

Introducción a los jupyter notebooks y el lenguaje de programación Python

GRUPO COMIT - Diciembre 2020

Agenda

- Introducción Jupyter Notebooks ([Capa de presentación Web del Banco](#))
- Introducción a los notebooks
- Programación en Python usando notebooks

Introducción Jupyter Notebooks

¿Qué es Jupyter Notebooks?

Definición

- Es un servicio Web que **permite el desarrollo de código en línea** con base en notebooks que soportan distintos lenguajes de programación (R, Python, etc).
- Los notebooks **facilitan la documentación e interacción** de los usuarios con el código.
- Además **permite compartir el código** en diferentes formatos (html, pdf, latex, markdown, Python)
- Es la **capa de presentación** por la cual los analistas del banco acceden a las capacidades del Open Data Cube (ODC) instalado en el banco.



¿Qué es Jupyter Notebooks?

¿Para qué es útil en nuestro caso?

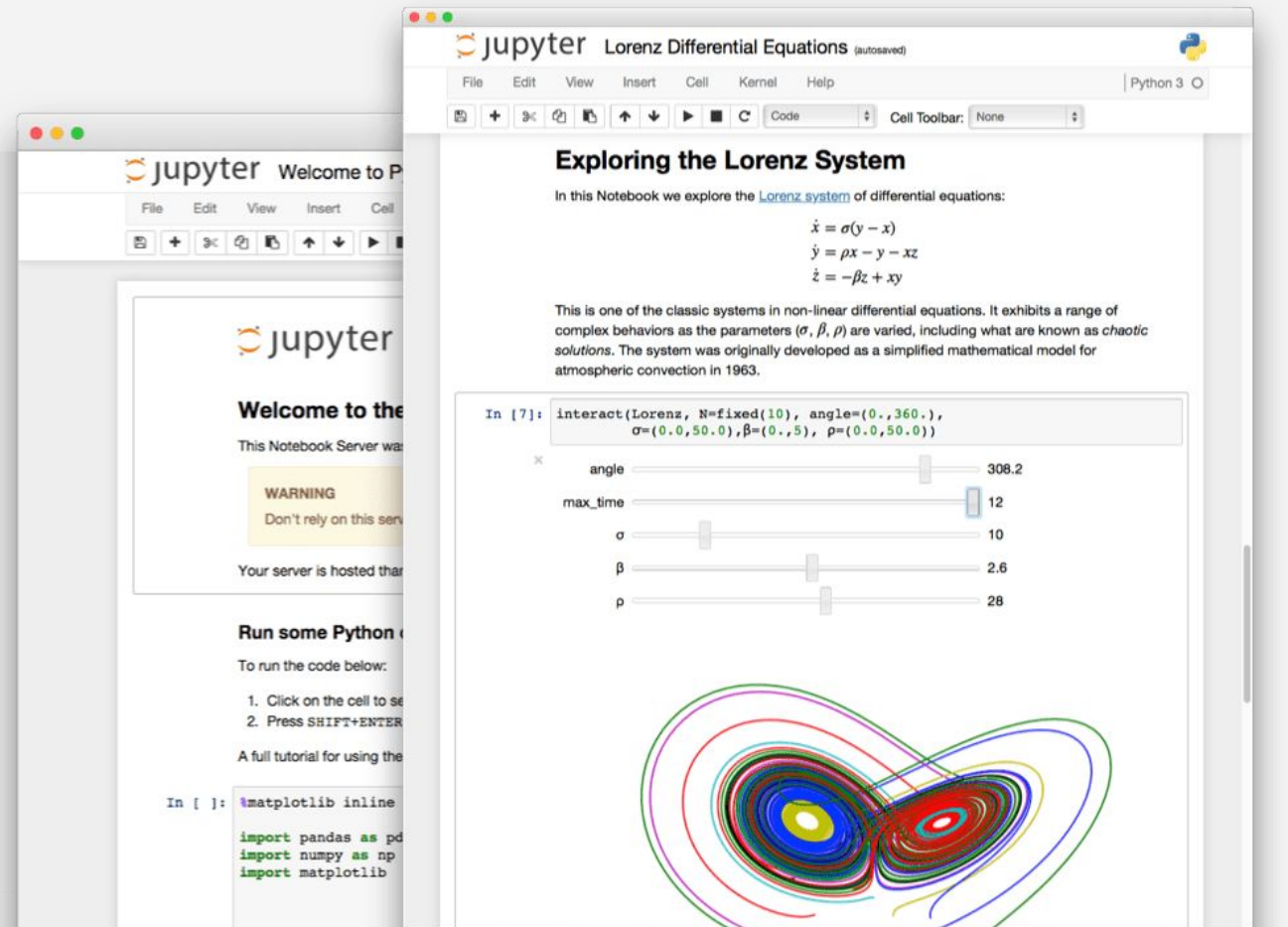
- Por medio de Jupyter Notebooks vamos a crear **notebooks** que contengan algoritmos de procesamiento de imágenes satelitales.
- Estos algoritmos necesariamente acceden al Open Data Cube (ODC) instalado en el banco para **recuperar información de las imágenes satelitales** disponibles en el banco.



