

Cálculo Numérico – LEQB

Prof. Carlos Leandro

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Conteúdos programáticos:

1- Introdução. Importância do Cálculo Numérico na Engenharia.

2- Introdução ao Python.

3- Introdução à teoria dos erros. Majorantes de erro. Fórmula fundamental do cálculo dos erros. Referência à análise intervalar.

4- Método dos mínimos quadrados. Casos discreto e contínuo.

5- Interpolação polinomial. Polinómio interpolador de Lagrange. Erro na interpolação. Interpolação inversa.

4- Integração Numérica. Fórmulas de Newton-Cotes fechadas (fórmulas simples e compostas).

5- Resolução numérica de equações não lineares. Método da bisection and método de Newton-Raphson.

6- Integração numérica de equações diferenciais ordinárias. Equações diferenciais ordinárias de 1ª ordem (Método de Euler; Método de Heun; Método de Runge-Kutta). Sistemas de equações diferenciais ordinárias de 1ª ordem (Método de Runge-Kutta).

- **Bibliografia principal**

Santos, F. C., "Fundamentos de Análise Numérica", Edições Sílabo, 2002.

Gilat, A., Subramaniam, V., "Métodos Numéricos para Engenheiros e Cientistas", 2008.

Burden, R. L., Faires, J. D., "Numerical Analysis", Books/Cole, 1997.

Chapra, S.C., Canale, R.P. "Numerical Methods for Engineers", McGraw-Hill, 2006.

Kharab, A. Guenther, R. B., "An introduction to numerical methods: A Matlab Approach", Chapman & Hall /CRC, 2002.

- **Avaliação**

Avaliação de conhecimentos: duas componentes alternativas - avaliação contínua ou avaliação por exame.

Avaliação contínua:

Um teste global (TG) (80% da classificação final)

Trabalho prático computacional (TP) (20% da classificação final)

$NF = 0,8 \text{ TG} + 0,2 \text{ TP};$

$NF \geq 10$

Avaliação por exame:

Exame Final (EF). Aprovação com a classificação mínima de 10 valores.

$NF = EF \geq 10$

Regime de Avaliação Contínua:

1. Um teste global cuja classificação corresponde a 80% da classificação final.
2. Trabalho prático computacional, cuja classificação corresponde a 20% da classificação final.

Aprovação com classificação mínima de 10 valores e pelo menos 8 valores no Teste Global.


Regime de Exame:


Prova escrita.

Aprovação com a classificação mínima de 10 valores.

- Repositório com transparecias e código:

<https://github.com/CalculoNumerico1920SVLeandro>

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
CalculoNumerico1920SVLeandro Semana 1




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00_apresentacao.ipynb	Semana 1	2 minutes ago
00_intro_Calculo_Numerico.ipynb	Semana 1	2 minutes ago




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


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49 lines (49 sloc) | 798 Bytes   Raw Blame History   

In [1]:

