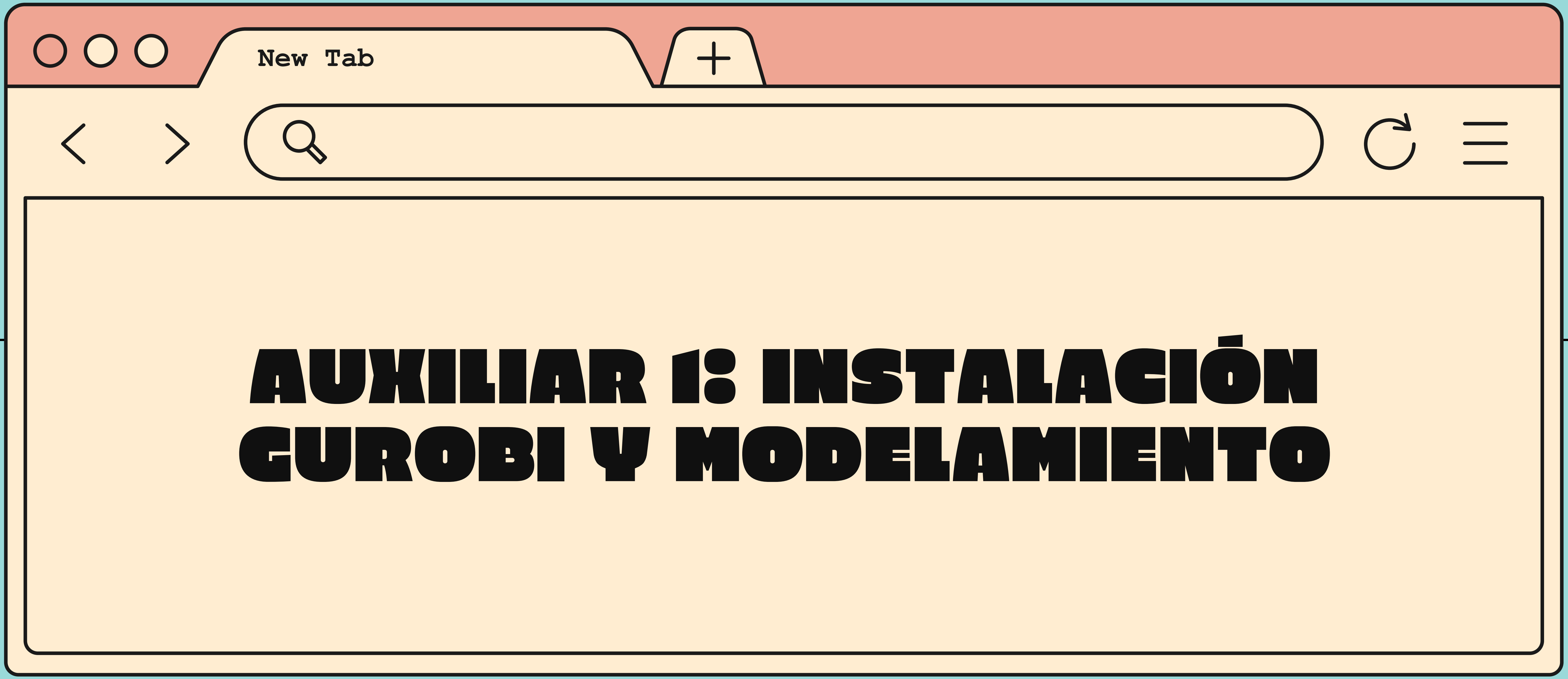
IN3171 Otoño 2022



AUXILIAR 1: INSTALACIÓN GUROBI Y MODELAMIENTO

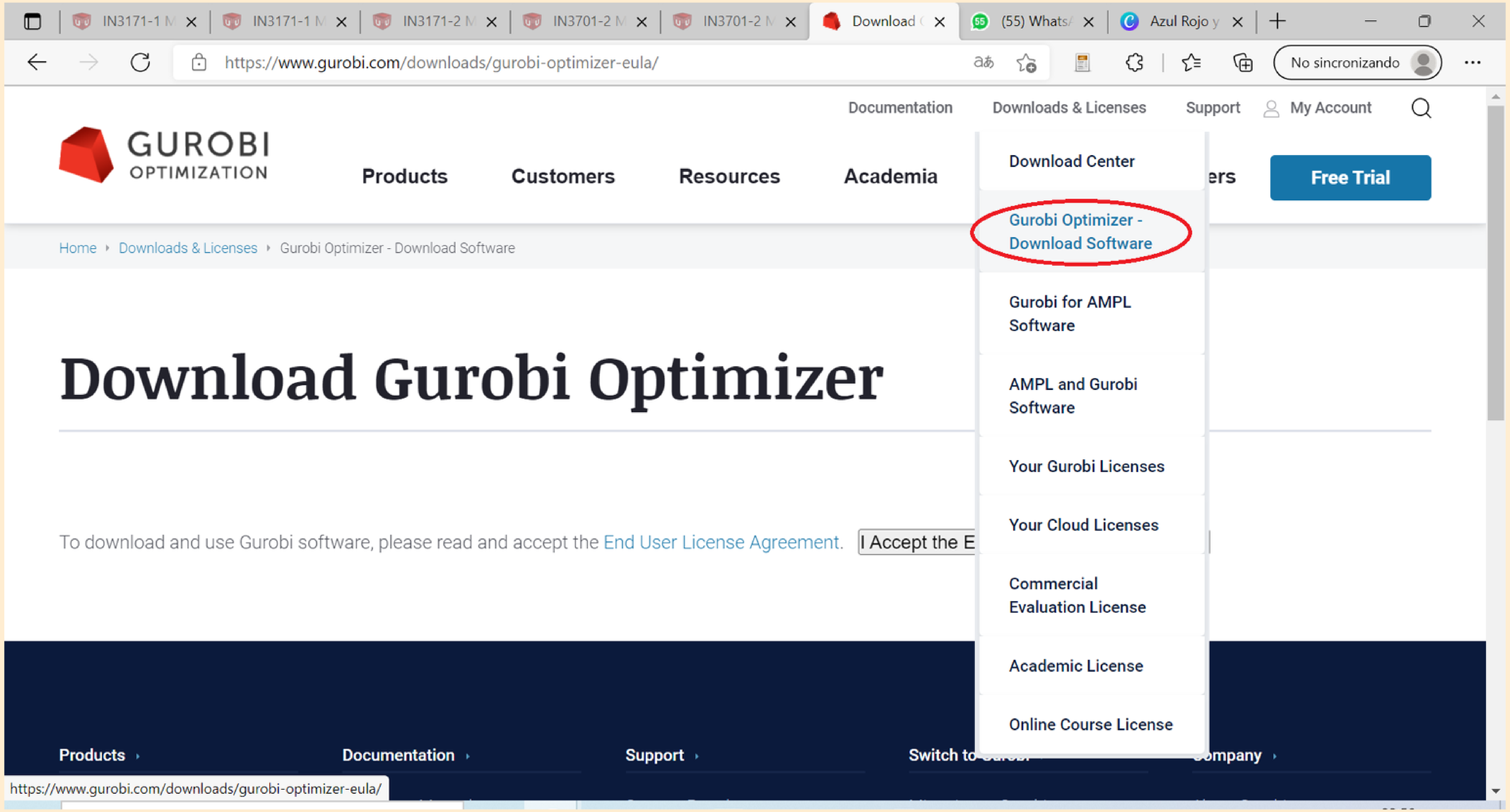
Marian
Mazurett

Agenda

1. Presentación
2. Instalación Gurobi y Anaconda
3. Problema de modelamiento
4. Programando en gurobi...

Parte 1: Instalación Gurobi

Descargar de http://www.gurobi.com/downloads/gurobi-optimizer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Parte 1: Instalación Gurobi

