

# System For Pratical Evaluations of Network Administration Course

**Diogo Nunes**

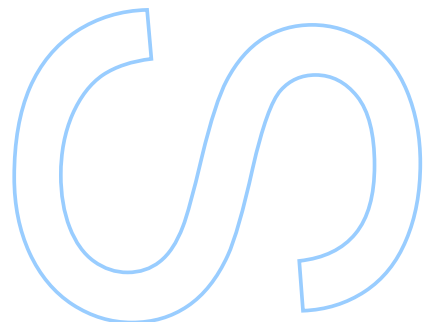
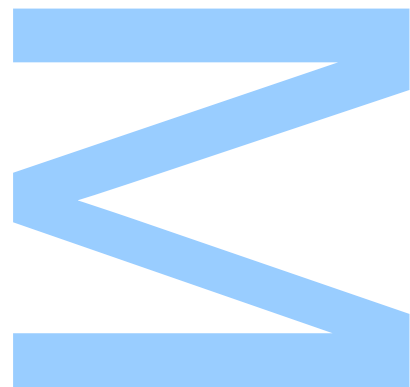
Mestrado em Engenharia de Redes e Sistemas Informáticos

Departamento de Ciência de Computadores

2025

**Orientador**

Prof. Rui Prior, Faculdade de Ciências

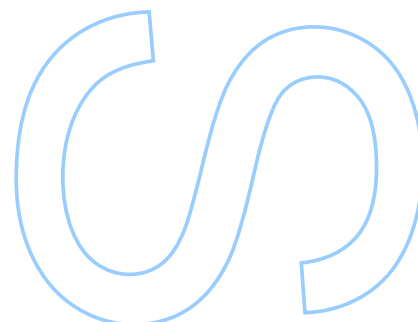




Todas as correções determinadas  
pelo júri, e só essas, foram efetuadas.

O Presidente do Júri,

Porto, \_\_\_\_/\_\_\_\_/\_\_\_\_



# Acknowledgements

Acknowledge ALL the people!

# Resumo

Este tese é sobre alguma coisa

Palavras-chave: física (keywords em português)

# Abstract

This thesis is about something, I guess.

Keywords: Computer Science

# Table of Contents

List of Figures.....	v
1. Introduction.....	1
2. Chapter Title Here .....	2
2.1. Citations .....	2
2.2. Figures .....	2
2.2.1. SVGs .....	4
2.2.1.1. Automatic export .....	4
2.3. Math .....	5
2.4. Abbreviations .....	6
Bibliography .....	6

## List of Figures

2.1. FCUP's fat cat. ....	2
2.2. FCUP's fat cat doing what cats do. ....	3
2.3. FCUP's fat cat. ....	3
2.4. FCUP's fat cat. ....	3
2.5. FCUP's fat cat. ....	3
2.6. The test SVG image, as it is seen in Inkscape .....	4
2.7. The test image, exported to PDF <i>with</i> $\text{\LaTeX}$ option.....	5





# 1. Introduction

In today's digital age the need for qualified Computer Science (CS) professionals is growing. The CS field is vast and has many areas of expertise, one of which is network administration. It is a crucial part of any organization, as it is responsible for the maintenance and management of the organization's network infrastructure. Proper training for network administrators is crucial for preparing them for real-world situations. One way to provide this training is through practical evaluations, allowing students to apply the knowledge they have acquired in a real-world scenario, helping them to develop the skills they will need in their future careers.

Creating a physical network environment for practical evaluations may be costly and challenging to scale for large student populations. Emulation and virtualisation technologies can help to simplify and cost-effectively create practice environments for students. These technologies alone do not address the issue of manually reviewing a network topology's setup. Manually reviewing each student's network configuration can be time-consuming and prone to human error, rendering it challenging for their instructors. Automating the evaluation process may substantially alleviate the burden on educators and guarantee uniform and fair assessments.

This dissertation continues the work of a previous student, who carried out research and first steps of development of a prototype of an automated evaluation system for network topologies. The main goal something something something

## 2. Chapter Title Here

Welcome to the tutorial on how to use this thesis model. This is not to teach you how to use  $\text{\LaTeX}$ . For that read a tutorial. But this aims to teach you how to do the basic stuff you will need in order to produce a decent document. We can start with a section and a section epigraph:

### 2.1. Citations

*Python is a truly wonderful language. When somebody comes up with a good idea it takes about 1 minute and five lines to program something that almost does what you want. Then it takes only an hour to extend the script to 300 lines, after which it still does almost what you want.*

---

Dr. Jack Jansen, maintainer of MacPython

You can add extra info to you references, like [? , section 3]. You can also call them by author, like saying ? ] .

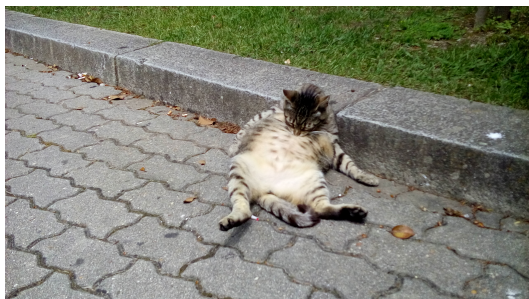
Also a random displayquote thing:

How can we image an object that's behind or enclosed on a medium where light does not propagate trivially? How can we manipulate light propagating in these media?