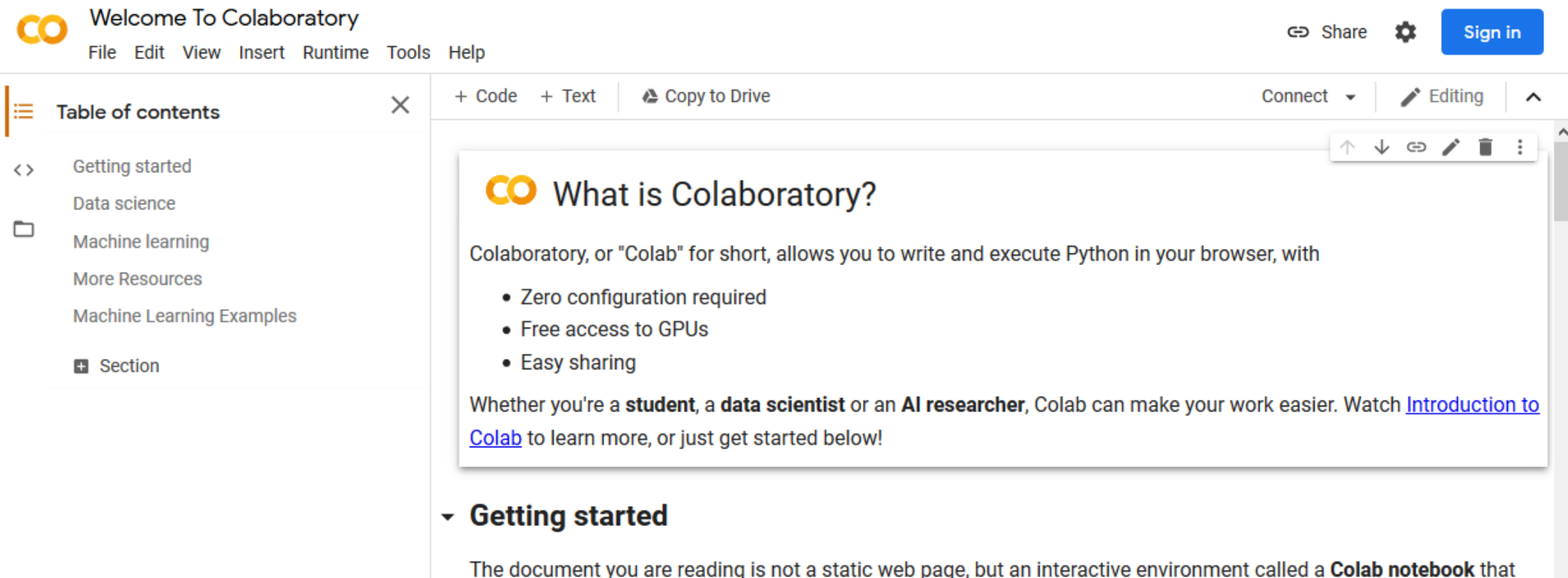
```
print("Test")
```

```
Test
```

In []:

- Recursos computacionais: <https://colab.research.google.com/>

Obs: Para usar o <https://colab.research.google.com/> têm de ter uma conta na google



The screenshot displays the Google Colaboratory web interface. At the top, the 'Welcome To Colaboratory' header is visible, along with a navigation menu (File, Edit, View, Insert, Runtime, Tools, Help) and a 'Sign in' button. A 'Table of contents' sidebar on the left lists sections like 'Getting started', 'Data science', 'Machine learning', and 'More Resources'. The main content area features a large introductory card titled 'What is Colaboratory?' which explains that Colab allows writing and executing Python in the browser. It lists three key benefits: zero configuration required, free access to GPUs, and easy sharing. Below this, it encourages users to watch an 'Introduction to Colab' video or get started directly. The 'Getting started' section is partially visible at the bottom.

CO Welcome To Colaboratory

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Share Settings Sign in

Table of contents

- Getting started
- Data science
- Machine learning
- More Resources
- Machine Learning Examples
- Section

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CO What is Colaboratory?

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch [Introduction to Colab](#) to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment called a **Colab notebook** that

- Recursos computacionais: <https://colab.research.google.com/>

The screenshot displays the Google Colaboratory web interface. On the left, a sidebar contains a 'Table of contents' with links to 'Introducing Colaboratory', 'Getting Started', 'More Resources', 'Machine Learning Examples: Se...', and a 'Section' icon. The main area features a top navigation bar with tabs: 'Examples', 'Recent' (selected), 'Google Drive', 'GitHub', and 'Upload'. Below the tabs is a search bar labeled 'Filter notebooks' with a dropdown arrow. A table with columns 'Title', 'First opened', and 'Last opened' is shown, but it contains no data rows. Below the table, the text 'No results' is displayed. At the bottom right of the interface, there are buttons for 'NEW NOTEBOOK' and 'CANCEL'. The top right corner includes a 'Share' button and a settings gear icon.

Welcome To Colaboratory

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Examples Recent Google Drive GitHub Upload

Filter notebooks

Title	First opened	Last opened
No results		

NEW NOTEBOOK CANCEL

Share

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computing resources, all for

- Recursos computacionais: <https://colab.research.google.com/>

The screenshot shows the Google Colaboratory interface. On the left, a sidebar contains a 'Table of contents' with links to 'Introducing Colaboratory', 'Getting Started', 'More Resources', and 'Machine Learning Examples: Se'. The main area displays a modal for connecting to a GitHub repository. The modal has a top bar with tabs: 'Examples', 'Recent', 'Google Drive', 'GitHub' (selected), and 'Upload'. Below the tabs, there is a search bar with the text 'Enter a GitHub URL or search by organization or user' and a checkbox for 'Include private repos'. A search bar contains the URL '://github.com/CalculoNumerico1920SVLeandro/CN-1920SV-notebook/blob/master/00_apresentacao.ipynb'. Below this, there are dropdown menus for 'Repository' (showing 'CalculoNumerico1920SVLeandro/CN-1920SV-notebook') and 'Branch' (showing 'master'). A 'Path' section lists two files: '00_apresentacao.ipynb' and '00_intro_Calculo_Numerico.ipynb', each with a search icon and a link icon. At the bottom right of the modal are the buttons 'NEW NOTEBOOK' and 'CANCEL'.

