This is the Slidedeck Title in class title

This is Subtitle in class `title`

This is header in JSON

Let there be celebration!

MarpX *is here!*

Outline

Transition Slide

Aditional Text about what´s ahead

Is Algebraic Graph Knowledge a Possibility ?

Research has been conducted in order to evaluate the possibility of reaching meaningful knowledge from Algebraic Graph transformations.

- Model Cheking and theorem prooving are viable paths.

When the neet to make strong assertions becomes inevitable:

- This is the first way: outstanding assertion!

* Note: This is a very long footnote line intended to test the layout of two.

H1 - H1 level of header

H2 - H2 level of header

H3 - H3 level of header

H4 - H4 level of header

H5 - H5 level of header

H6 - H6 level of header

- This is a fragment o normal text written here in order to exemplify the use of several featrues in CSS.
- This is a fragment o normal text written here in order to exemplify the use of several featrues in CSS.
  - This is one **bold** comment.
  - This is another *italic* comment.

One image slide

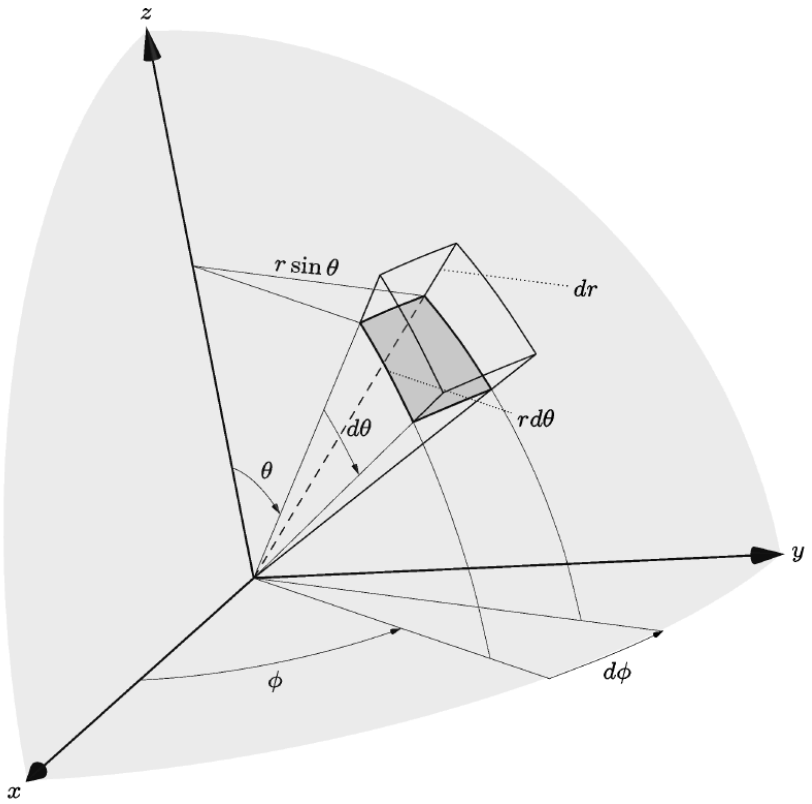

Fig. 7.1: Object defined in terms of spherical coordinates.

Images fit into columns

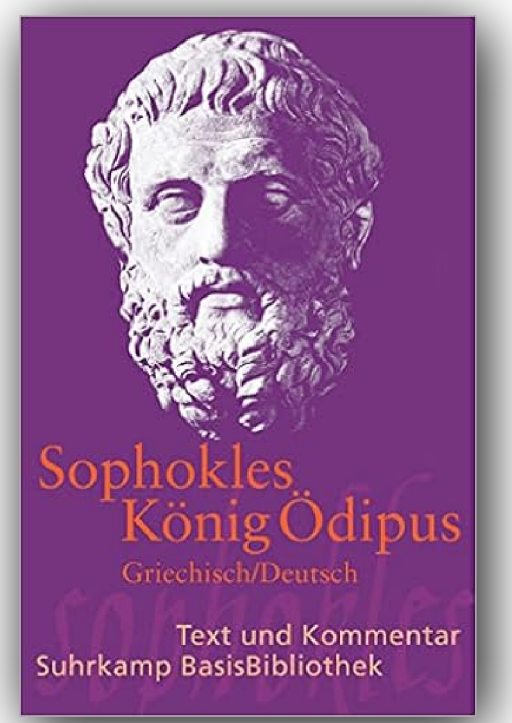

Fig. 8.1: Sophokles, Suhrkamp (2015).