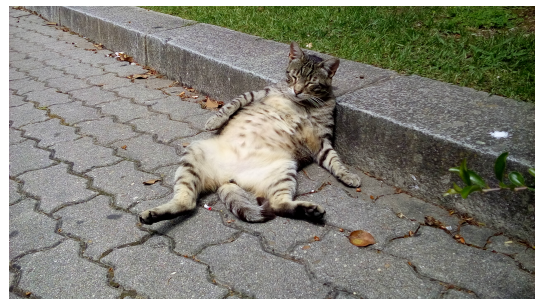
You can make personal notes like this

### 2.2. Figures

Let us start with a figure with two subfigures like in 2.1.



(a) FCUP's fat cat doing what cats do.



(b) FCUP's fat cat resting.

Figure 2.1: FCUP's fat cat.

Or two figures side by side like 2.2 and 2.3.



Figure 2.2: FCUP's fat cat doing what cats do.

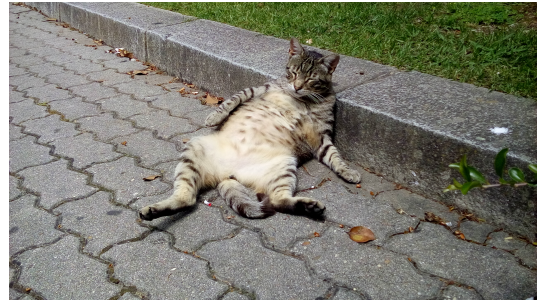


Figure 2.3: FCUP's fat cat.

Or a figure with some text on the side, like 2.4, or even a figure wrapped around in text, as seen on Figure 2.5.

And here we have some text related to this image. The text can occupy the same space as the image would normally do.

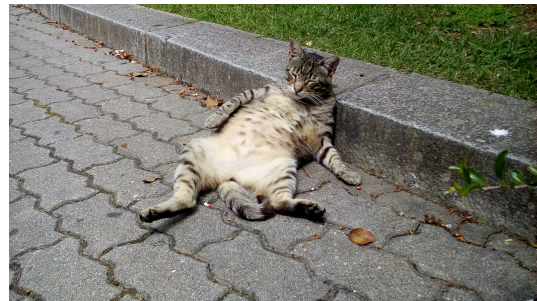


Figure 2.4: FCUP's fat cat.

This is where the float goes with text wrapping around it. You may embed tabular environment inside wraptable environment and customize as you like:

Ultrices dui sapien eget mi proin sed libero. Ornare lectus sit amet est placerat in egestas erat imperdiet. Tortor dignissim convallis aenean et. Quam adipiscing vitae proin sagittis nisl rhoncus mattis. Vivamus at augue eget arcu dictum varius dui. cursus turpis massa tincidunt dui.

Leo in vitae turpis massa sed. Tempus orci eu lobortis elementum. Turpis egestas integer eget aliquet nibh praesent tristique magna. Sed blandit libero volutpat sed cras ornare arcu dui. Feugiat sed lectus vestibulum mattis ullamcorper velit sed ullamcorper. Interdum velit euismod in pellentesque massa

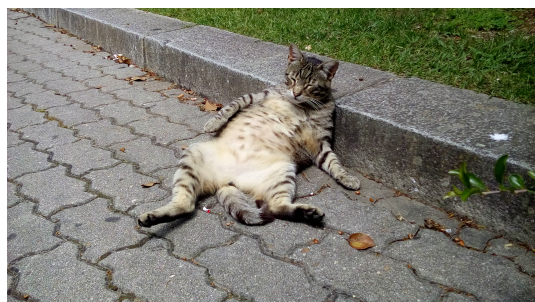


Figure 2.5: FCUP's fat cat.

placerat dui ultricies lacus. Ac ut consequat semper viverra nam. Dis parturient montes nascetur ridiculus mus. Mattis pellentesque id nibh tortor.

## 2.2.1 SVGs

How to make a  $\text{\LaTeX}$  document with vector images, where the text in the images has exactly the same font and size as in normal text? This article describes how this is done using the ‘PDF/EPS/PS + LaTeX’ output feature of Inkscape 0.48. Inkscape can export the graphics to PDF/EPS/PS, and the text to a  $\text{\LaTeX}$  file. When the  $\text{\LaTeX}$  file is input in the  $\text{\LaTeX}$  document, the PDF/EPS/PS image is included with overlaid text. Because typesetting of the text is done by  $\text{\LaTeX}$ ,  $\text{\LaTeX}$  commands can be used in images, such as writing equations, references and shorthand macros.

