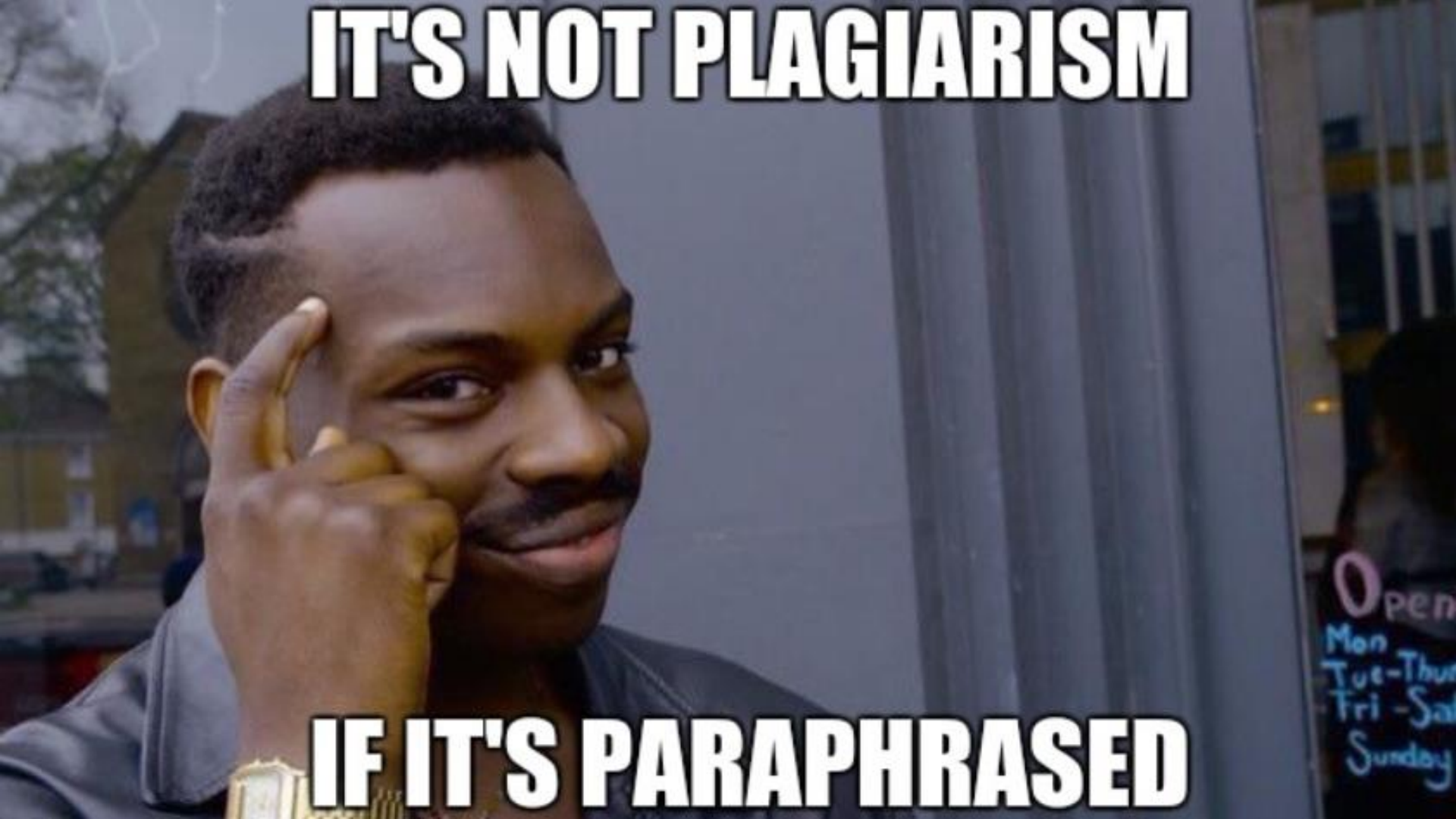
Setiap bentuk kecurangan akan mendapatkan sanksi dengan tegas sesuai dengan peraturan universitas!

Kecurangan akan diberi peringatan 1 kali, dan mendapatkan nilai 0 baik untuk pelaku dan pemberi kesempatan.

Kejadian kedua, **nilai E**.

Setiap kejadian kecurangan akan dilaporkan ke Dekan.