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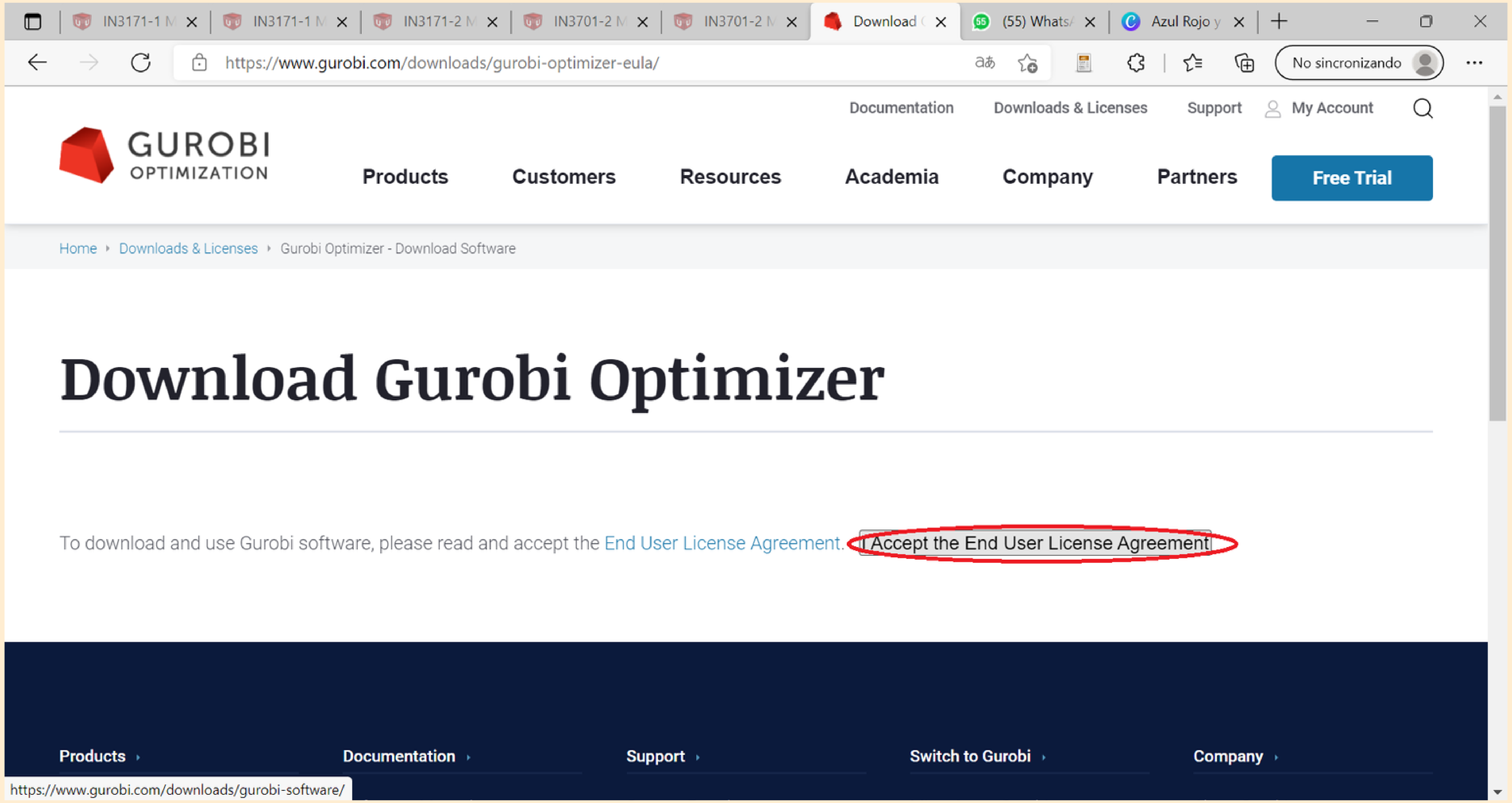
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Parte 1: Instalación Gurobi

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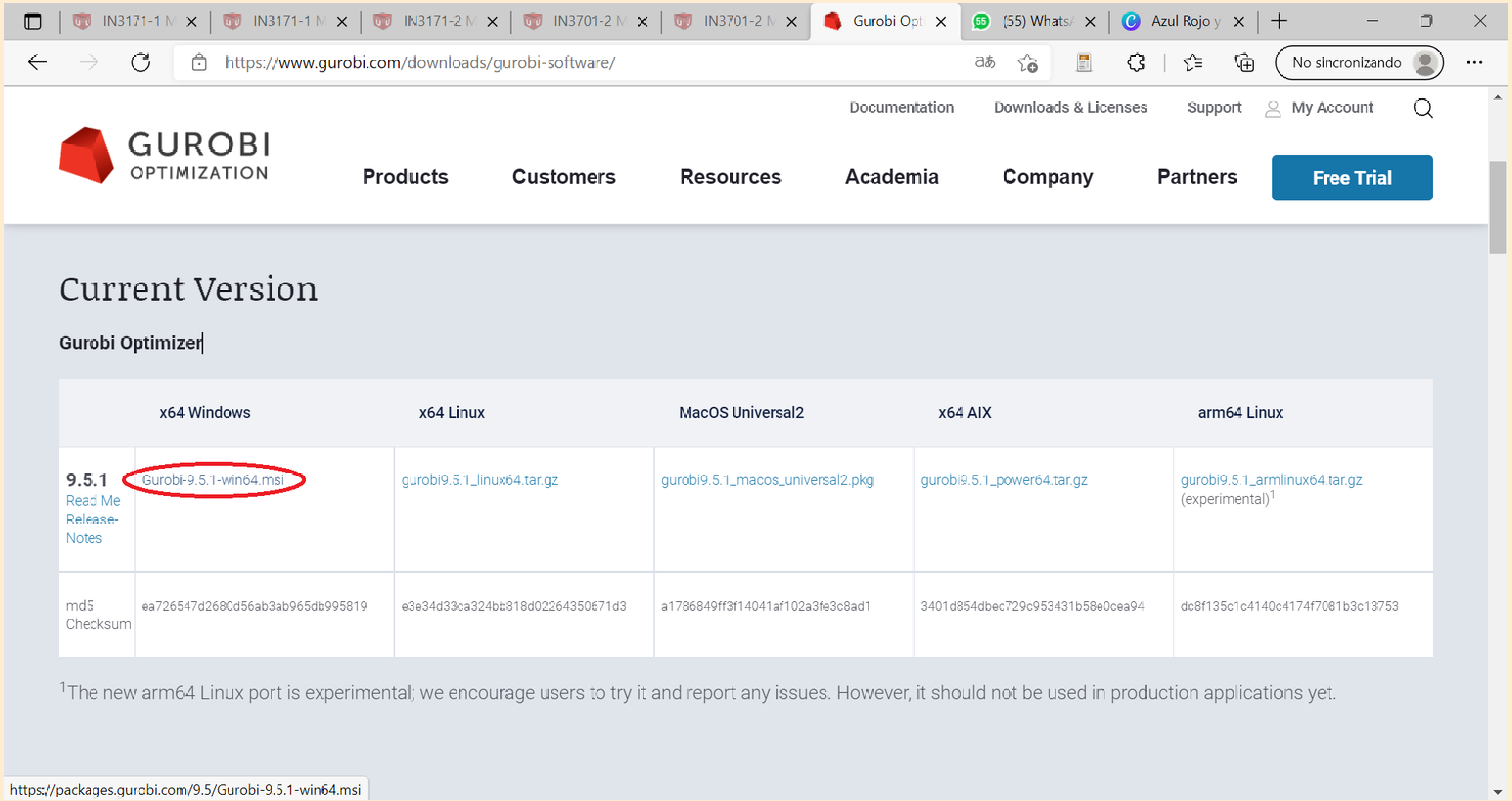

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Current Version

Gurobi Optimizer

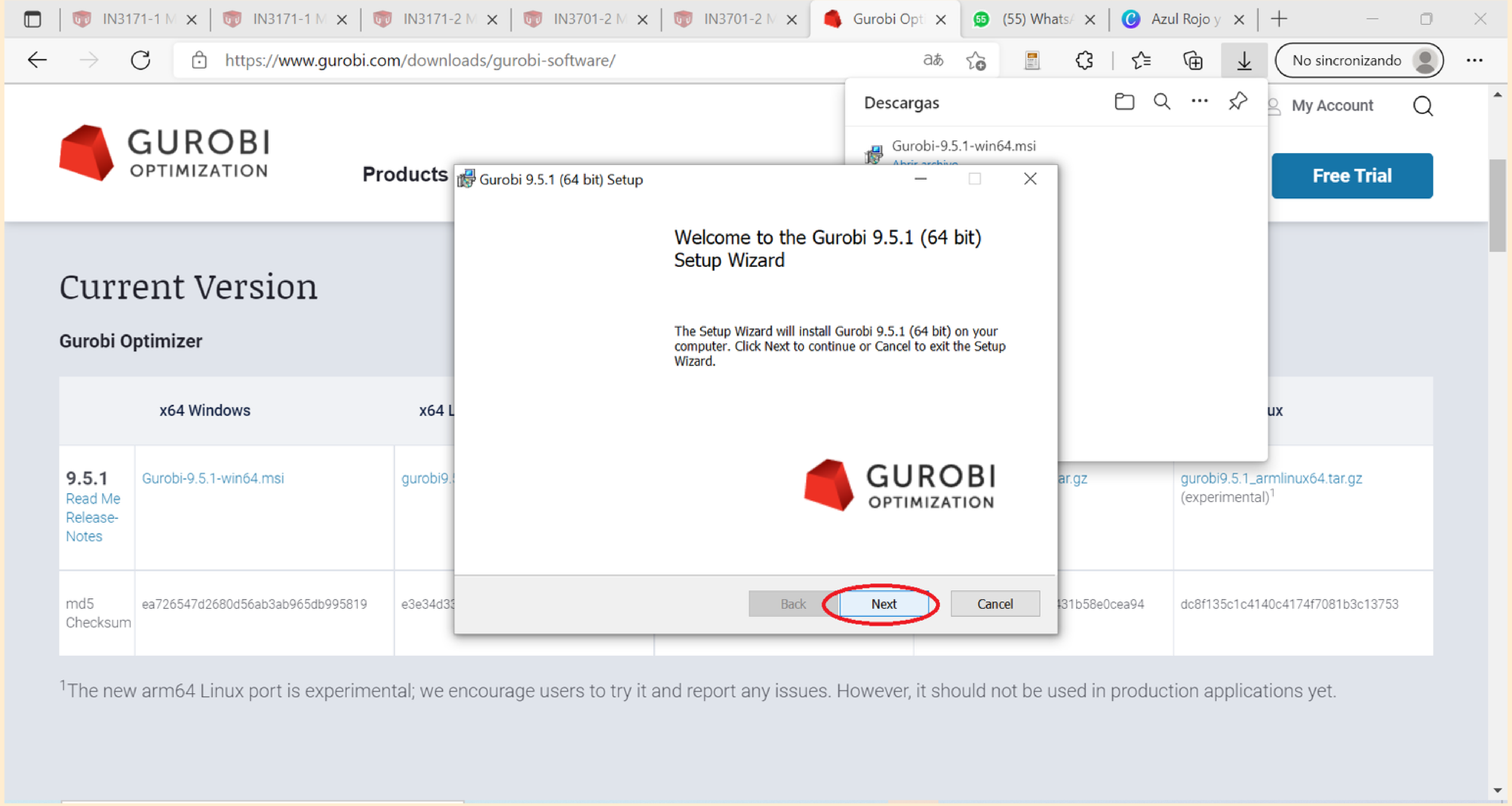
	x64 Windows	x64 Linux	MacOS Universal2	x64 AIX	arm64 Linux
9.5.1 Read Me Release-Notes	Gurobi-9.5.1-win64.msi	gurobi9.5.1_linux64.tar.gz	gurobi9.5.1_macos_universal2.pkg	gurobi9.5.1_power64.tar.gz	gurobi9.5.1_armlinux64.tar.gz (experimental)[1]
md5 Checksum	ea726547d2680d56ab3ab965db995819	e3e34d33ca324bb818d02264350671d3	a1786849ff3f14041af102a3fe3c8ad1	3401d854dbec729c953431b58e0cea94	dc8f135c1c4140c4174f7081b3c13753