¿Qué es Jupyter Notebooks?

```
factorial.py
1 |from os import system
2
3 #this say function is the most important part of kids programming
4 #it uses the built in OSX say command to convert text to speech
5 def say(something):
6     system('say "%s"' % something)
7
8 def factorial(n):
9     if n == 1:
10         return n
11     else:
12         return n * factorial(n-1)
13
14 first_line = "Type the number you want to do a factorial for."
15 print(first_line)
16 say(first_line)
17 number = input('?')
18 answer = factorial(number)
19 answer_string = "The answer is %d" % answer
20 print(answer_string)
21 say(answer_string)
22
```

Line 1, Column 1 Spaces: 4 Python



Reconocimiento Interfaz Jupyter Banco

1. Conectarse a la VPN del Banco
2. Abrir un navegador (Firefox, Chrome, etc)
3. Digitar la url **10.0.43.16:8081**



The screenshot displays the Jupyter web interface. The browser's address bar is highlighted with a blue box and contains the URL `10.0.43.16:8081/tree`. Below the address bar, the Jupyter logo is visible on the left, and a 'Quit' button is on the right. The interface has three tabs: 'Files' (selected), 'Running', and 'Clusters'. Below the tabs, there is a message: 'Select items to perform actions on them.' To the right of this message are buttons for 'Upload', 'New', and a refresh icon. Below this is a table with columns for 'Name', 'Last Modified', and 'File size'. The table contains one entry: a folder named 'capacitaciones'. The text 'hace 3 minutos' is displayed to the right of the folder name.

Reconocimiento Interfaz Jupyter Banco

Files: permite visualizar todos os archivos y directorios del servidor.



The screenshot displays the JupyterLab web interface. At the top, the browser address bar shows the URL `10.0.43.16:8081/tree`. Below the address bar, the Jupyter logo is visible on the left, and a 'Quit' button is on the right. A navigation bar contains three tabs: 'Files', 'Running', and 'Clusters'. The 'Files' tab is currently selected and highlighted with a blue border. Below the tabs, a message states 'Select items to perform actions on them.' To the right of this message are buttons for 'Upload', 'New', and a refresh icon. A table lists the files and directories on the server. The first entry is a directory named 'capacitaciones', which is selected with a checkbox. The table has columns for 'Name', 'Last Modified', and 'File size'. The 'Last Modified' column shows the time 'hace 3 minutos'.

	Name	Last Modified	File size
<input checked="" type="checkbox"/>	/		
<input checked="" type="checkbox"/>	capacitaciones	hace 3 minutos	

Reconocimiento Interfaz Jupyter Banco

Files: Listado de archivos y directorios en el servidor

The screenshot shows the Jupyter web interface. At the top, there's a browser address bar with '10.0.43.16:8081/tree'. Below it, the Jupyter logo and a 'Quit' button are visible. The 'Files' tab is selected, with 'Running' and 'Clusters' tabs also present. A message says 'Select items to perform actions on them.' To the right are 'Upload', 'New', and a refresh icon. The file list has columns for 'Name', 'Last Modified', and 'File size'. One item, 'capacitaciones', is listed with a timestamp of 'hace 3 minutos'. A blue arrow points from the text 'Files: Listado de archivos y directorios en el servidor' to the file list area.

	Name	Last Modified	File size
<input type="checkbox"/>	/		
<input type="checkbox"/>	capacitaciones	hace 3 minutos	

Reconocimiento Interfaz Jupyter Banco

Upload: permite cargar archivos al servidor, en la ubicación actual.