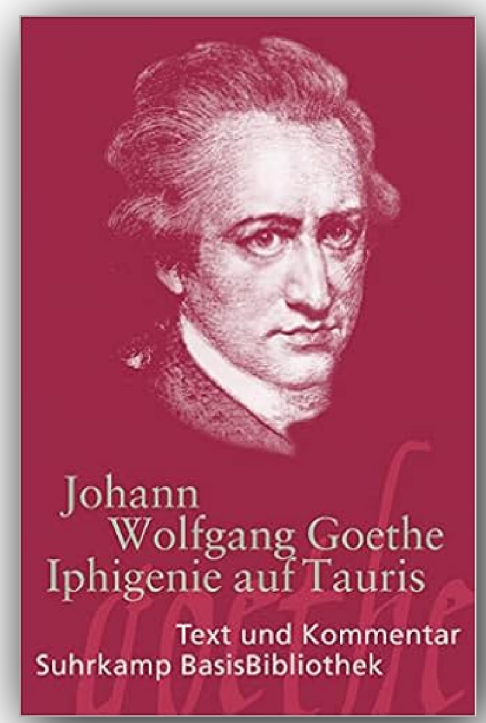

Fig. 8.2: Göthe, Suhrkamp (2011).

Fig. 8.3: Heine, Suhrkamp (2011).

Image and text on the same slide (1)

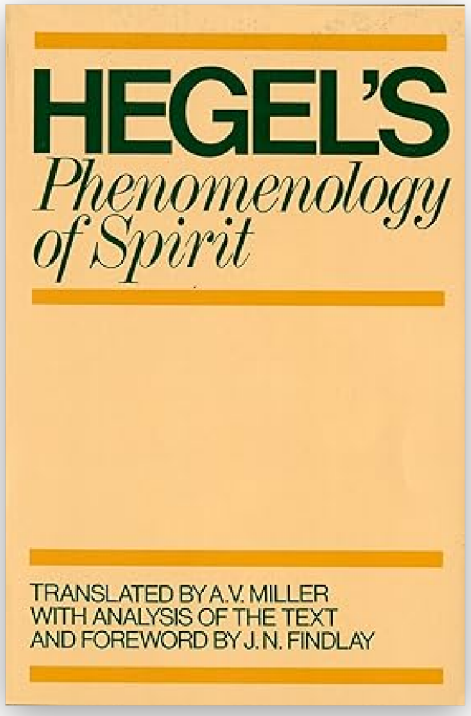

Fig. 9.1: *Phänomenologie des Geistes* Oxford edition.

Hegels Phänomenologie

Das Buch trug ursprünglich den Titel "Phänomenologie des Geistes" von seinem Autor: G.W.F. Hegel.

- Das **1807** veröffentlichte Werk markiert eine bedeutende Entwicklung des deutschen Idealismus nach Kant.
- In diesem Buch entwickelt Hegel seine Konzepte der Dialektik.

> Price at Amazon used to be $ 17.83.

Image and text on the same slide (2)

Kant, Leibniz & Newton

Philosophy and the sciences were closely linked in the age of Leibniz, Newton, and Kant.

This addresses the transformations of metaphysics as a discipline, the emergence of analytical mechanics, the diverging avenues of 18th-century Newtonianism, the body-mind problem, and philosophical principles of classification in the life sciences.

> Price at Amazon used to be 128,39 €

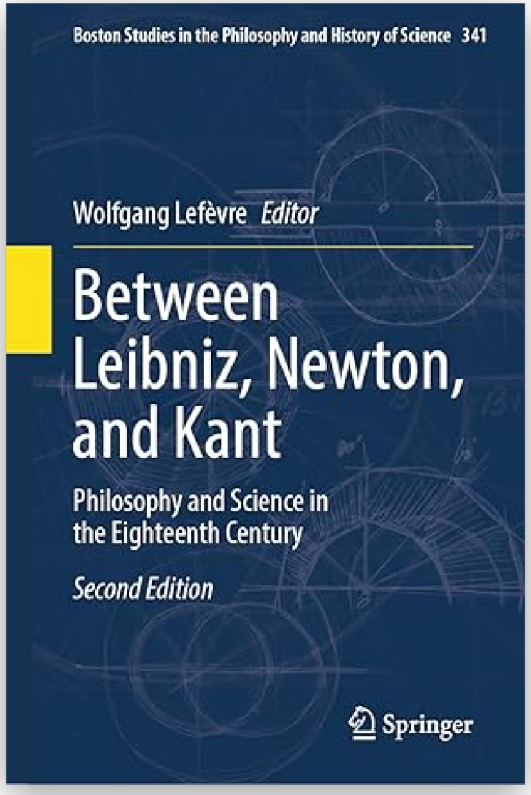

Fig. 10.1: Springer edition (2023).

This is header in JSON
© Back to the beginning - Created with Marp e MarpX.

Multi-images Environment (1)

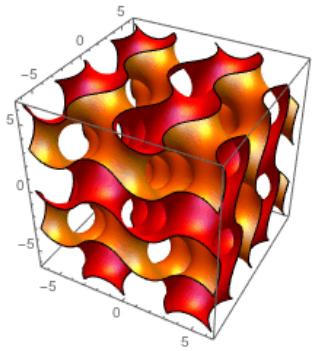

Fig. 11.1: Math001.

