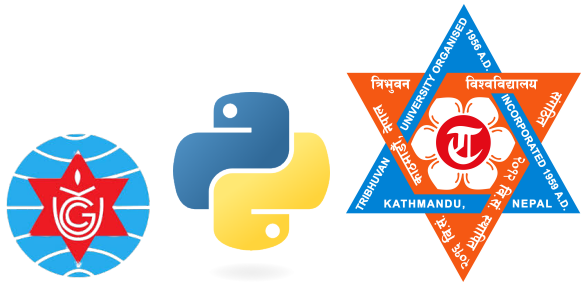
Python Fundamentals: (Matplotlib, Various types of Plots, Curve Fitting, Pandas)



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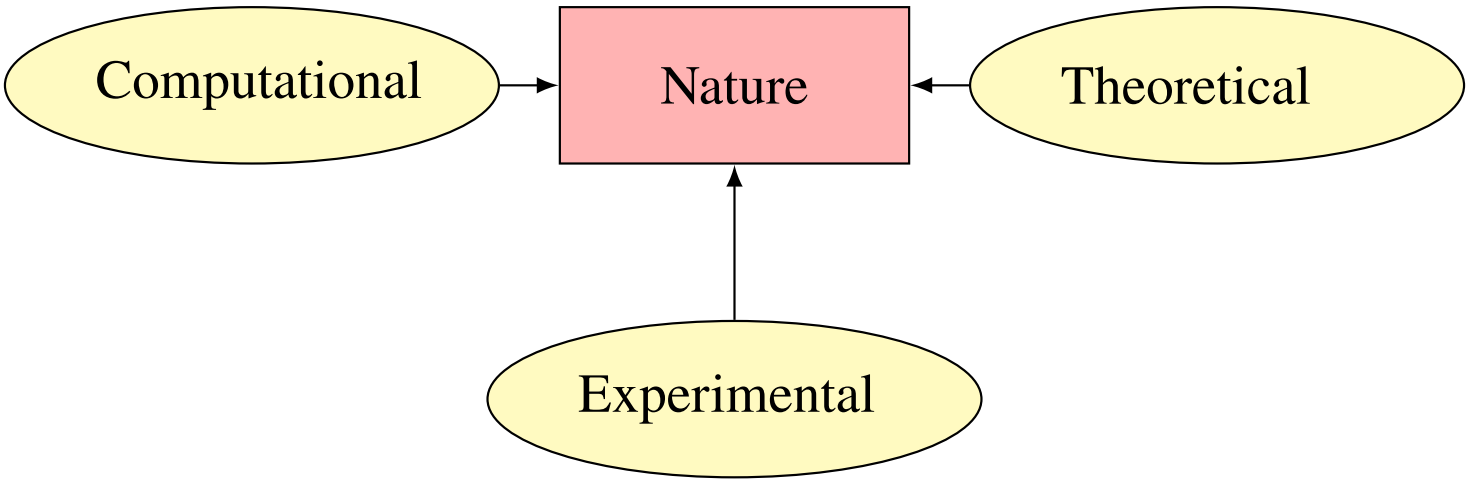
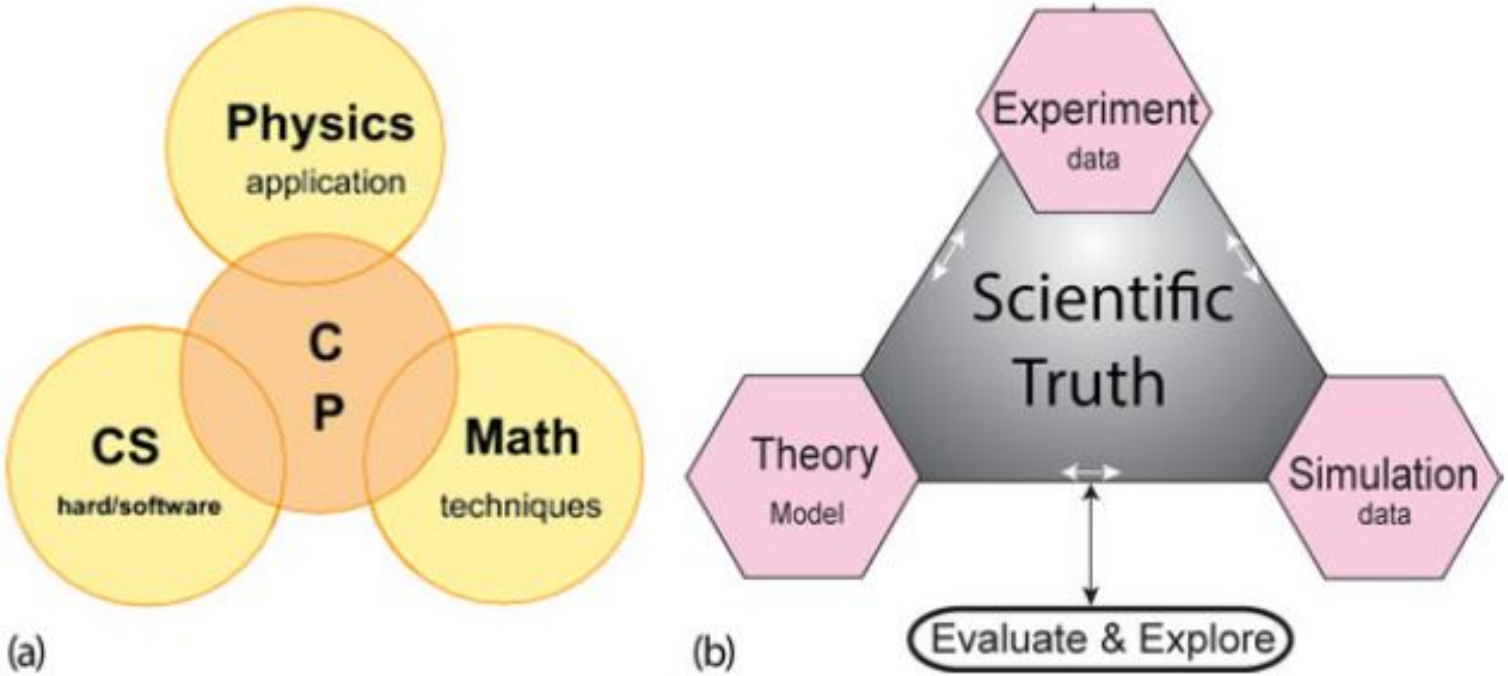
Contents