The screenshot shows the Jupyter web interface. At the top, there is a address bar with the URL '10.0.43.16:8081/tree'. Below the address bar, the Jupyter logo is visible on the left and a 'Quit' button on the right. The main interface has three tabs: 'Files', 'Running', and 'Clusters'. Below the tabs, there is a message 'Select items to perform actions on them.' and a list of files. The first file in the list is a folder named 'capacitaciones'. To the right of the file list, there are buttons for 'Upload', 'New', and a refresh icon. The 'Upload' button is highlighted with a blue box, and a blue arrow points from the text above to it. Below the file list, there are columns for 'Name', 'Last Modified', and 'File size'. The 'Last Modified' column shows the time 'hace 3 minutos'.

10.0.43.16:8081/tree

jupyter

Quit

Files Running Clusters

Select items to perform actions on them.

☐ 0

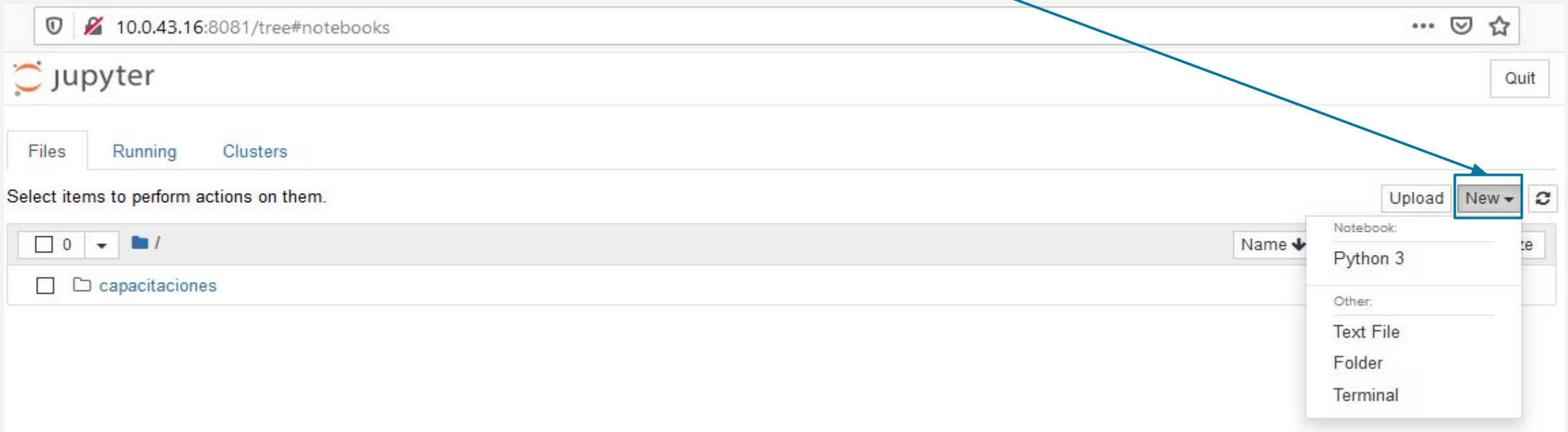
☐

capacitaciones

hace 3 minutos

Reconocimiento Interfaz Jupyter Banco

New: presenta opciones para la creación de archivos y directorios



Reconocimiento Interfaz Jupyter Banco

Update: actualiza/refresca el listado de archivos.



The screenshot shows the Jupyter web interface. At the top, there is a browser address bar with the URL `10.0.43.16:8081/tree`. Below this is the Jupyter logo and a 'Quit' button. The interface has three tabs: 'Files', 'Running', and 'Clusters'. The 'Files' tab is active. Below the tabs, there is a message: 'Select items to perform actions on them.' To the right of this message are three buttons: 'Upload', 'New', and a refresh button (circular arrow icon). The refresh button is highlighted with a blue box and a blue arrow pointing to it from the text 'Update: actualiza/refresca el listado de archivos.' Below the buttons is a table with columns: 'Name', 'Last Modified', and 'File size'. The table has one row with a checkbox, a folder icon, and the text 'capacitaciones'. To the right of this row is the text 'hace 3 minutos'.

10.0.43.16:8081/tree

jupyter

Quit

Files Running Clusters

Select items to perform actions on them.