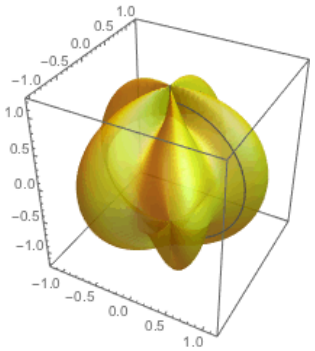

Fig. 11.2: Math002.

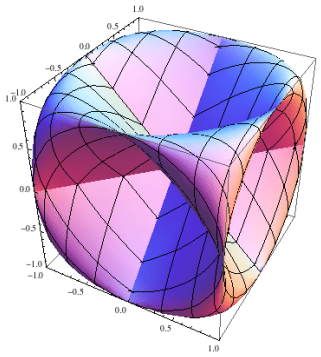

Fig. 11.3: Math003.

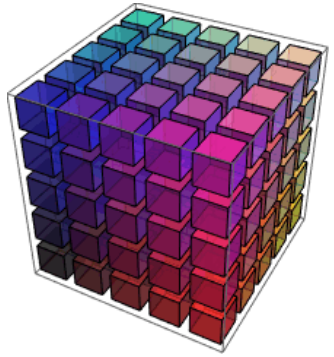

Fig. 11.4: Math004.

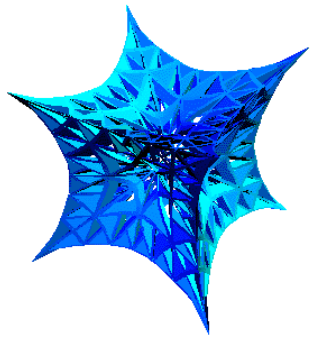

Fig. 11.5: Math005.

Multi-images Environment (2)

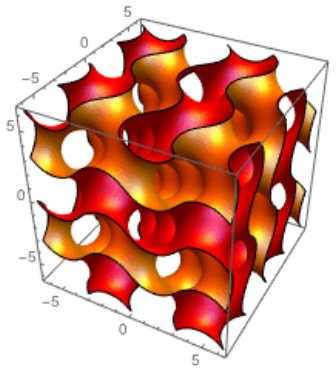

Fig. 12.1: Math001.

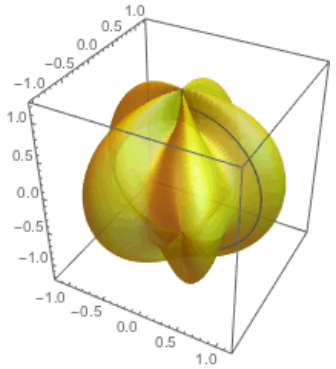

Fig. 12.2: Math002.

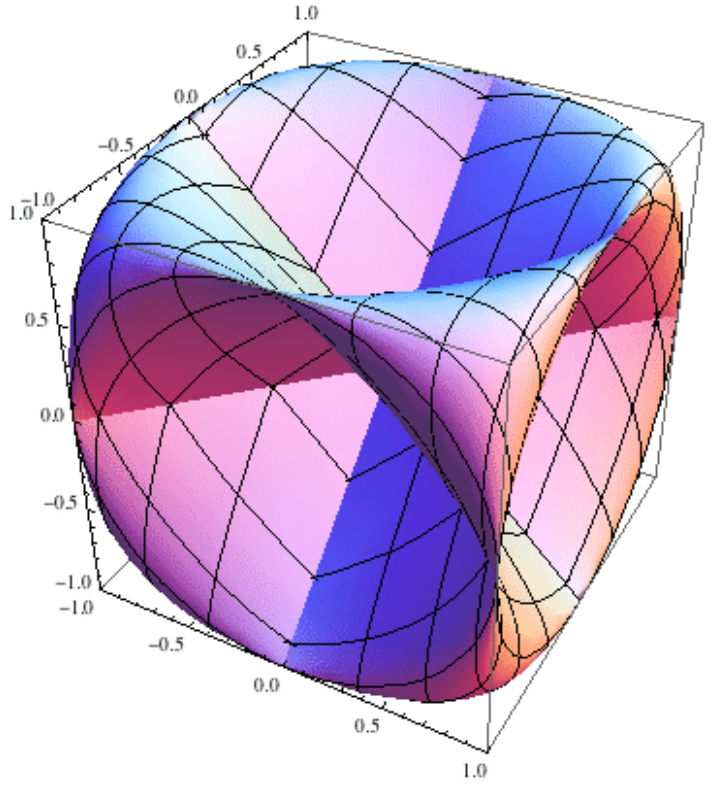

Fig. 12.3: Math003.