[1] The new arm64 Linux port is experimental; we encourage users to try it and report any issues. However, it should not be used in production applications yet.

https://packages.gurobi.com/9.5/Gurobi-9.5.1-win64.msi

Parte 1: Instalación Gurobi

Descargar de http://www.gurobi.com/downloads/gurobi-optimizer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Gurobi-9.5.1-win64.msi
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Next
Cancel

Gurobi 9.5.1 (64 bit) Setup

Welcome to the Gurobi 9.5.1 (64 bit) Setup Wizard

The Setup Wizard will install Gurobi 9.5.1 (64 bit) on your computer. Click Next to continue or Cancel to exit the Setup Wizard.

Current Version

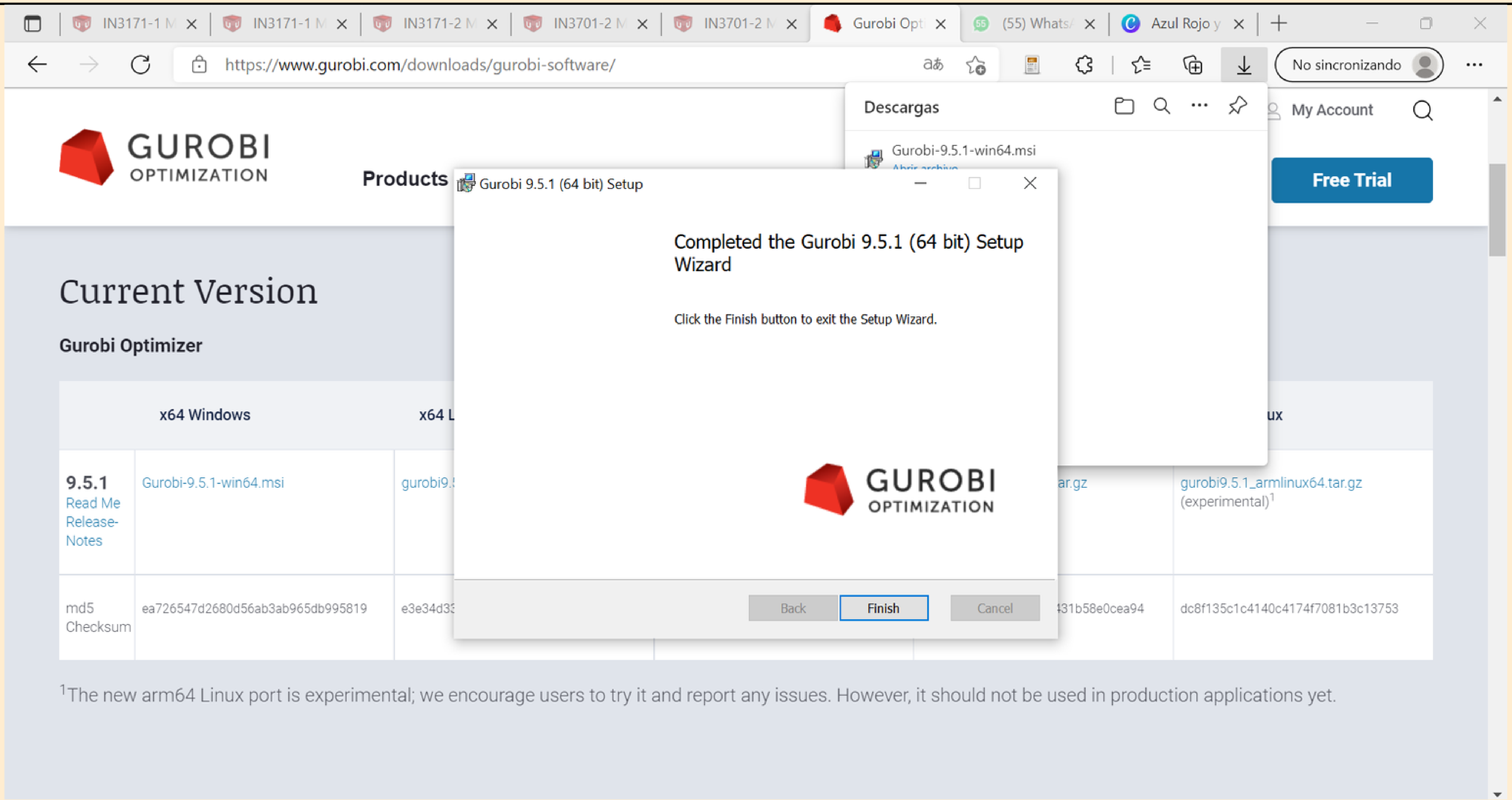
Gurobi Optimizer

	x64 Windows	x64 L			ux
9.5.1 Read Me Release-Notes	Gurobi-9.5.1-win64.msi	gurobi9.		ar.gz	gurobi9.5.1_armlinux64.tar.gz (experimental)[1]
md5 Checksum	ea726547d2680d56ab3ab965db995819	e3e34d3		31b58e0cea94	dc8f135c1c4140c4174f7081b3c13753

[1] The new arm64 Linux port is experimental; we encourage users to try it and report any issues. However, it should not be used in production applications yet.

Parte 1: Instalación Gurobi

Descargar de http://www.gurobi.com/downloads/gurobi-optimizer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IN3171-2 M
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Gurobi 9.5.1 (64 bit) Setup
Back
Finish
Cancel

https://www.gurobi.com/downloads/gurobi-software/

Completed the Gurobi 9.5.1 (64 bit) Setup Wizard

Click the Finish button to exit the Setup Wizard.

Current Version

Gurobi Optimizer

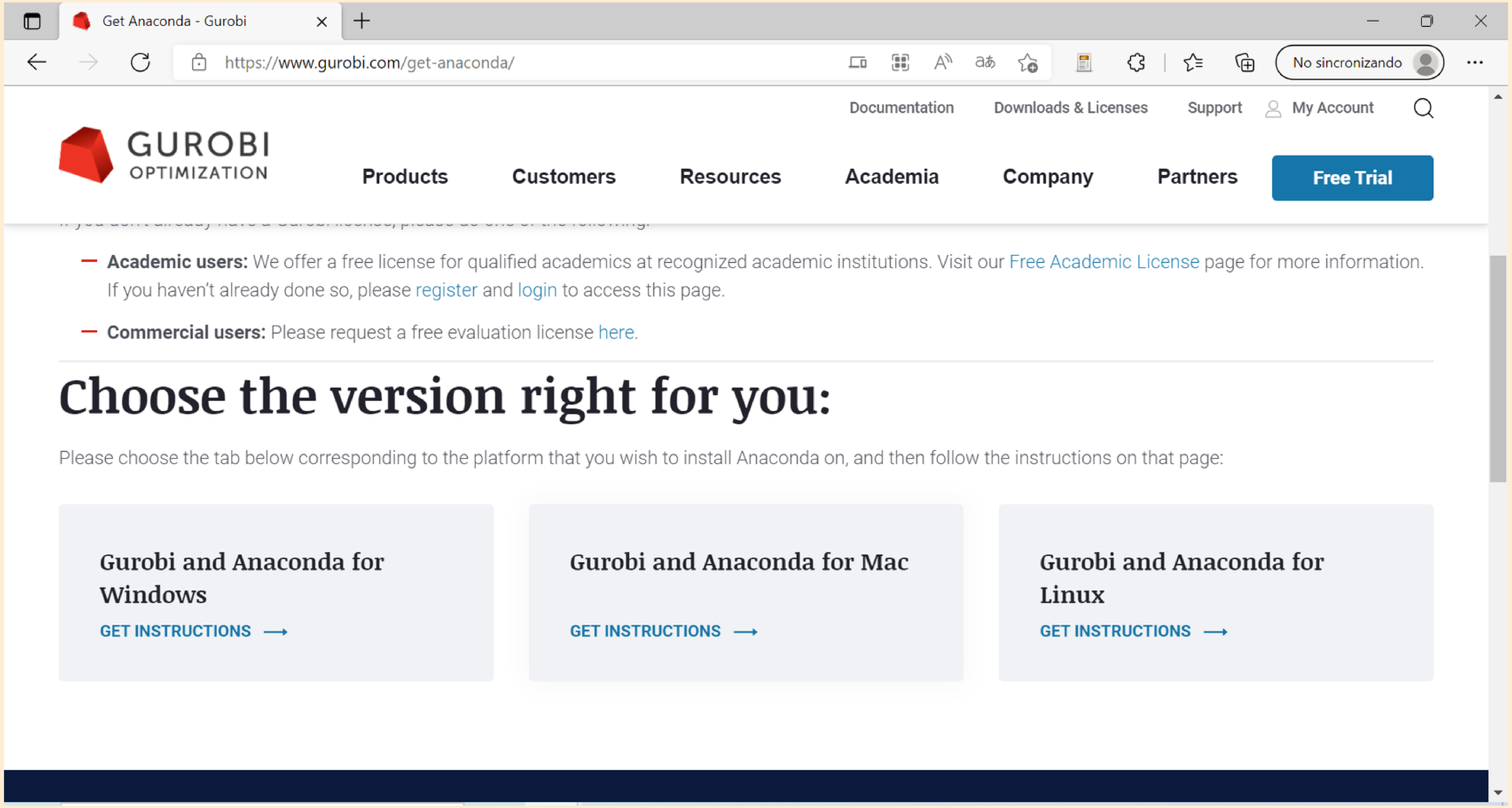
	x64 Windows	x64 L		ux
9.5.1 Read Me Release-Notes	Gurobi-9.5.1-win64.msi	gurobi9.	ar.gz	gurobi9.5.1_armlinux64.tar.gz (experimental)[1]
md5 Checksum	ea726547d2680d56ab3ab965db995819	e3e34d3	31b58e0cea94	dc8f135c1c4140c4174f7081b3c13753

[1] The new arm64 Linux port is experimental; we encourage users to try it and report any issues. However, it should not be used in production applications yet.