Upload New 

☐ 0  /

☐  capacitaciones

hace 3 minutos

Reconocimiento Interfaz Jupyter Banco

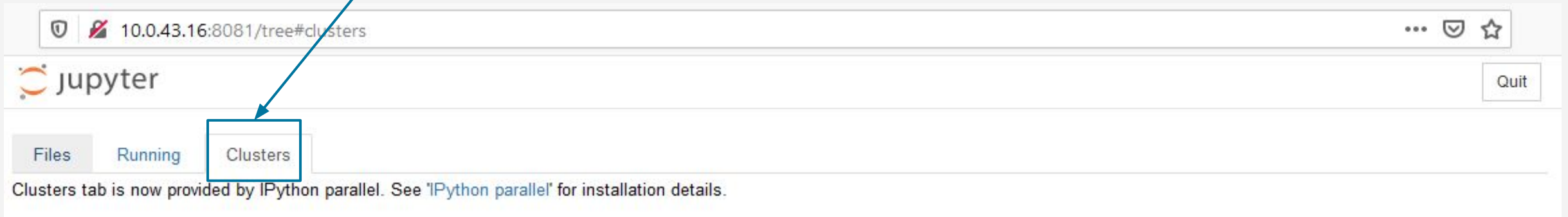
Running: permite visualizar todos los [notebooks](#) y [terminales](#) en ejecución.



The screenshot shows the Jupyter web interface. At the top, there is a browser address bar with the URL '10.0.43.16:8081/tree#running'. Below the address bar is the Jupyter logo and a 'Quit' button. A navigation bar contains three tabs: 'Files', 'Running', and 'Clusters'. The 'Running' tab is selected and highlighted with a blue box. Below the navigation bar, the text 'Currently running Jupyter processes' is displayed. Underneath, there are two sections: 'Terminals' and 'Notebooks'. Both sections show a message: 'There are no terminals running.' and 'There are no notebooks running.' respectively. A blue arrow points from the text 'Running: permite visualizar todos los notebooks y terminales en ejecución.' to the 'Running' tab.

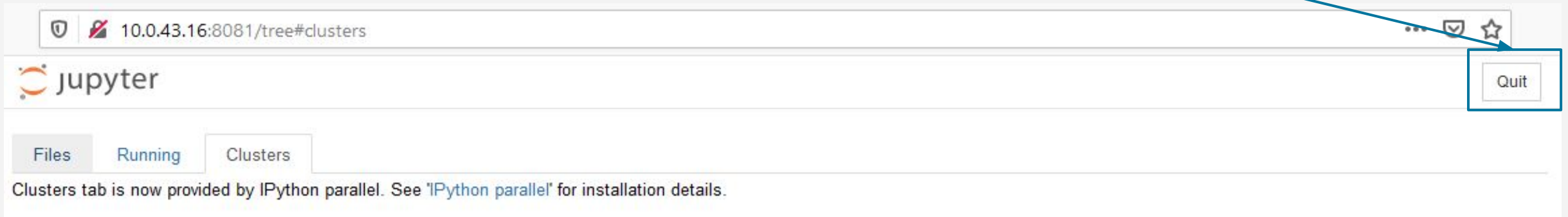
Reconocimiento Interfaz Jupyter Banco

Clusters: permite la ejecución de código en servidores remotos.



Reconocimiento Interfaz Jupyter Banco

Quit: apaga el servidor **(NO USAR)**



Ejercicio

1. Reconocimiento de la Interfaz web
2. ¿Preguntas?



Introducción a los notebooks

Ingreso a mi directorio de trabajo

Localizar **mi directorio** de trabajo e ingresar con un click sobre **mi nombre de usuario**



Files Running Clusters

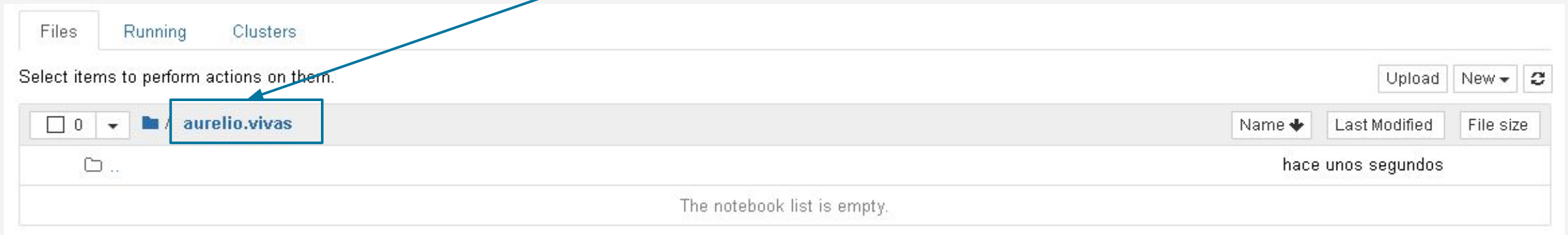
Select items to perform actions on them.