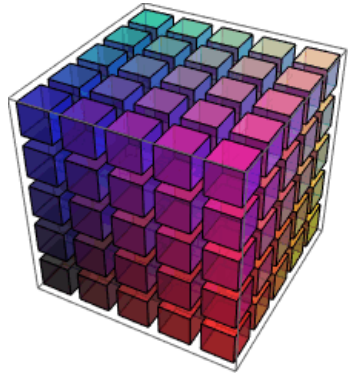

Fig. 12.4: Math004.

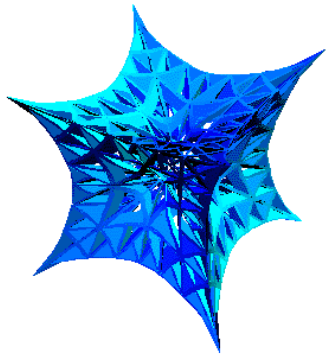

Fig. 12.5: Math005.

Figures and caption in *multicolumn*

Fig. 13.1: God Zeus

Fig. 13.2: Afrodite

Fig. 13.3: Dionísio

Fig. 13.4: Era

Ordered and *unordered* lists

1. First object in list;
2. Second object in list;
3. Third object in list;
    i. First objetc in sublist;
    ii. Second object in sublist;
        a. Another level;
        b. Yet another item.
    iii. Third object in sublist.
4. Fourth object in List.

- First object in list;
- Second object in list;
- Third object in list;
    - First objetc in sublist;
    - Second object in sublist;
        - Another level;
        - Yet another item.
    - Third object in sublist;
- Fourth object in List;

Tables

Organizing data with tables in Markdown

Renaissance painters

Painter	Country	Birth Year	Death Year	Most Famous Work
Albrecht Dürer	Germany	1471	1528	*Melencolia I*
Leonardo da Vinci	Italy	1452	1519	*Mona Lisa*
Michelangelo	Italy	1475	1564	*Sistine Chapel Ceiling*
Raphael	Italy	1483	1520	*The School of Athens*
Titian	Italy	~1488	1576	*Assumption of the Virgin*

Table 16.1: Renowned Renaissance painters with biographical data and masterpieces (alphabetical order).

Programming languages

Language	Creator(s)	Year	Main Paradigm(s)
C	*Dennis Ritchie*	1972	Structured, Procedural
C++	*Bjarne Stroustrup*	1983	Object-oriented, multi-paradigm
Erlang	*Joe Armstrong*	1986	Funcional, Concorrente
Haskell	*Comitê Haskell*	1990	Purely Functional
Java	*James Gosling*	1995	Object-Oriented
Pascal	*Niklaus Wirth*	1970	Structured, Procedural
Python	*Guido van Rossum*	1991	Multi-paradigm (OO, Procedural, Functional)

Table 17.1: List of programming languages.

Mathematical Formulations

Writing equations with LaTeX

Probability Distribution (1)

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$

Fig. 19.1: Normal Distribution (Gaussian).