Una vez instalado les pedirá reiniciar.

Parte II: Instalación Anaconda

https://www.gurobi.com/get-anaconda/
Aquí están las instrucciones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- **Commercial users:** Please request a free evaluation license here.

Choose the version right for you:

Please choose the tab below corresponding to the platform that you wish to install Anaconda on, and then follow the instructions on that page:

Gurobi and Anaconda for Windows

GET INSTRUCTIONS ⟶

Gurobi and Anaconda for Mac

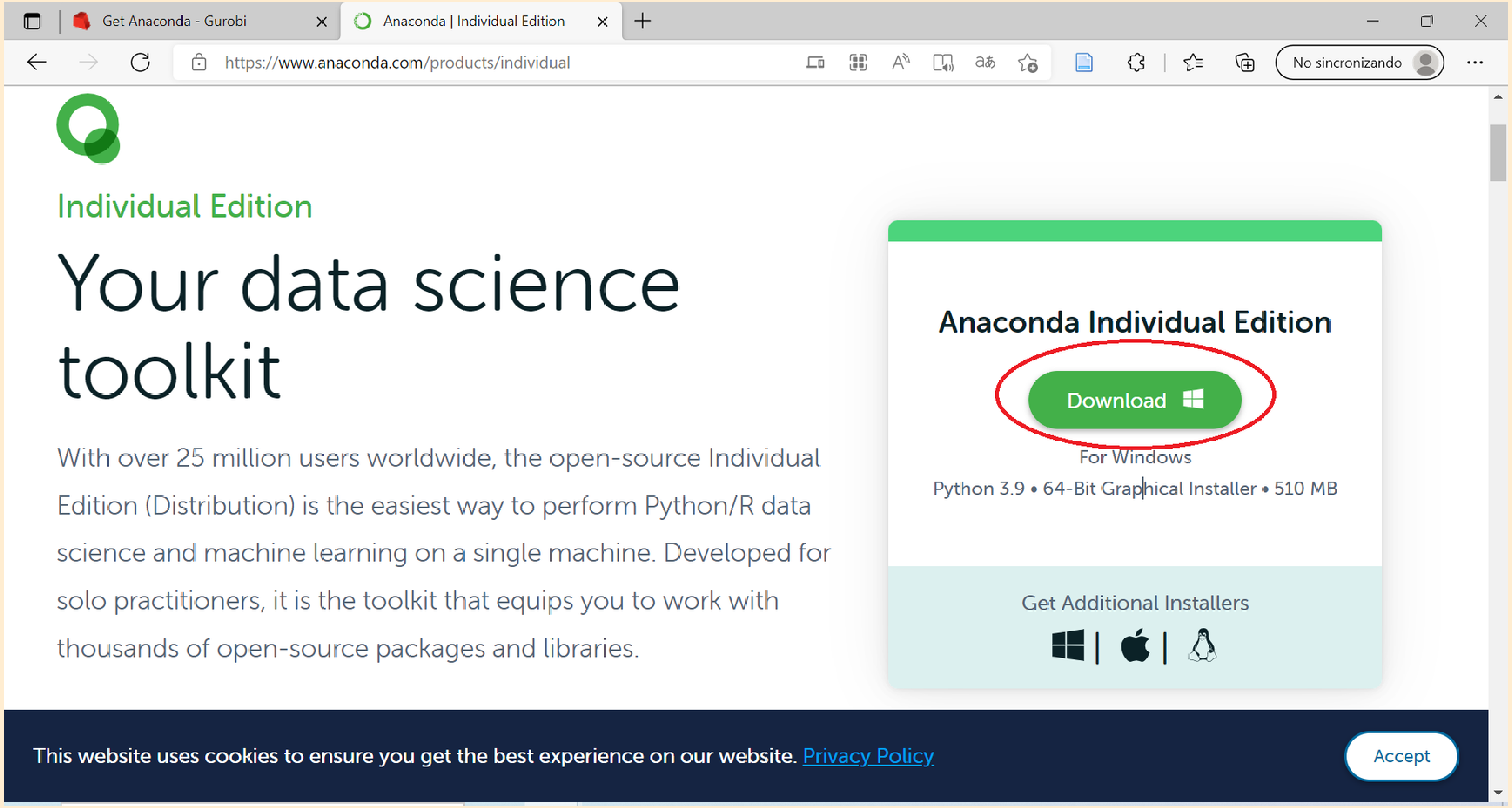
GET INSTRUCTIONS ⟶

Gurobi and Anaconda for Linux

GET INSTRUCTIONS ⟶

Parte II: Instalación Anaconda

www.anaconda.com/products/individual



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Anaconda | Individual Edition
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Individual Edition

Your data science toolkit

With over 25 million users worldwide, the open-source Individual Edition (Distribution) is the easiest way to perform Python/R data science and machine learning on a single machine. Developed for solo practitioners, it is the toolkit that equips you to work with thousands of open-source packages and libraries.

Anaconda Individual Edition

Download

For Windows

Python 3.9 • 64-Bit Graphical Installer • 510 MB

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Parte II: Instalación Anaconda

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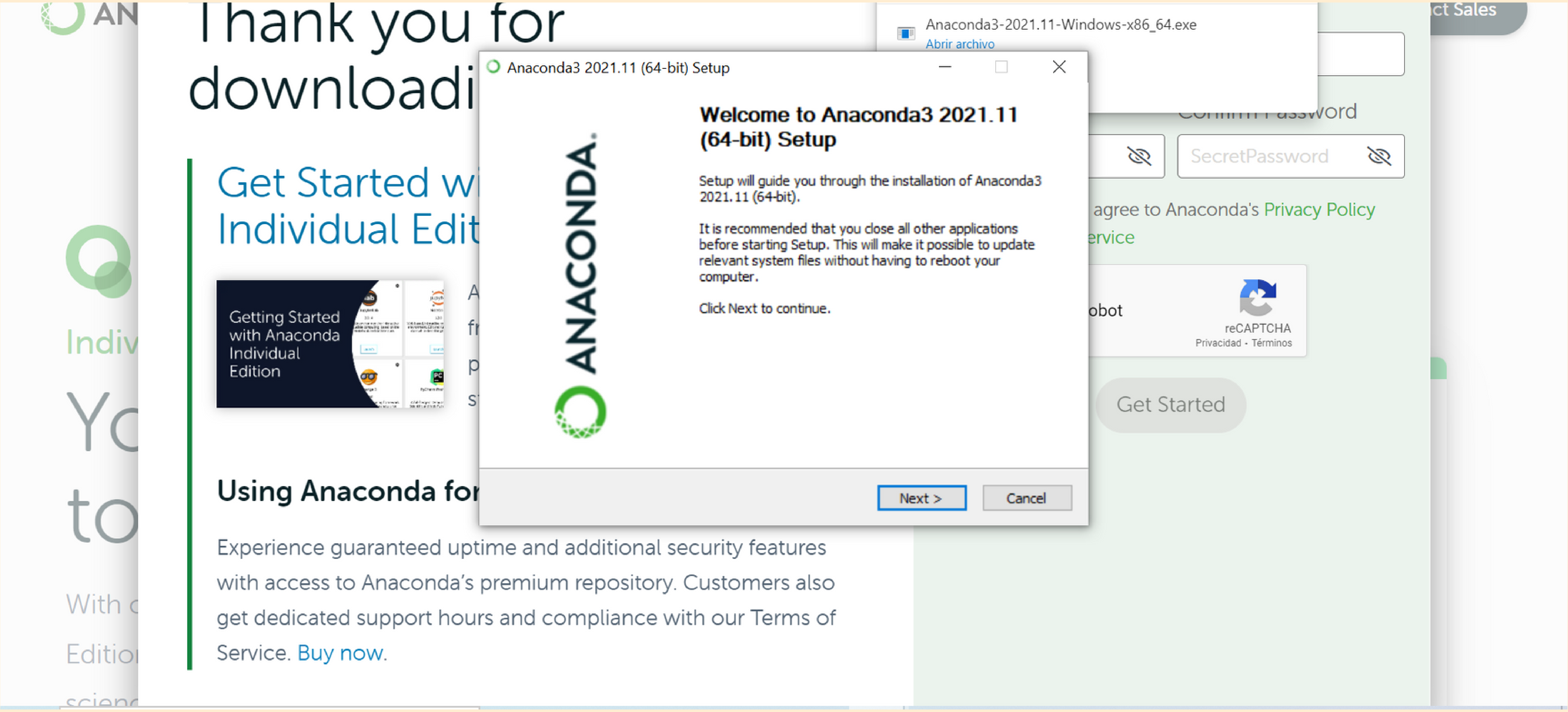
IMPORTANTE: Seleccionar
Add Anaconda to my PATH environment variable



Anaconda3-2021.11-Windows-x86_64.exe

Anaconda3 2021.11 (64-bit) Setup

Welcome to Anaconda3 2021.11 (64-bit) Setup

Setup will guide you through the installation of Anaconda3 2021.11 (64-bit).