Upload New ↕

<input type="checkbox"/> 0	Name ↓	Last Modified	File size
<input type="checkbox"/>	andrea.velandia	hace 24 minutos	
<input type="checkbox"/>	angel.rincon	hace 27 minutos	
<input type="checkbox"/>	aurelio.vivas	hace 19 minutos	

Ingreso a mi directorio de trabajo

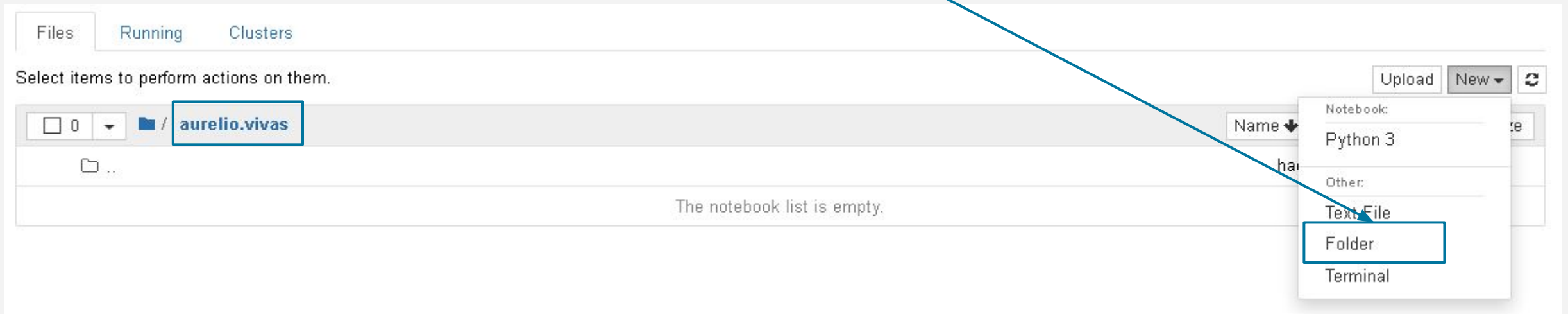
Validar que me encuentre ubicado en mi
directorio de trabajo



The screenshot shows a web interface with three tabs: 'Files', 'Running', and 'Clusters'. Below the tabs is a text prompt: 'Select items to perform actions on them.' To the right of this prompt are three buttons: 'Upload', 'New' (with a dropdown arrow), and a refresh icon. Below the prompt is a directory listing. The first entry is a folder icon followed by '0' and a dropdown arrow, then a folder icon followed by 'aurelio.vivas'. This entry is highlighted with a blue box. To the right of the directory listing are three buttons: 'Name' (with a dropdown arrow), 'Last Modified', and 'File size'. Below the directory listing is a text prompt: 'hace unos segundos'. At the bottom of the interface is a message: 'The notebook list is empty.'

Crear un directorio para la capacitación

Crear un nuevo directorio



The screenshot displays the JupyterLab interface. At the top, there are tabs for 'Files', 'Running', and 'Clusters'. Below these, a message states 'Select items to perform actions on them.' The main area shows a file browser with a folder named 'aurelio.vivas' highlighted. A right-click context menu is open over the folder, showing options: 'Notebook: Python 3', 'Other: Text File', 'Folder' (which is highlighted with a blue box), and 'Terminal'. A blue arrow points from the text 'Crear un nuevo directorio' to the 'Folder' option in the menu. The bottom of the interface shows a message: 'The notebook list is empty.'

Crear un directorio para la capacitación

Validar la creación del nuevo directorio

The screenshot shows a web-based file management interface. At the top, there are tabs for 'Files', 'Running', and 'Clusters'. Below the tabs, a message says 'Select items to perform actions on them.' To the right of this message are buttons for 'Upload', 'New', and a refresh icon. The main area displays a file tree. The current path is '/ aurelio.vivas'. Below this, there is a folder icon and the text 'Untitled Folder'. A blue arrow points from the text 'Validar la creación del nuevo directorio' to the 'Untitled Folder' entry. The 'Untitled Folder' entry is highlighted with a blue border. To the right of the folder name, there are columns for 'Name', 'Last Modified', and 'File size'. The 'Last Modified' column shows 'hace unos segundos' and the 'File size' column shows 'en unos segundos'.