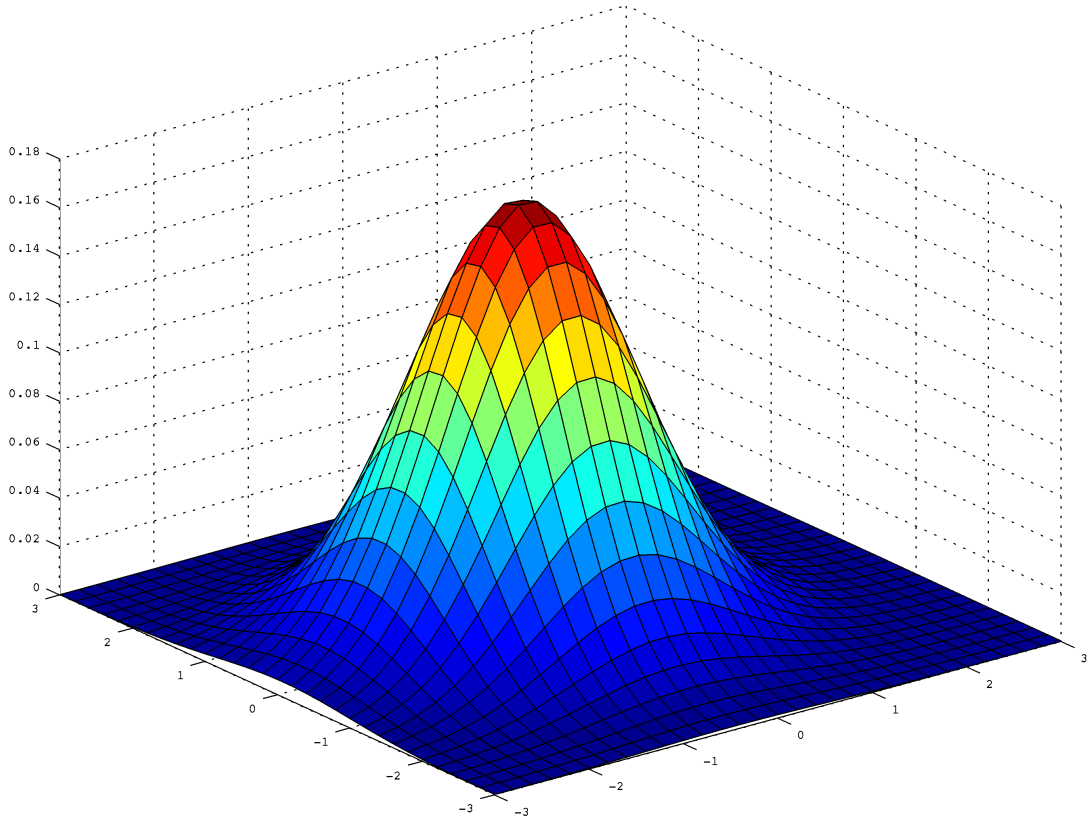

Fig. 19.2: Multivariate Normal Distribution.

Probability Distribution (2)

$$f(x) = \frac{\sqrt{\frac{(d_1 x)^{d_1} d_2^{d_2}}{(d_1 x + d_2)^{d_1 + d_2}}}}{x\, B\left(\frac{d_1}{2}, \frac{d_2}{2}\right)}$$

Fig. 20.1: Fisher-Snedecor F distribution.

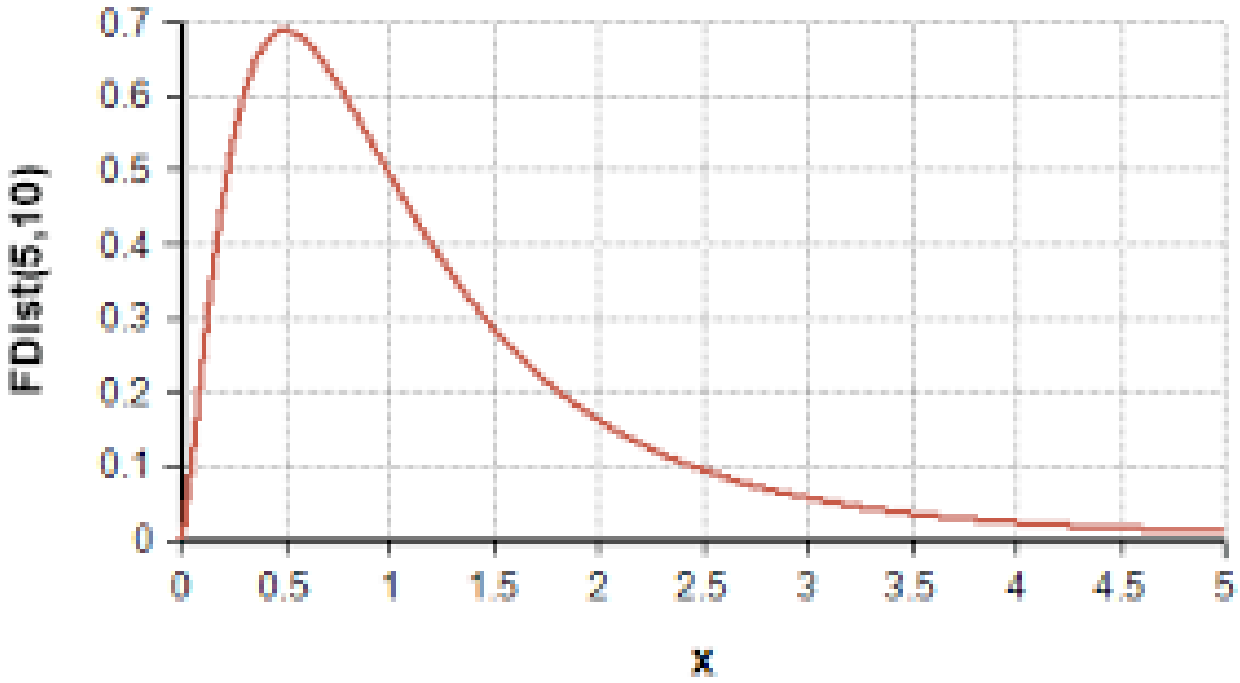

Fig. 20.2: Multivariate Normal Distribution.

Electromagnetic Field (Differential form)

Below, in modern vector notation, in *differential form*, are Maxwell's four equations governing the **electromagnetic field**.