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

Experience guaranteed uptime and additional security features with access to Anaconda's premium repository. Customers also get dedicated support hours and compliance with our Terms of Service. Buy now.

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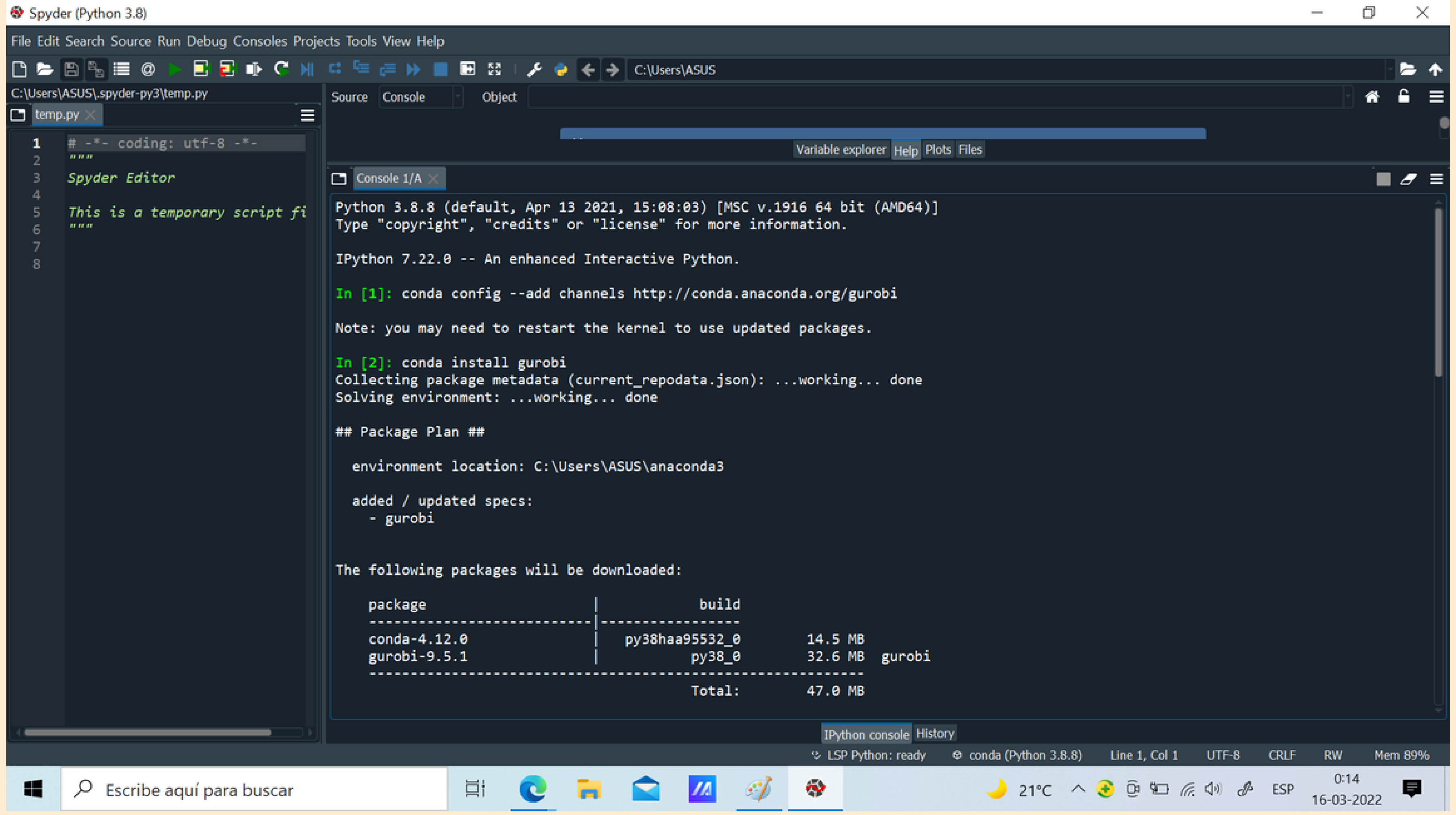
Parte III: Instalación Gurobi en Anaconda


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\ASUS
C:\Users\ASUS\.spyder-py3\temp.py
temp.py
Source Console Object
Variable explorer Help Plots Files
Console 1/A
IPython console History
LSP Python: ready conda (Python 3.8.8) Line 1, Col 1 UTF-8 CRLF RW Mem 89%
Escribe aquí para buscar
21°C ESP 0:14 16-03-2022

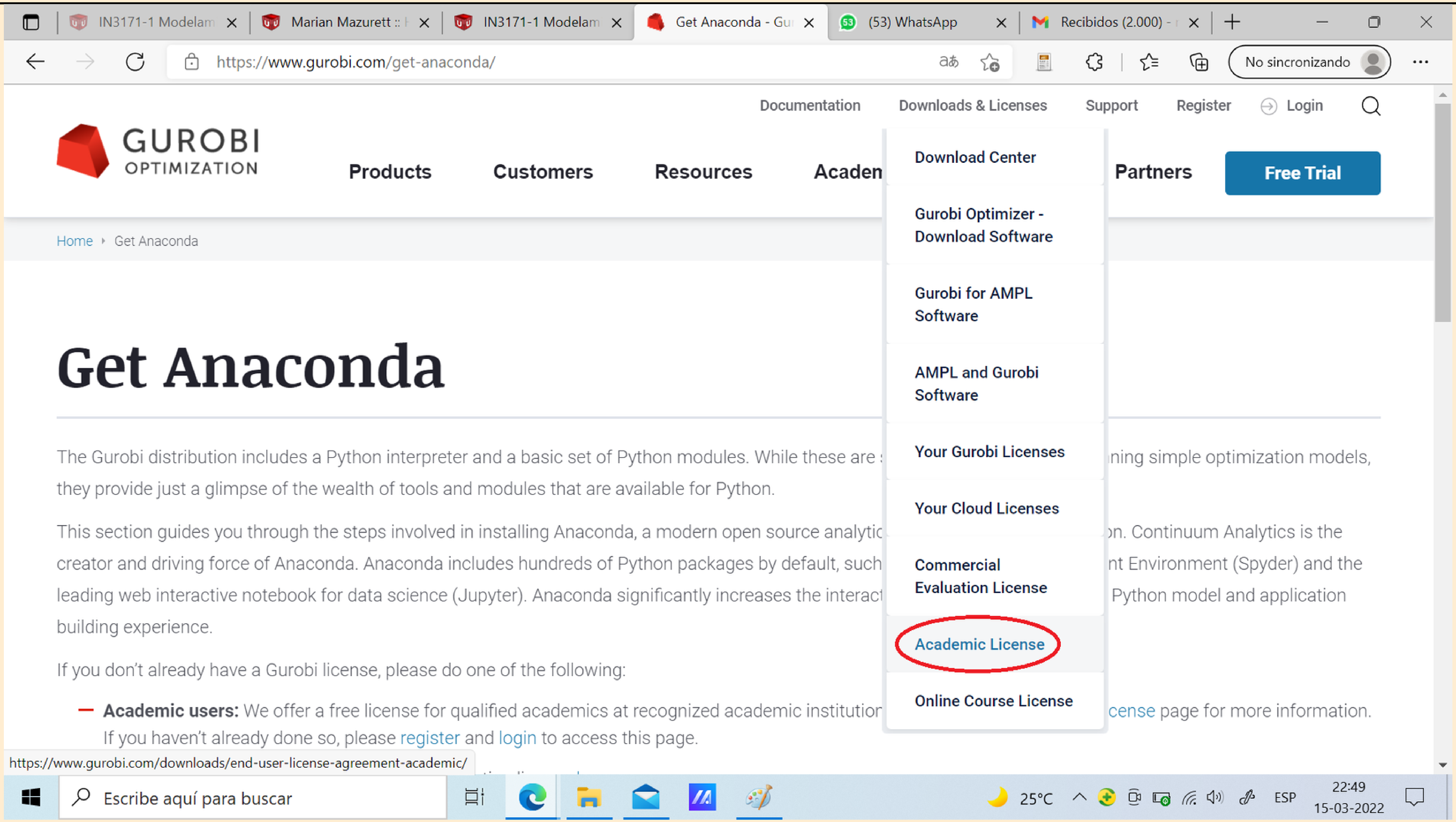
```
# -*- coding: utf-8 -*-
"""
Spyder Editor

This is a temporary script fi
"""
```

```
Python 3.8.8 (default, Apr 13 2021, 15:08:03) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 7.22.0 -- An enhanced Interactive Python.

In [1]: conda config --add channels http://conda.anaconda.org/gurobi

Note: you may need to restart the kernel to use updated packages.

In [2]: conda install gurobi
Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

## Package Plan ##

  environment location: C:\Users\ASUS\anaconda3

  added / updated specs:
    - gurobi


The following packages will be downloaded:

    package                    |            build
    ---------------------------|-----------------
    conda-4.12.0               |   py38haa95532_0        14.5 MB
    gurobi-9.5.1               |           py38_0        32.6 MB  gurobi
    ------------------------------------------------------------
                                           Total:        47.0 MB
```

conda config --add channels http://conda.anaconda.org/gurobi

conda install gurobi

Parte IV: Obtención e instalación licencia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Marian Mazurett ::
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Get Anaconda

The Gurobi distribution includes a Python interpreter and a basic set of Python modules. While these are ning simple optimization models, they provide just a glimpse of the wealth of tools and modules that are available for Python.