Name	Last Modified	File size
0		
..	hace unos segundos	
Untitled Folder	en unos segundos	

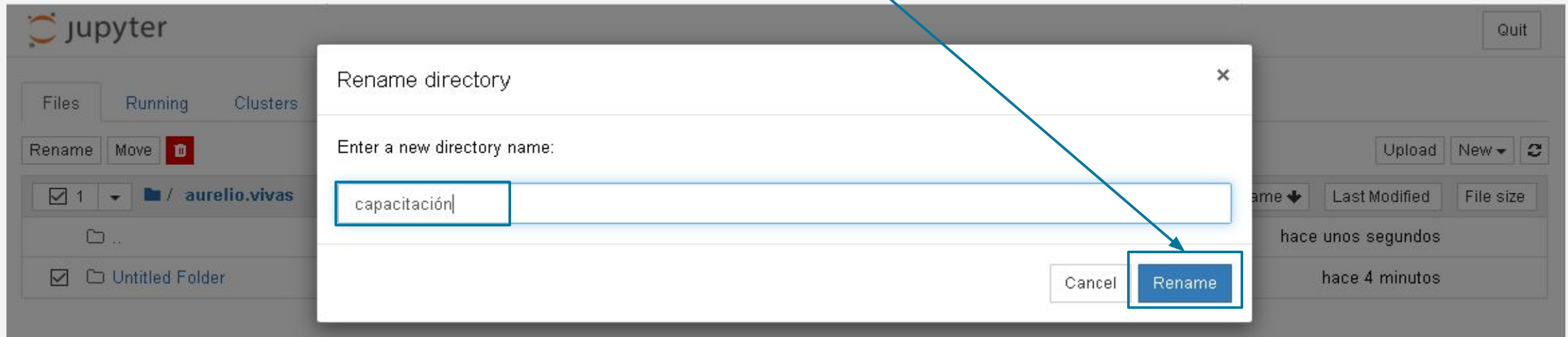
Crear un directorio para la capacitación

Seleccionar el nuevo directorio



Crear un directorio para la capacitación

Cambiar el nombre del nuevo directorio a
"capacitación".



Crear un directorio para la capacitación

Validar que el nombre haya cambiado y
ingresar con un click



Files Running Clusters

Select items to perform actions on them.

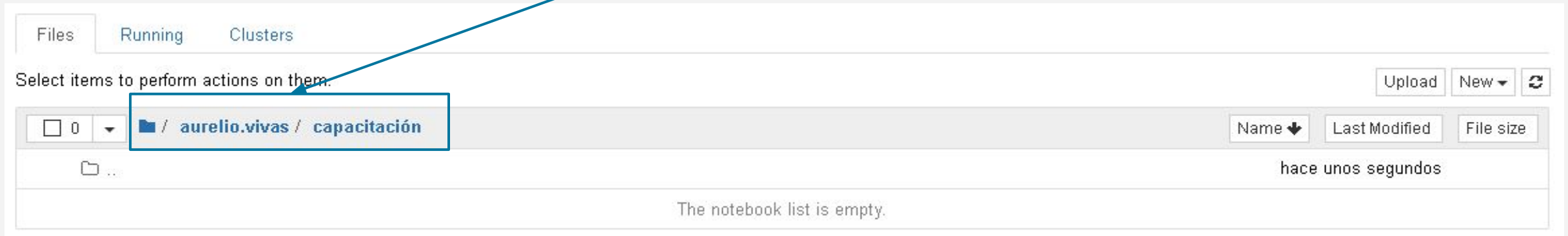
Upload New ↕

☐ 0 ▾ / aurelio.vivas

	Name ▾	Last Modified	File size
<input type="checkbox"/>	..	hace unos segundos	
<input type="checkbox"/>	capacitación	hace 6 minutos	

Crear un directorio para la capacitación

Validar el ingreso al directorio



The screenshot shows a web-based file management interface. At the top, there are three tabs: 'Files', 'Running', and 'Clusters'. Below the tabs, there is a text prompt 'Select items to perform actions on them.' followed by 'Upload', 'New', and a refresh icon. A blue line points from the text 'Validar el ingreso al directorio' to a selection box containing the path '/ aurelio.vivas / capacitación'. The selection box also shows a checkbox and the number '0'. To the right of the selection box, there are three columns: 'Name' with a downward arrow, 'Last Modified', and 'File size'. Below these columns, there is a folder icon and the text 'hace unos segundos'. At the bottom, there is a message 'The notebook list is empty.'