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0} \qquad \text{(Gauss's law)}$$

$$\nabla \cdot \mathbf{B} = 0 \qquad \text{(No magnetic monopoles)}$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \qquad \text{(Faraday-Lenz law)}$$

$$\nabla \times \mathbf{B} = \mu_0\mathbf{J} + \mu_0\varepsilon_0\frac{\partial \mathbf{E}}{\partial t} \qquad \text{(Ampere-Maxwell Law)}$$

Electromagnetic Field (Integral form)

Below, in modern vector notation, in *integral form*, are Maxwell's four equations governing the electromagnetic field.

$$\oint_{\Sigma} \mathbf{E} \cdot d\mathbf{S} = \frac{Q_{\text{enc}}}{\varepsilon_0} \qquad \text{(Gauss's law)}$$

$$\oint_{\Sigma} \mathbf{B} \cdot d\mathbf{S} = 0 \qquad \text{(No magnetic monopoles)}$$

$$\oint_{\partial\Sigma} \mathbf{E} \cdot d\mathbf{l} = -\frac{d}{dt} \int_{\Sigma} \mathbf{B} \cdot d\mathbf{S} \qquad \text{(Faraday-Lenz law)}$$

$$\oint_{\partial\Sigma} \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_{\text{enc}} + \mu_0 \varepsilon_0 \frac{d}{dt} \int_{\Sigma} \mathbf{E} \cdot d\mathbf{S} \qquad \text{(Ampere-Maxwell Law)}$$

Python programs

```
"""
O programa traça, em 2D, os perfis instantâneos do
campo elétrico E (y) e do campo magnético B (z),
ambos perpendiculares ao eixo de propagação x.
"""
import numpy as np
import matplotlib.pyplot as plt

# Constantes e parâmetros
c = 3e8
E0 = 1.0
lambda_ = 1.0
k = 2 * np.pi / lambda_
omega = 2 * np.pi * c / lambda_
x = np.linspace(0, 2 * lambda_, 1000)
t = 0
E = E0 * np.sin(k * x - omega * t)
B = (E0 / c) * np.sin(k * x - omega * t)
B_scaled = c * B  # para visualização

plt.plot(x, E, label='E(x, t=0)')
plt.plot(x, B_scaled, label='c·B(x, t=0)')
plt.xlabel('x (m)')
plt.ylabel('Amplitude (u.a.)')
plt.title('Propagação de onda eletromagnética no vácuo (instantâneo)')
plt.legend()
plt.grid(True)
plt.show()
```

Fig. 23.1: First program.

```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D   # registra o proj. 3-D

# --------------------- parâmetros físicos ----------------------
c   = 3.0e8                     # velocidade da luz (m s⁻¹)
E0  = 1.0                       # amplitude arbitrária do campo elétrico (V m⁻¹)
lam = 1.0                       # comprimento de onda (m)
k = 2*np.pi/lam                 # número de onda
ω = 2*np.pi*c/lam               # frequência angular
# domínios espacial e temporal
x = np.linspace(0, 2*lam, 1000)  # duas ondas completas
t = 0.0                         # instante “congelado”
# --------------------- campos E e B ----------------------------
E =  E0 * np.sin(k*x - ω*t)      # componente em y
B = (E0/c) * np.sin(k*x - ω*t)   # componente em z (antes do escalonamento)
B_plot = c * B                  # escala-se por c para comparar a E
# --------------------- figura 3-D ------------------------------
fig = plt.figure(figsize=(8, 4))
ax  = fig.add_subplot(111, projection='3d')

# linha do campo elétrico: (x, E, 0)
ax.plot(x, E, np.zeros_like(x), label='E(x, t=0)')
# linha do campo magnético escalonado: (x, 0, c B)
ax.plot(x, np.zeros_like(x), B_plot, label='c·B(x, t=0)')
# rótulos e estética
ax.set_xlabel('x (m)')
ax.set_ylabel('E (V/m)')
ax.set_zlabel('c·B (V/m)')
ax.set_title('Propagação de uma onda eletromagnética no vácuo (instantâneo 3-D)')
ax.legend()
plt.tight_layout()
plt.show()
```

Fig. 23.2: Second program.

Electromagnetic wave propagation (1)