- Introduction
- Applications
- Statistics
- Coding/Plotting (55 min)
- Summary/Discussion (20 min)
- References

Introduction

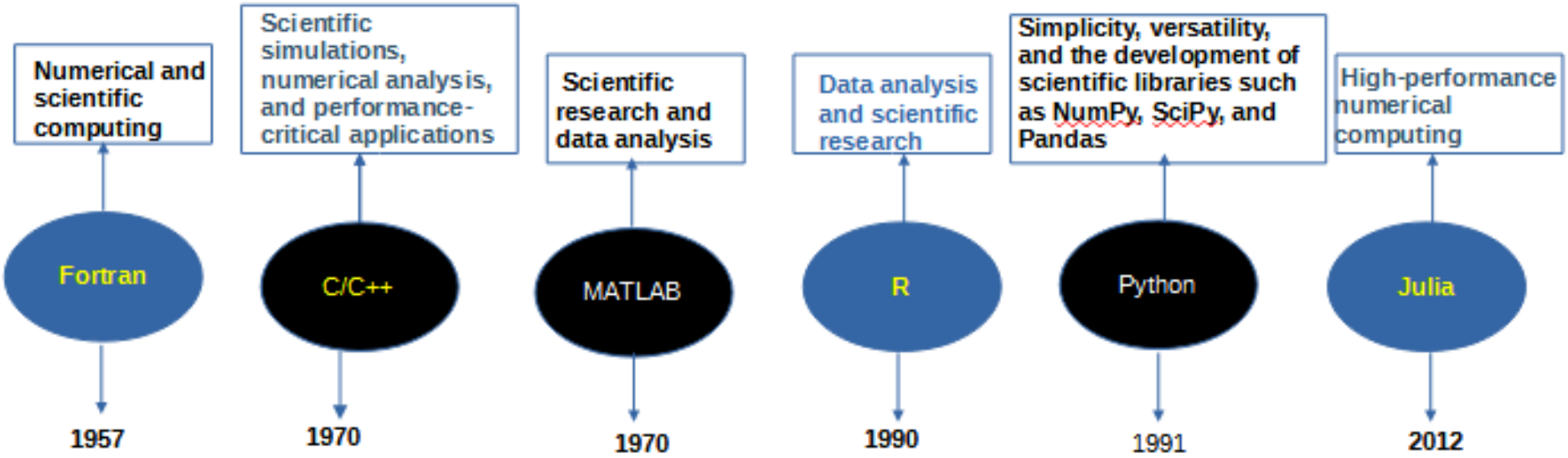


Introduction[1]



[1] Landau et al. (2015)

Types of most famous Programming Language [2]