This section guides you through the steps involved in installing Anaconda, a modern open source analytic on. Continuum Analytics is the creator and driving force of Anaconda. Anaconda includes hundreds of Python packages by default, such nt Environment (Spyder) and the leading web interactive notebook for data science (Jupyter). Anaconda significantly increases the interact Python model and application building experience.

If you don't already have a Gurobi license, please do one of the following:

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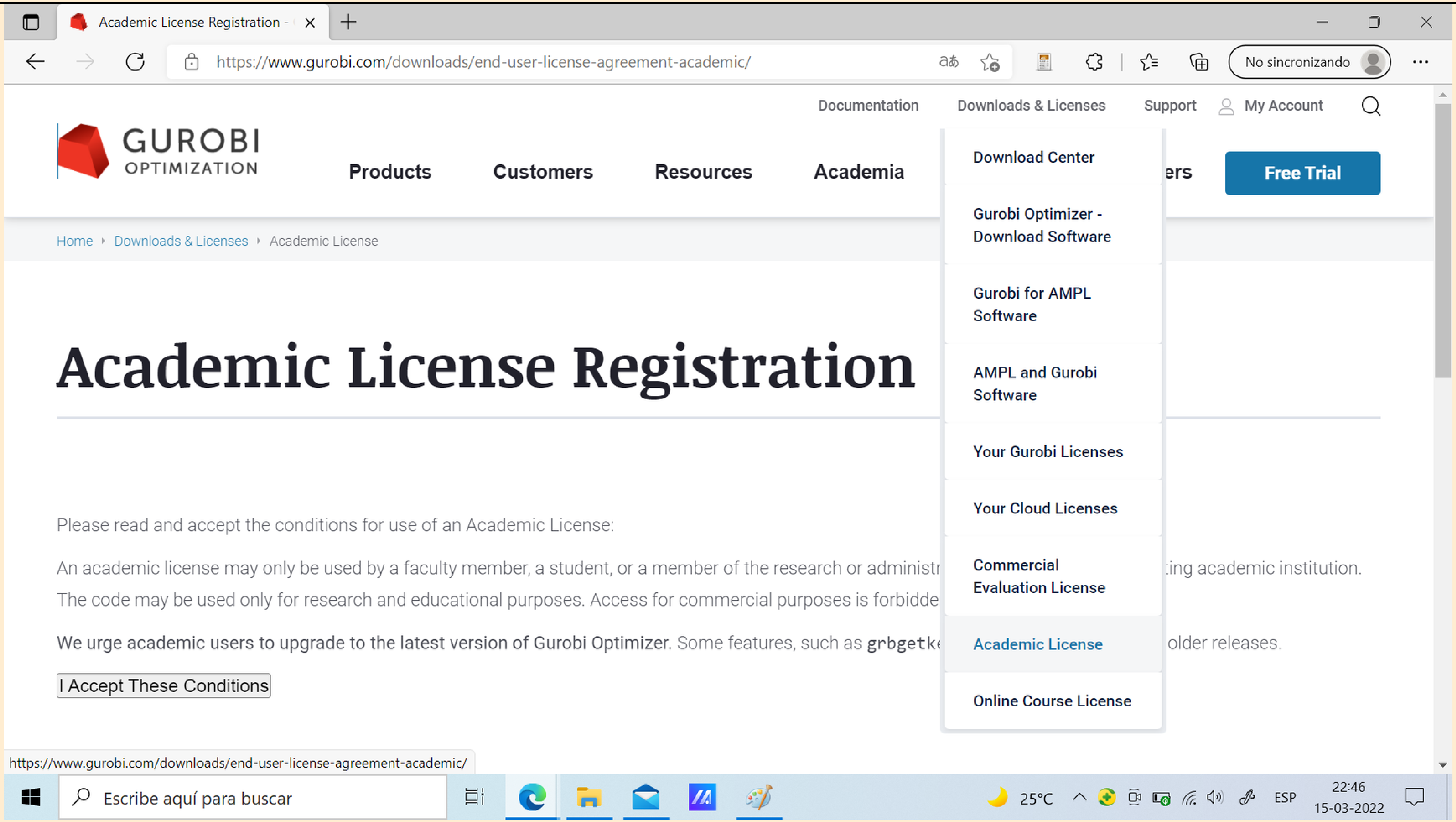
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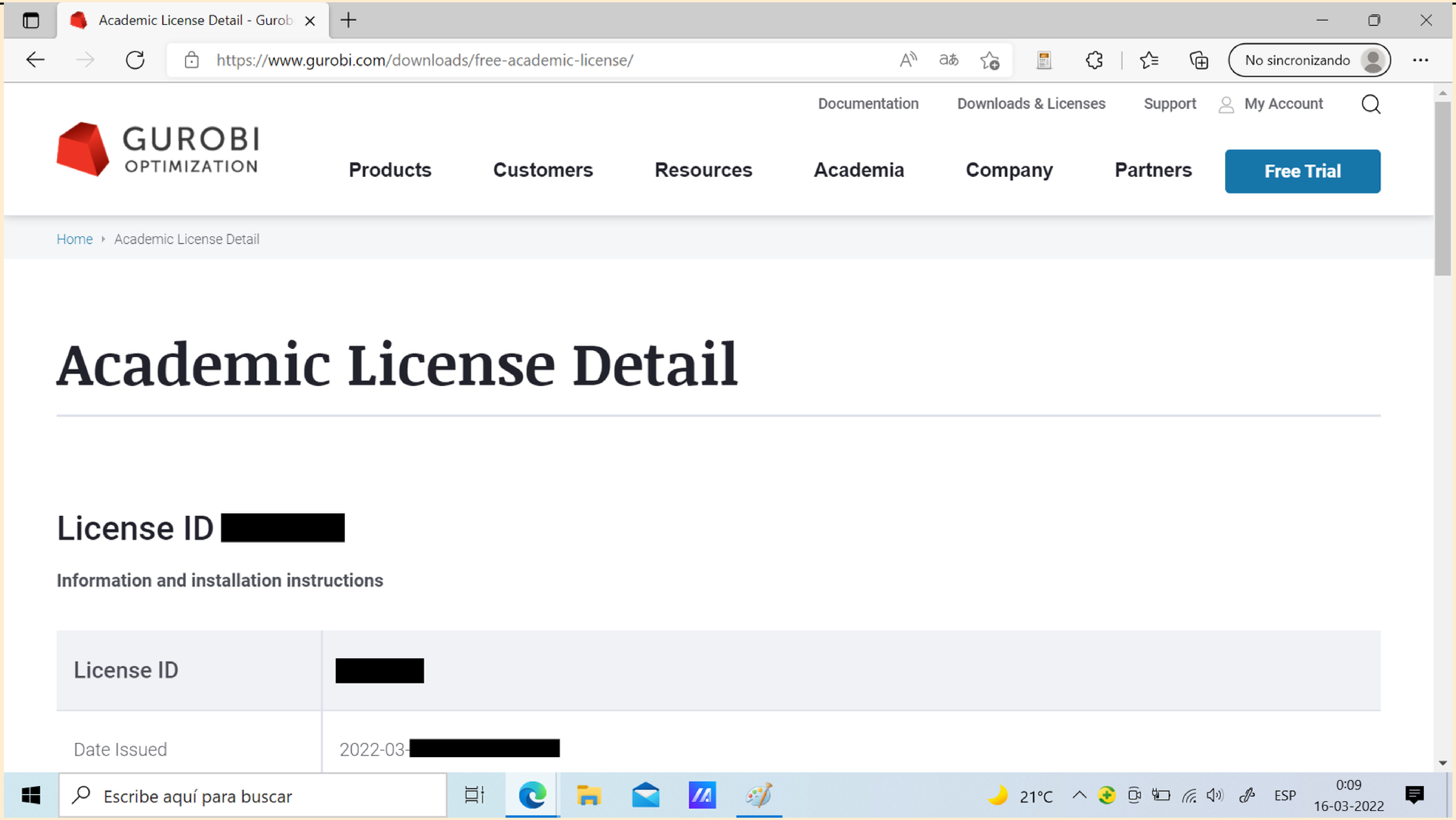
We urge academic users to upgrade to the latest version of Gurobi Optimizer. Some features, such as grbgetk … older releases.