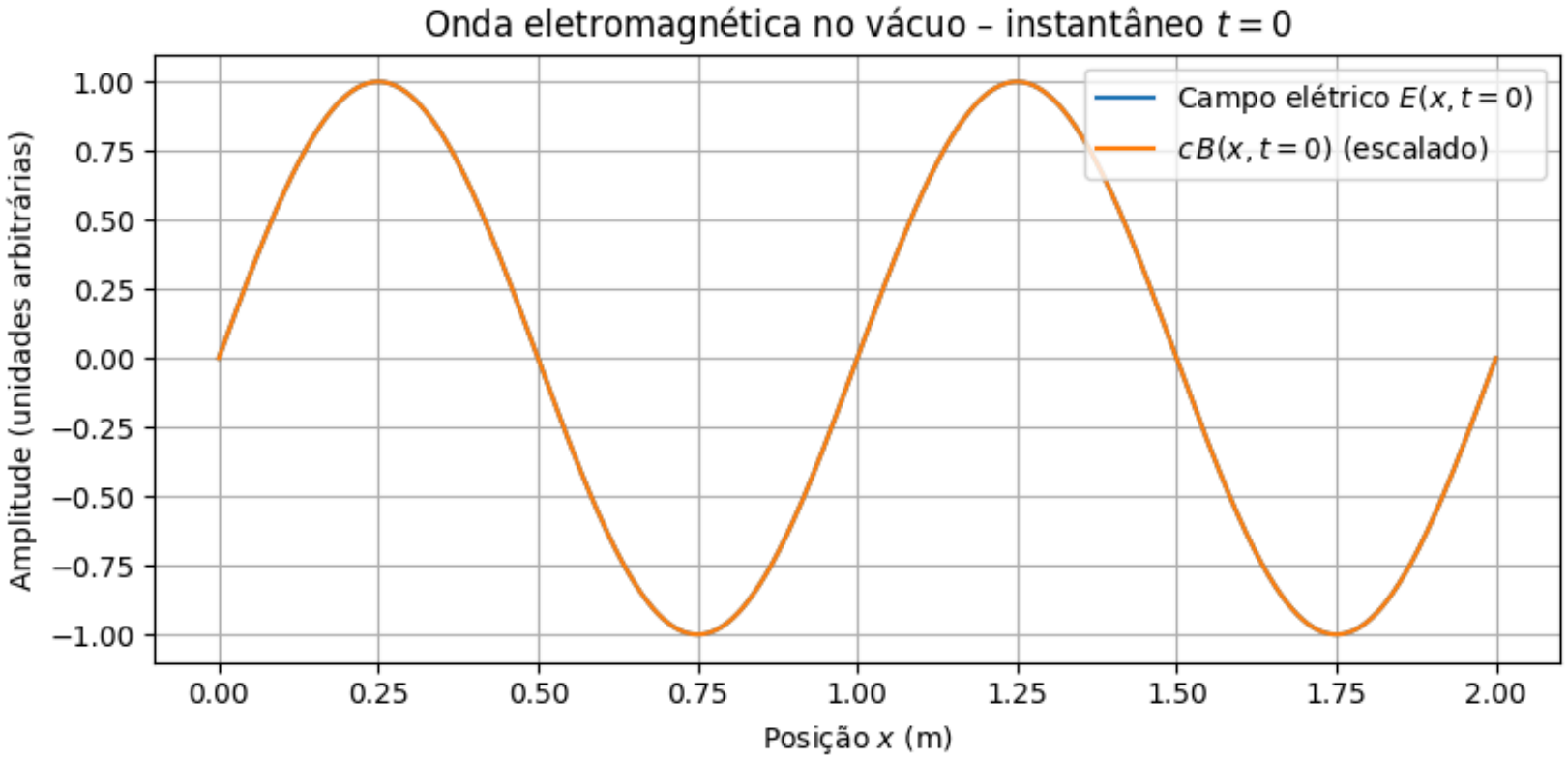

Fig. 24.1: Result of the 3D rendering of the program electromag-plot01.py.

Electromagnetic wave propagation (2)