[2] https://gvanrossum.github.io/

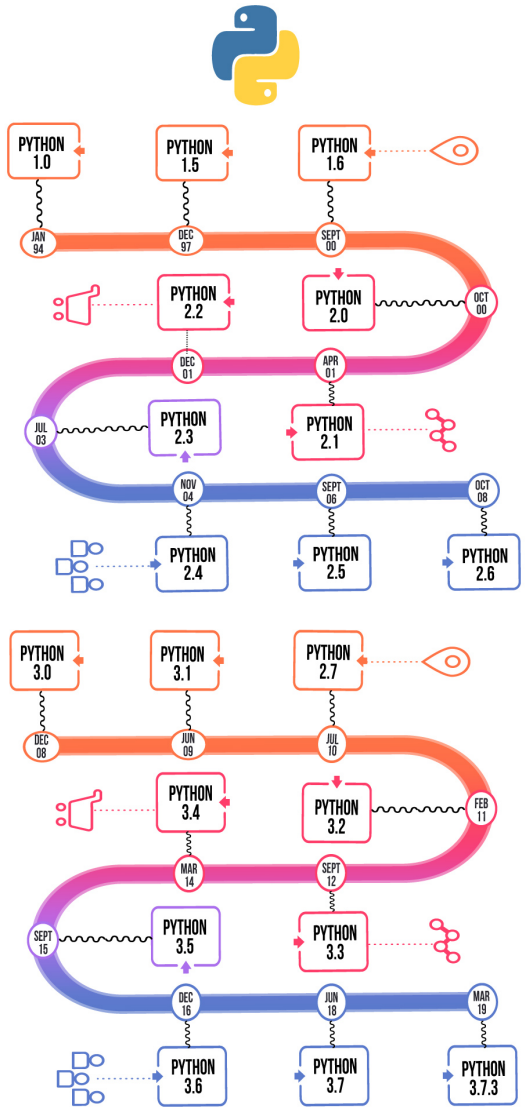
Python [3]

Founder of Python Language: **Guido van Rossum**

History: When he began implementing Python, Guido van Rossum was also reading the published scripts from **"Monty Python's Flying Circus"** a BBC comedy series from the 1970s. Van Rossum thought he needed a name that was short, unique, and slightly mysterious, so he decided to call the language Python.

[3] https://gvanrossum.github.io//

Introduction : Python 3.11.3, released on 5 April 2023 [4]



[4] https://docs.python.org/release/3.11.3/

Applications [5]

[5] Garcia & Revano (2021)