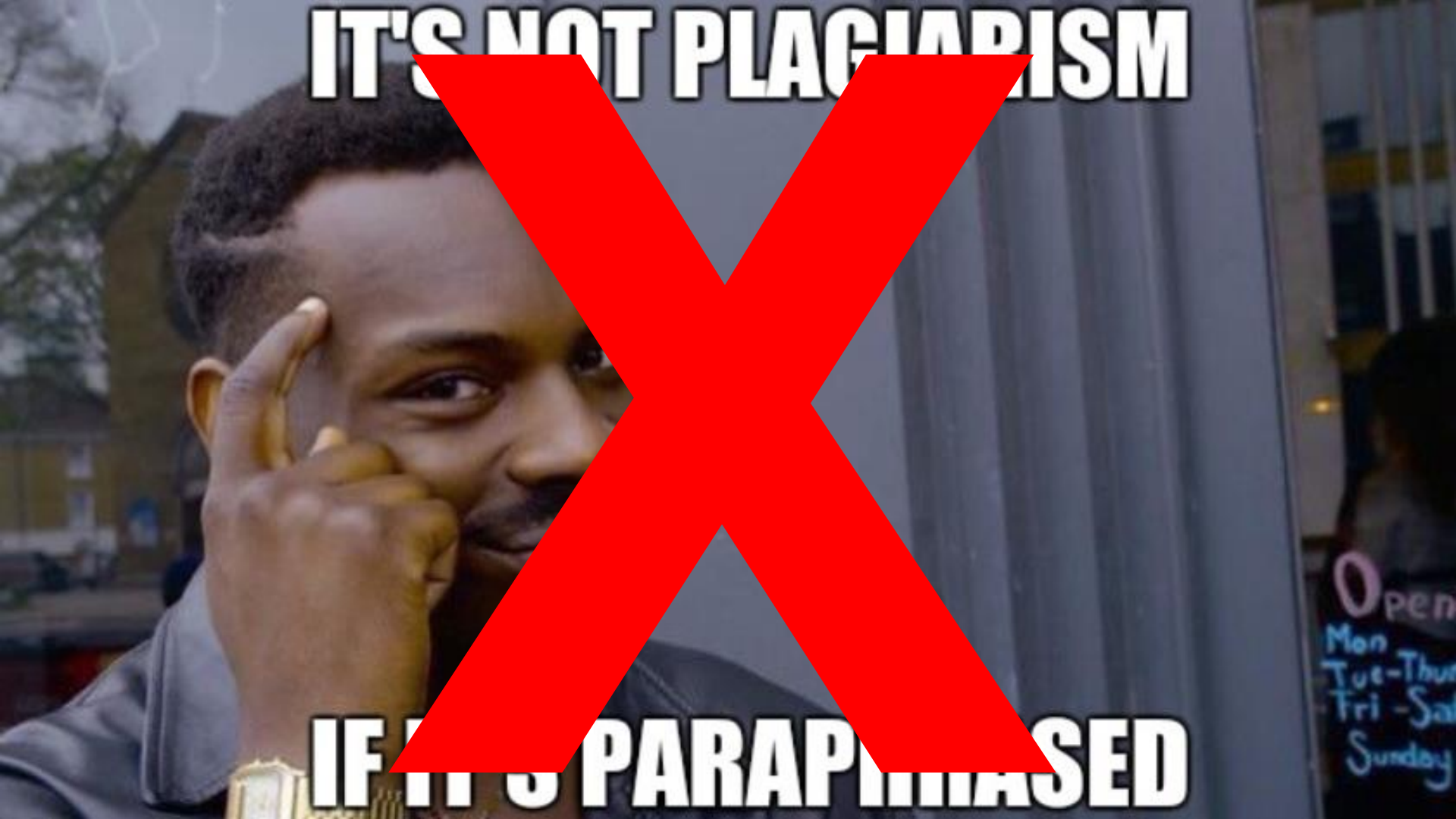
**IT'S NOT PLAGIARISM**



**IF IT'S PARAPHRASED**

**IT'S NOT PLAGIARISM**

**IF IT'S PARAPHRASED**



# Study tips

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## **Preview before class**

Take a quick look on the topic before class, like doing sports it is better to do some warming-up beforehand

## **Focus and active during class**

Make the most of your time in the class, you are here for obtaining knowledge useful for your own career

## **Review after class**

A quick review makes the learned material stay longer in your mind

# Reading time: Memory hacking

## The Basics of Effective Learning



[ [Learning Home](#) ] [ [Topics Menu](#) ] [ [Study Skills](#) ] [ [Concepts of Learning](#) ]  
[ [Web Site Resources](#) ] [ [BC3 Help Resources](#) ] [ [Learning Site Map](#) ]

## Memory and the Importance of Review

### Memory

*"We remember what we understand; we understand only what we pay attention to; we pay attention to what we want." - Edward Bolles*

<http://faculty.bucks.edu/specpop/memory.htm>



**Thanks  
and have fun coding!**

# Bonus