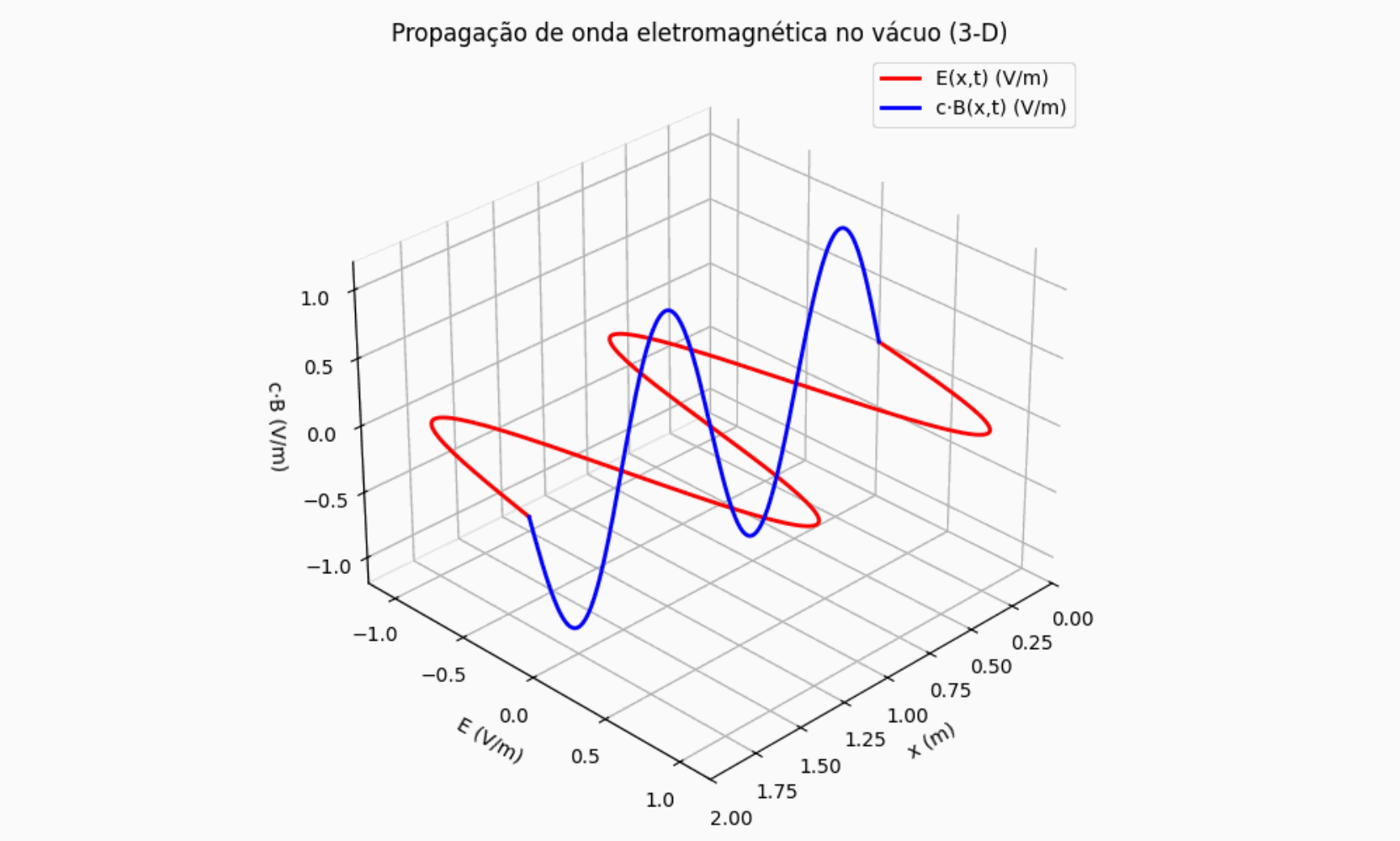

Fig. 25.1: 3D animation of an electromagnetic wave propagation.

Quotes

Special text deserves special space

"There is an *increasing* demand of current information systems to incorporate the use of a higher degree of formalism in the development process. *Formal Methods* consist of a set of tools and techniques based on mathematical model and formal logic that are used to *specify and verify* requirements and designs for hardware and software systems."

"There is an increasing demand of current information systems to incorporate the use of a higher degree of formalism in the development process. Formal Methods consist of a set of tools and techniques based on mathematical model and formal logic that are used to specify and verify requirements and designs for hardware and software systems."

Appendix

Bibliography, References, Appendix. etc.

Appendix 1 - Special Sections (1)

CSS Section	Description/Purpose	Markdown Class (example)
section.title	Title slide	<!-- _class: title -->
section.title-bg	Title slide with background	<!-- _class: title-bg -->
section.chapter	Chapter slide	<!-- _class: chapter -->
section.chapter-alt	Alternative chapter	<!-- _class: chapter-alt -->
section.agenda	Agenda/content slide	<!-- _class: agenda -->
section.end	Thank you slide	<!-- _class: end -->
section.end-bg	Thank you with background	<!-- _class: end-bg -->
section.copyright	Copyright slide	<!-- _class: copyright -->
section.logos	Slide with additional logos	<!-- _class: logos -->

Table 30.1: List of tags used (1).

Appendix 1 - Special Sections (2)

CSS Section	Description/Purpose	Markdown Class (example)
section.blank	Blank slide	<!-- _class: blank -->
section.nobrand	Slide without branding	<!-- _class: nobrand -->
section.multicolumn	Slide with multiple columns	<!-- _class: multicolumn -->
section.multicolumn vcenter	Vertically centered IN multiple columns	<!-- _class: multicolumn vcenter -->
section.grid-tlr	Grid: top, left, right	<!-- _class: grid-tlr -->
section.grid-lrb	Grid: left, right, bottom	<!-- _class: grid-lrb -->
section.quote	Quote slide (unified quote)	<!-- _class: quote -->
section.quote.dark	Alternative quote (formerly quote2)	<!-- _class: quote dark -->
section.references	References/bibliography slide	<!-- _class: references -->

Table 31.1: List of tags used (2).

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Credits

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2. Cover image: Courtesy of © Ishtar Bäcklund Dakhil (THOR, Annika. Der Sohn des Odysseus. Berlin: Verlag Urachhaus 2021.

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