Statistics

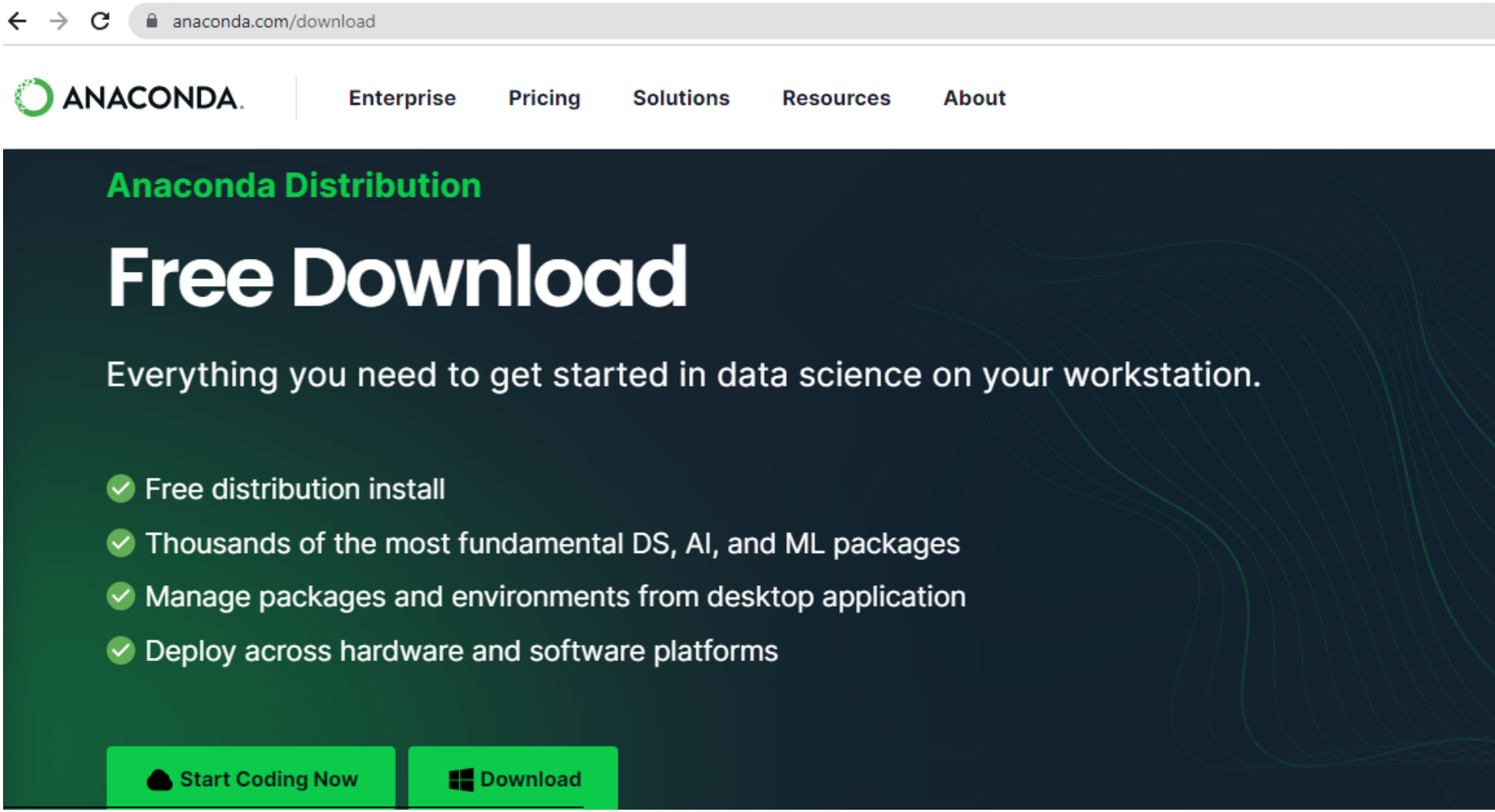
1. Slope (m) = $\frac{dy}{dx}$
2. Intercept (c) = y-mx
3. Pearson's correlation coefficient $(r) = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$
4. p-values: to assess the strength of evidence against a null hypothesis.
5. Q_1, Q_2 Q_3
6. Minimum, Maximum and Range
7. Mean, Median, Mode
8. Standard deviation $(\sigma) = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$
9. Standard error (SE) = $\frac{\sigma}{\sqrt{n}}$
10. Mean Absolute Deviation (MAD) = $\frac{\sum |x_i - \mu|}{n}$
11. Variance = $\frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2$
12. CV = $\left(\frac{\text{Standard Deviation}}{\text{Mean}} \right) \times 100\%$
13. Skewness = $\frac{\sum_{i=1}^{n} (x_i - \bar{x})^3}{n \cdot \sigma^3}$
14. Kurtosis = $\frac{\sum_{i=1}^{n} (x_i - \bar{x})^4}{n \cdot \sigma^4} - 3$

Coding/plotting [6]

Symbol	Functionality
`+`	addition
`-`	subtraction
`*`	multiplication
`/`	division
`%`	modulo (yields remainder after division)
`//`	integer division (truncates toward zero)
`**`	exponentiation
`abs(a)`	absolute value of the number a, $\|a\|$
`math.sin(x)`	sine of x radians (other trigonometric functions are also available)
`math.factorial(n)`	factorial of n, $n!$
`math.log(a,b)`	$log_b(a)$ (defaults to natural logarithm, if no base b specified)
`math.sqrt(x)`	square root of x, $\sqrt{x}$

[6] Ekmekci et al. (2016)

Coding/plotting [7]



[7] https://www.anaconda.com/download

Coding and plotting

1. Online Coding: https://nb.anaconda.cloud/jupyterhub/user
2. Offline Coding: https://www.anaconda.com/
3. w3schools: https://www.w3schools.com/python/
4. Nuclear Physics: https://github.com/Devendra20-20/Nuclear_Physics
5. Astrophysics: https://github.com/Devendra20-20/Astrophysics
6. NPS School of Computing: https://npshub.github.io/

Acknowledgements

- Workshop Organizing Committee
- Supervisor, Prof. Raju Khanal, Central Department of Physics, TU
- IoST, TU
- UGC, Nepal

References

Ekmekci, B., McAnany, C. E., & Mura, C. (2016). An introduction to programming for bioscientists: a Python-based primer. *PLoS computational biology*, *12*(6), e1004867.

Garcia, M. B., & Revano, T. F. (2021). Assessing the Role of Python Programming Gamified Course on Studentsâ Knowledge, Skills Performance, Attitude, and Self-Efficacy. In *2021 IEEE 13th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM)* (pp. 1–5).

Landau, R. H., Páez, M. J., & Bordeianu, C. C. (2015). *Computational physics: Problem solving with python*. John Wiley & Sons.

Thank you !!!