Parte IV: Obtención e instalación licencia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Information and installation instructions

License ID	[redacted]
Date Issued	2022-03-[redacted]

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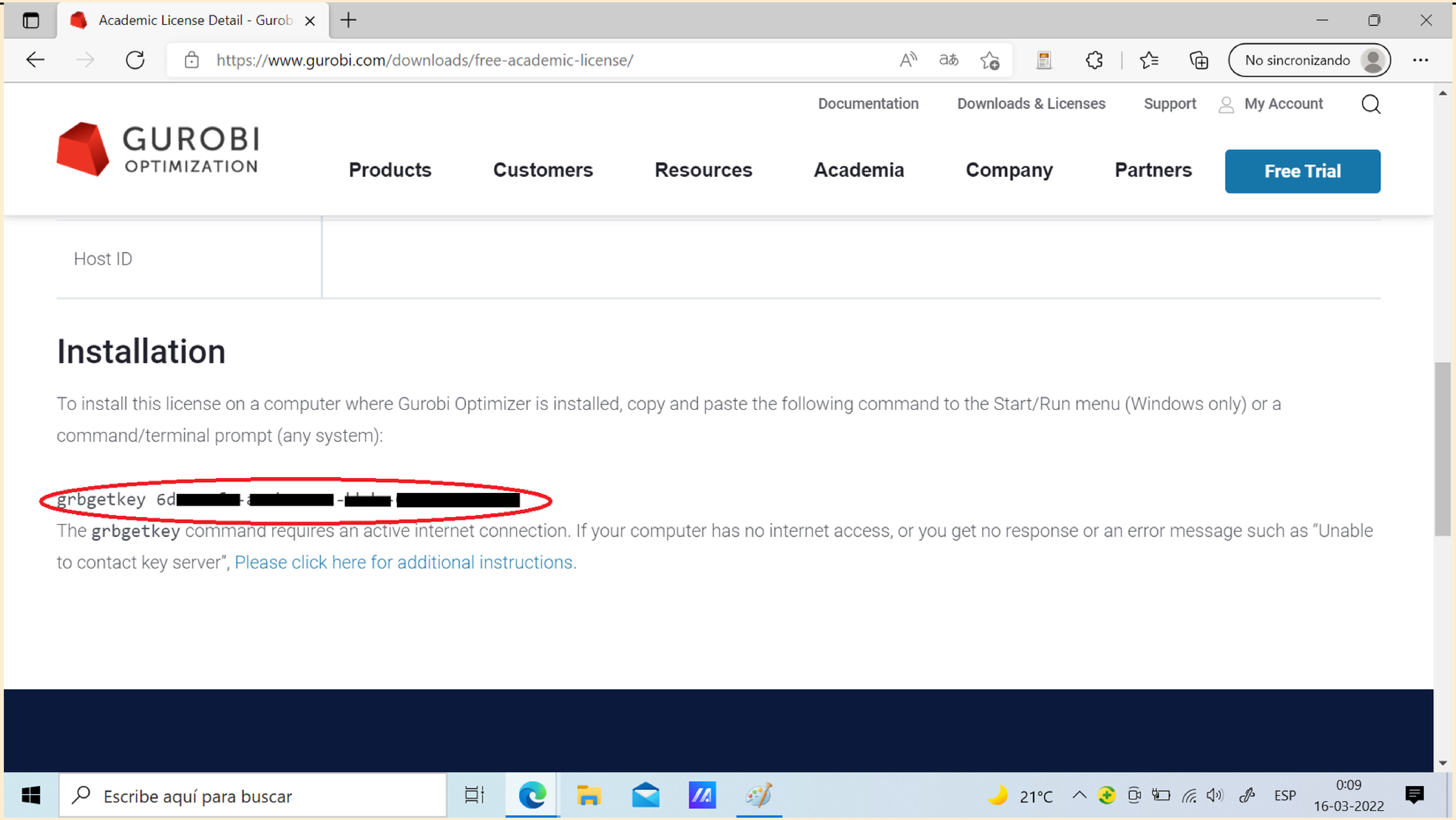
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Host ID	

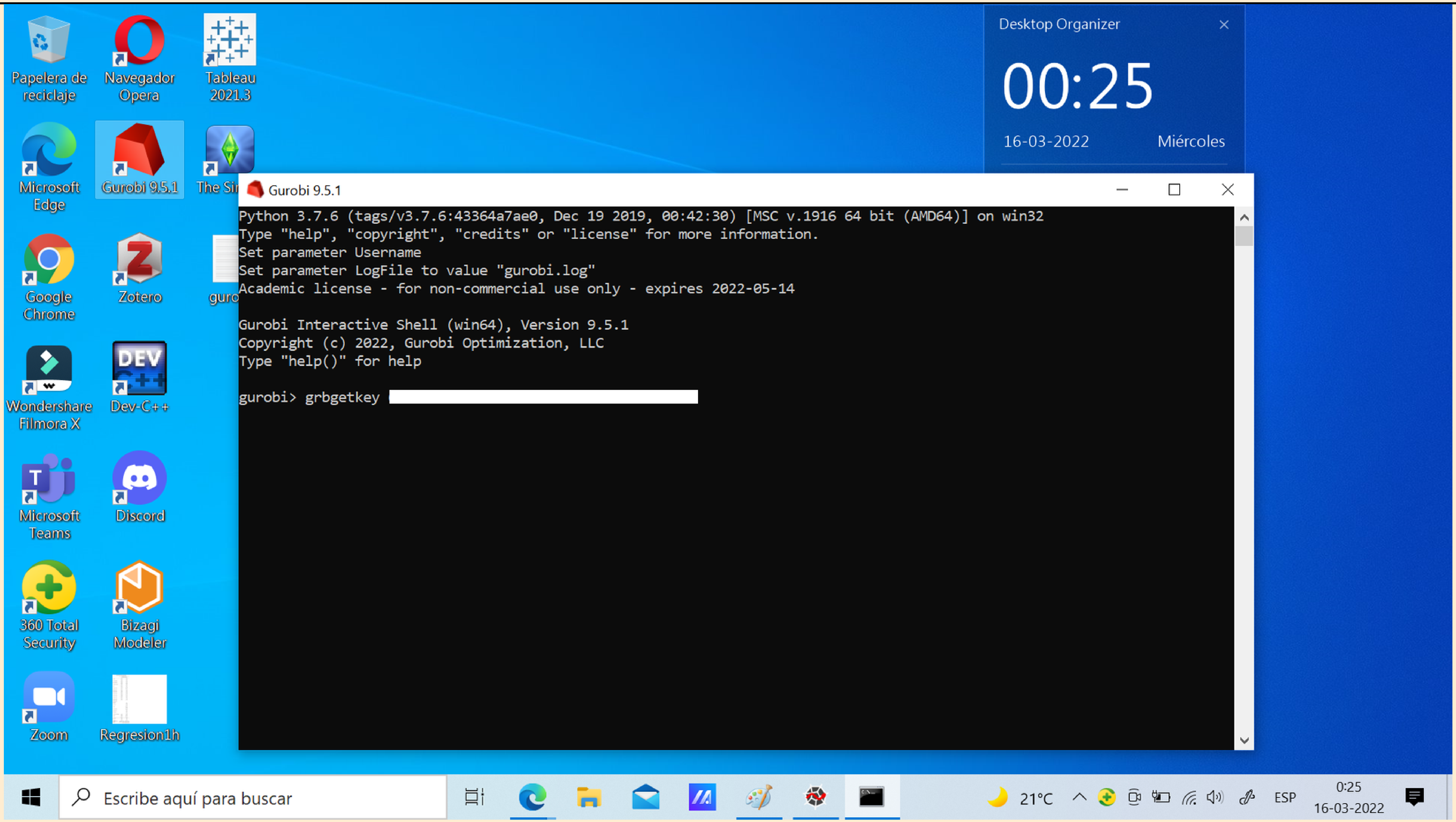
Installation

To install this license on a computer where Gurobi Optimizer is installed, copy and paste the following command to the Start/Run menu (Windows only) or a command/terminal prompt (any system):

```
grbgetkey 6d[redacted]-[redacted]-[redacted]-[redacted]
```

The `grbgetkey` command requires an active internet connection. If your computer has no internet access, or you get no response or an error message such as "Unable to contact key server", Please click here for additional instructions.

Parte IV: Obtención e instalación licencia


Papelera de reciclaje
Navegador Opera
Tableau 2021.3
Microsoft Edge
Gurobi 9.5.1
The Si
Google Chrome
Zotero
guro
Wondershare Filmora X
Dev-C++
Microsoft Teams
Discord
360 Total Security
Bizagi Modeler
Zoom
Regresion1h
Desktop Organizer
00:25
16-03-2022
Miércoles
Gurobi 9.5.1
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ESP
0:25
16-03-2022

```
Python 3.7.6 (tags/v3.7.6:43364a7ae0, Dec 19 2019, 00:42:30) [MSC v.1916 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
Set parameter Username
Set parameter LogFile to value "gurobi.log"
Academic license - for non-commercial use only - expires 2022-05-14

Gurobi Interactive Shell (win64), Version 9.5.1
Copyright (c) 2022, Gurobi Optimization, LLC
Type "help()" for help

gurobi> grbgetkey [redacted]
```

Problema de Modelamiento

PPL contiene:

- -Parámetros
- -Variables de decisión
- -Restricciones
- -Función objetivo

Problema de Modelamiento

Inspirado en P1 aux0 2019-2 Macarena Osorio

Imagine que usted maneja un local de pizzas que sólo vende 2 tipos de pizza: margarita pesto y vegetariana. La pizza margarita pesto lleva 1 porción de queso, 2 porciones de tomate y 1 porción de pesto. La vegetariana lleva 2 porciones de queso, 1 porción de tomate y 1 porción de champiñones. El local compra diariamente el equivalente a 10 porciones de pesto y champiñón y 20 porciones de los demás ingredientes. El precio de la pizza margarita pesto es $4000 y el de la vegetariana es $5000. Suponiendo que todo lo producido se vende, determine la cantidad de cada tipo de pizza que debiera producir su local para maximizar sus ingresos diarios.