*(requires Inkscape version 0.48 or higher; this document discusses features up to Inkscape 0.49)*

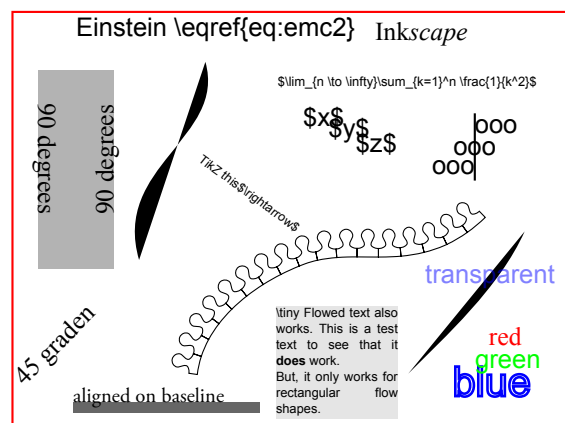


Figure 2.6: The test SVG image, as it is seen in Inkscape (exported to PDF *without*  $\text{\LaTeX}$  option).

$$E = mc^2 \quad (2.1)$$

### 2.2.1.1 Automatic export

(‘write18’ must be enabled, see the `epstopdf` package documentation. Add `-shell-escape` to the command line when calling `pdflatex`. **And inkscape must be discoverable by the OS**),

Whenever the SVG file is updated, it is possible to have  $\text{\LaTeX}$  automatically call Inkscape to export the image to PDF and  $\text{\LaTeX}$  again. This simplifies the workflow to

- Modify the SVG image in Inkscape;
- Save the SVG (Ctrl+S, no need to export to PDF);

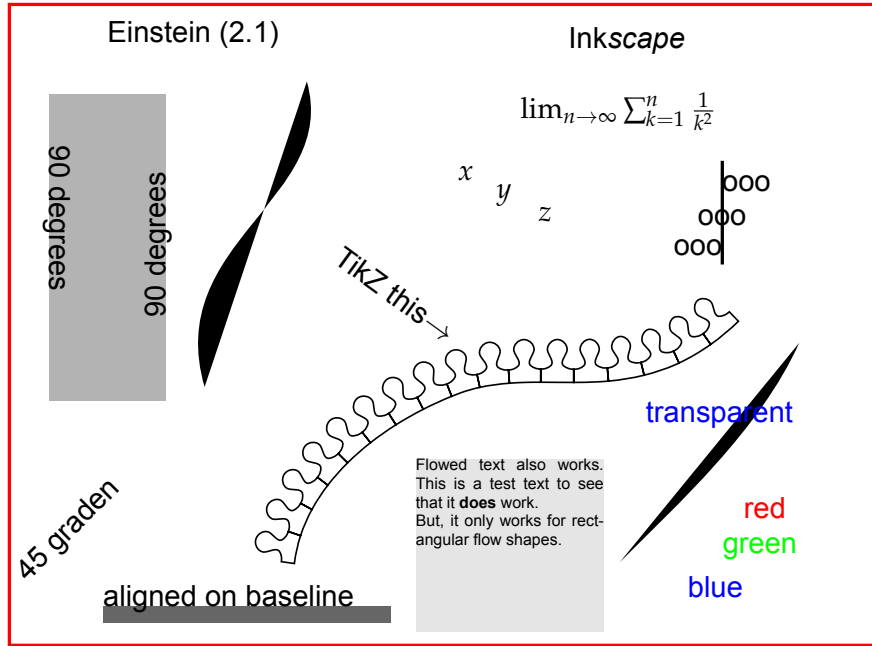


Figure 2.7: The test image, exported to PDF *with*  $\LaTeX$  option.

- Recompile  $\LaTeX$  document.  $\pdf\LaTeX$  will notice the SVG file has changed, and will automatically do the export for you.

## 2.3. Math

The following equation uses a custom mathematical operator defined in line 88 of preamble.tex:

$$\begin{aligned} \text{meshgrid } \mathbf{x}_1 &= \begin{bmatrix} a_1 & b_1 & c_1 \\ a_1 & b_1 & c_1 \end{bmatrix} \\ \text{meshgrid } \mathbf{x}_2 &= \begin{bmatrix} a_2 & a_2 & a_2 \\ b_2 & b_2 & b_2 \end{bmatrix} \end{aligned} \quad (2.2)$$

The following equation uses the custom ceil and floor operator defined in line 86 of the stock preamble.tex:

$$x = \left\lfloor \frac{y}{2} \right\rfloor + \left\lceil \frac{w}{2} \right\rceil \quad (2.3)$$

And this is an equation with multiple lines:

$$\begin{aligned}
 I_0 &= I' + I'' \cos(\Psi) \\
 I_{\pi/2} &= -I'' \sin(\Psi) \\
 I_{\pi} &= I' - I'' \cos(\Psi) \\
 I_{3\pi/2} &= I'' \sin(\Psi)
 \end{aligned}
 \tag{2.4}$$

And this is some random Python code:

```

1 def Hello():
2     """
3     Meaningful docstring with in-depth explanation of this function
4     """
5     print(`Hello World !!`)
6
7 if __name__ == '__main__':
8     Hello()

```

## 2.4. Abbreviations

Use acronyms like this: Artificial Neural Network (ANN)

## References

## Appendix Title Here

Write your Appendix content here.