Welcome To Colaboratory

File Edit View Insert Run Help

Examples Recent Google Drive **GitHub** Upload

Enter a GitHub URL or search by organization or user ☐ Include private repos

://github.com/CalculoNumerico1920SVLeandro/CN-1920SV-notebook/blob/master/00_apresentacao.ipynb

Repository: [🔗](#) Branch: [🔗](#)

CalculoNumerico1920SVLeandro/CN-1920SV-notebook master

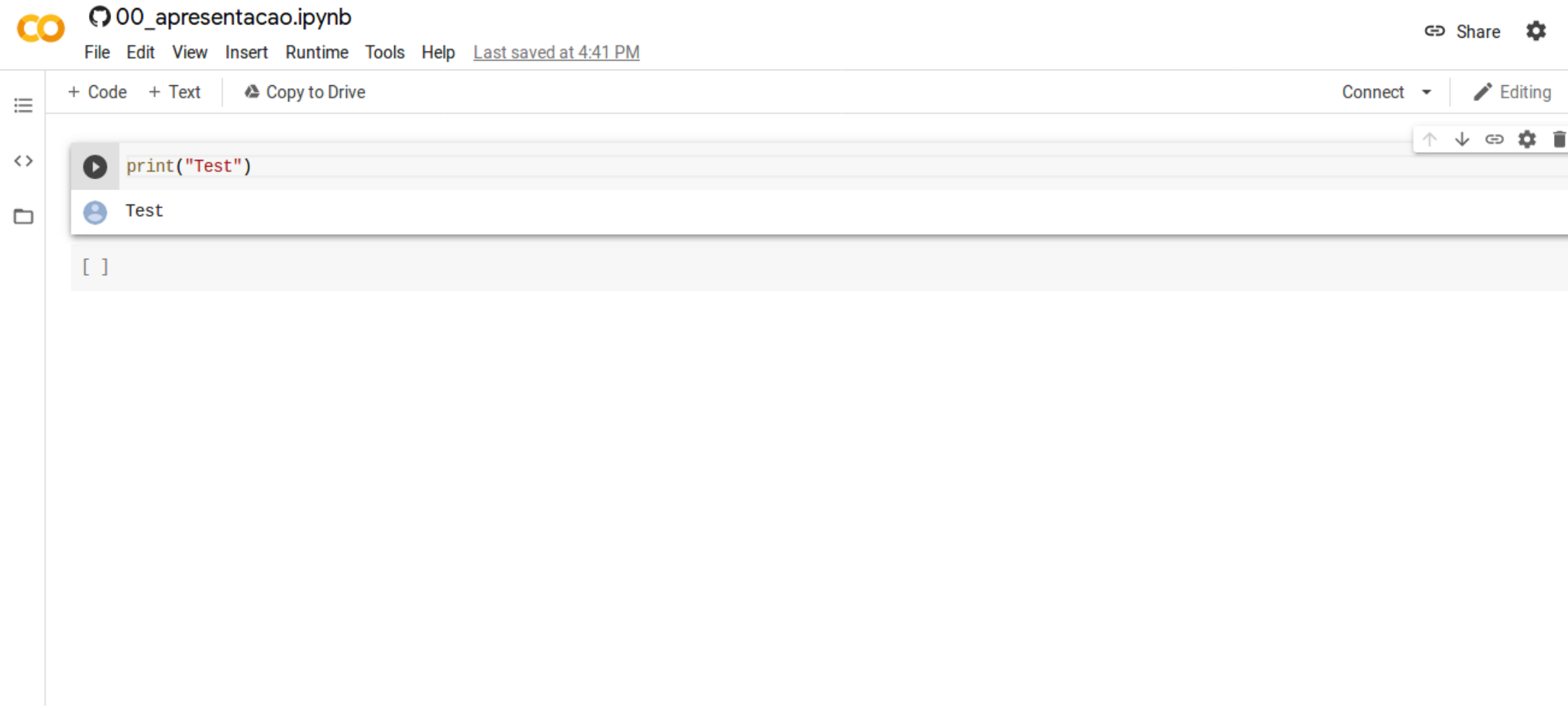
Path

00_apresentacao.ipynb

00_intro_Calculo_Numerico.ipynb

NEW NOTEBOOK CANCEL

- Recursos computacionais: <https://colab.research.google.com/>



The image shows a Google Colab notebook interface. At the top left is the Colab logo (two orange circles). Next to it is the file name "00_apresentacao.ipynb". To the right of the file name is a "Share" button with a link icon and a settings gear icon. Below the file name is a menu bar with "File", "Edit", "View", "Insert", "Runtime", "Tools", and "Help". To the right of the menu bar is a status bar that says "Last saved at 4:41 PM". Below the menu bar is a toolbar with "+ Code", "+ Text", and "Copy to Drive". To the right of the toolbar is a "Connect" button with a dropdown arrow and an "Editing" button with a pencil icon. The main area of the notebook contains a code cell with a play button icon and the code `print("Test")`. Below the code cell is an output cell with a user icon and the text "Test". At the bottom of the notebook is a text area containing "[]".

00_apresentacao.ipynb

File Edit View Insert Runtime Tools Help [Last saved at 4:41 PM](#)

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Connect Editing

```
print("Test")
```

Test

[]