Problema de Modelamiento

Parámetros

10 porciones de pesto y champiñón

20 porciones de los demás ingredientes

Variables de Decisión

x:= cant. de pizza margarita pesto a producir

y:= cant. de pizza vegetariana a producir

Restricciones: 1) Naturaleza de las variables

$x \in N$

$y \in N$

Problema de Modelamiento

Restricciones: 2) Limitaciones ingredientes

$x <= 10$ puedo producir máximo 10 pizzas de cada tipo (por los ingredientes champiñón y pesto que adquiero)
$y <= 10$

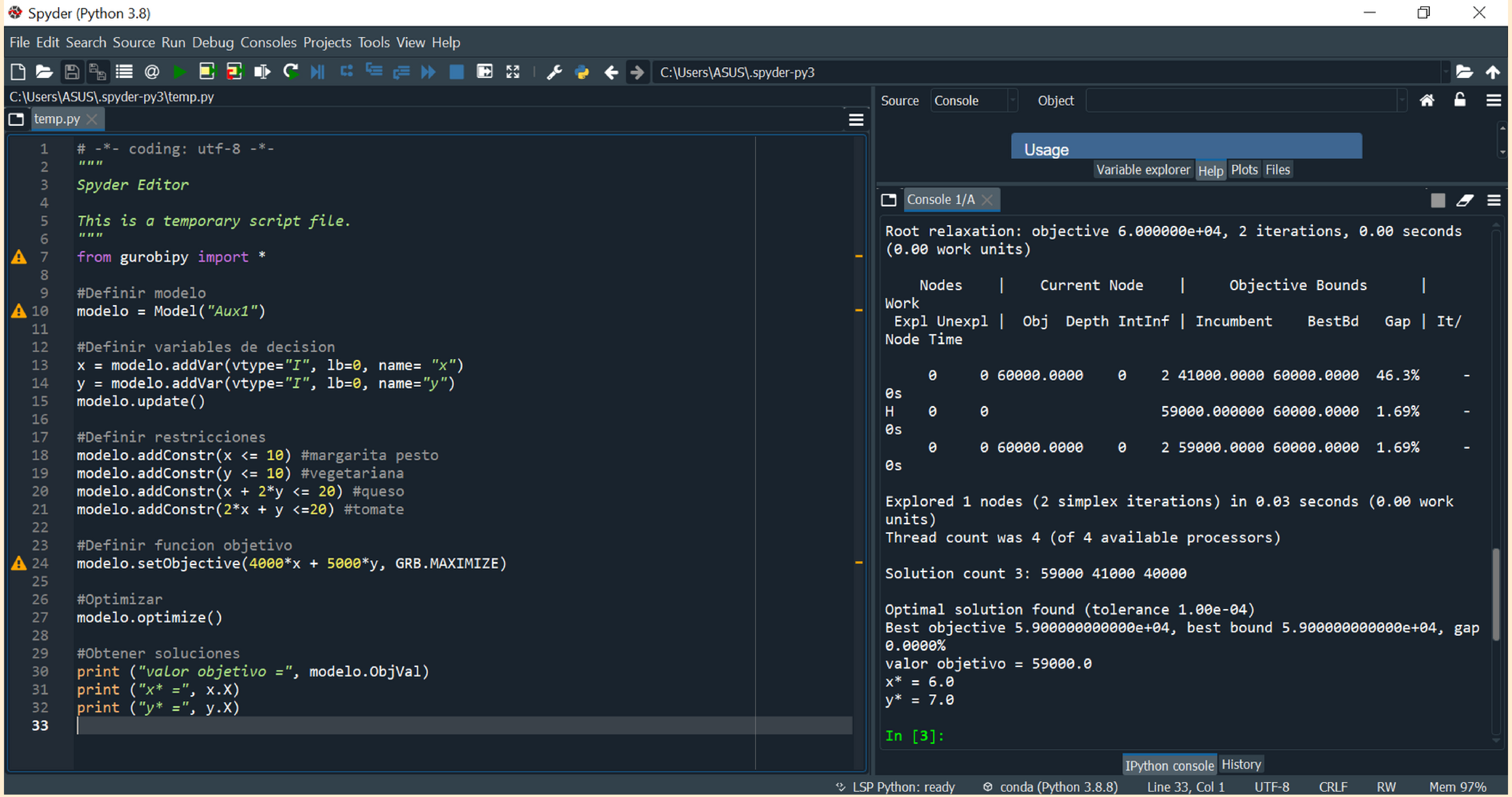
$x+2*y <= 20$ queso

$2*x+y <= 20$ tomate

Función Objetivo:

max $4000*x+5000*y$

Programando en Gurobi



Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\ASUS\.spyder-py3
C:\Users\ASUS\.spyder-py3\temp.py
temp.py
Source Console Object
Usage
Variable explorer Help Plots Files
Console 1/A
IPython console History
LSP Python: ready conda (Python 3.8.8) Line 33, Col 1 UTF-8 CRLF RW Mem 97%

```python
# -*- coding: utf-8 -*-
"""
Spyder Editor

This is a temporary script file.
"""
from gurobipy import *

#Definir modelo
modelo = Model("Aux1")

#Definir variables de decision
x = modelo.addVar(vtype="I", lb=0, name= "x")
y = modelo.addVar(vtype="I", lb=0, name="y")
modelo.update()

#Definir restricciones
modelo.addConstr(x <= 10) #margarita pesto
modelo.addConstr(y <= 10) #vegetariana
modelo.addConstr(x + 2*y <= 20) #queso
modelo.addConstr(2*x + y <=20) #tomate

#Definir funcion objetivo
modelo.setObjective(4000*x + 5000*y, GRB.MAXIMIZE)

#Optimizar
modelo.optimize()

#Obtener soluciones
print ("valor objetivo =", modelo.ObjVal)
print ("x* =", x.X)
print ("y* =", y.X)
```

```
Root relaxation: objective 6.000000e+04, 2 iterations, 0.00 seconds
(0.00 work units)

    Nodes    |    Current Node    |     Objective Bounds      |
Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/
Node Time

     0     0 60000.0000    0    2 41000.0000 60000.0000  46.3%     -
0s
H    0     0                    59000.000000 60000.0000  1.69%     -
0s
     0     0 60000.0000    0    2 59000.0000 60000.0000  1.69%     -
0s

Explored 1 nodes (2 simplex iterations) in 0.03 seconds (0.00 work
units)
Thread count was 4 (of 4 available processors)

Solution count 3: 59000 41000 40000

Optimal solution found (tolerance 1.00e-04)
Best objective 5.900000000000e+04, best bound 5.900000000000e+04, gap
0.0000%
valor objetivo = 59000.0
x* = 6.0
y* = 7.0

In [3]:
```

Problema de Modelamiento

Imagine que participa en el curso “Taller de Ingeniería Industrial” y quiere coordinar el trabajo de su grupo que tiene un conjunto M de personas, por ejemplo M = {Christiane, Rocio, Carla, Valentina, Karen, Gabriel, Gary, Gonzalo, Mauricio, Arturo, Alexis}. Hay un conjunto J de tareas que se deben hacer para completar el proyecto. Para cada tarea $j \in J$ hay un valor $pj \geq 0$ que corresponde al ńumero de horas que se debe dedicar a hacer la tarea j. Se debe asignar exactamente una persona del grupo a cada trabajo. Si un miembro del equipo, $i \in M$, tiene un conjunto de tareas $J' \subseteq J$ asignado, entonces el miembro i tiene que trabajar $Pj \in J'$ pj horas en total. El objetivo es minimizar el ńumero de horas totales que trabaja la persona del grupo que ḿas horas trabaja.

Problema de Modelamiento

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Parámetros

pj := tiempo que tarda en realizarse el trabajo j ∈ J

Variables de Decisión

xij := 1 Si la persona i realiza el trabajo j.
0, De otra manera.

t:= tiempo durante el cual trabaja la persona que trabaja más horas

Restricciones:

1) Naturaleza de las variables

xij ∈ {0, 1}

t ∈ R+0

Problema de Modelamiento

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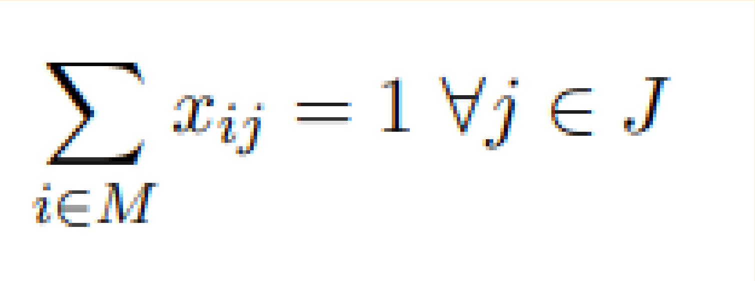
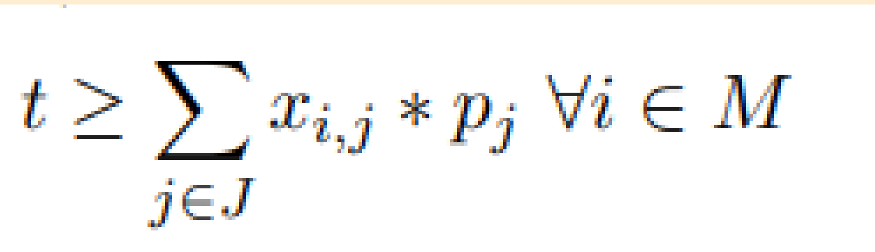
Restricciones

2) Todos los trabajos se realizan y sólo una persona puede realizar un trabajo en particular



$$\sum_{i \in M} x_{ij} = 1 \ \forall j \in J$$

3) Cada persona trabaja como máximo un tiempo t



$$t \geq \sum_{j \in J} x_{i,j} * p_j \ \forall i \in M$$

Problema de Modelamiento

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Función Objetivo

min t