Files Running Clusters

Select items to perform actions on them.

Upload New ↕

☐ 0 ▾ / aurelio.vivas / capacitación

Name ▾ Last Modified File size

hace unos segundos

The notebook list is empty.

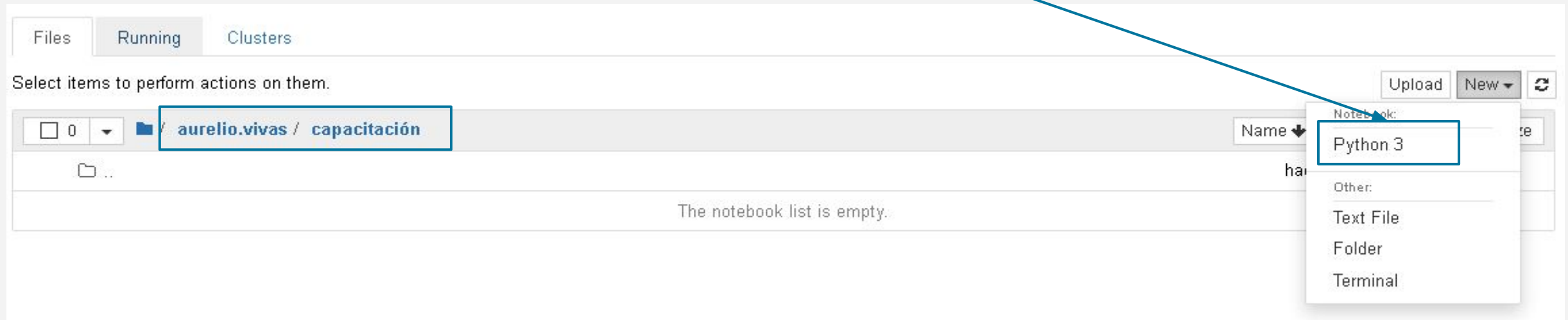
Ejercicio

1. Crear un directorio llamado "capacitación" en mi directorio de trabajo
2. Ingresar al directorio
3. ¿Preguntas?



Crear mi primer notebook

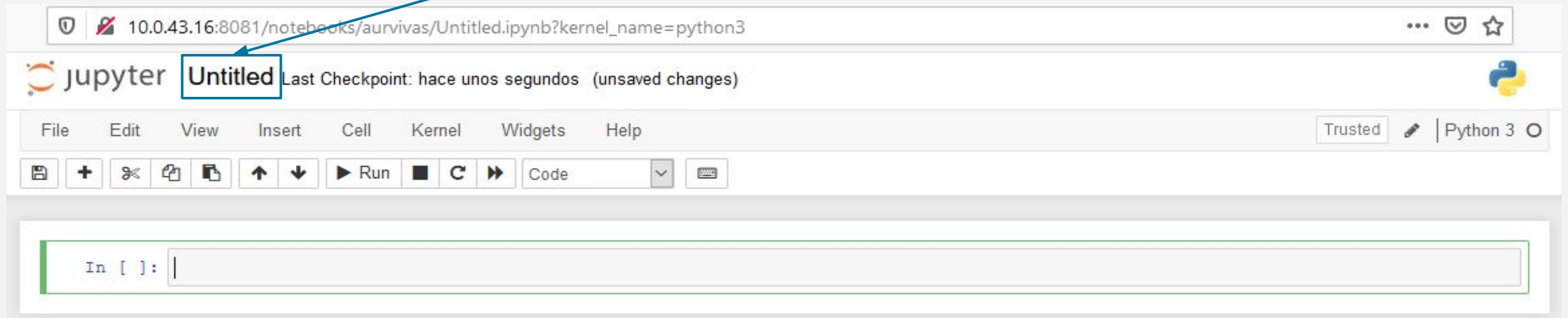
Crear un notebook de Python 3



The screenshot displays the JupyterLab user interface. At the top, there are tabs for 'Files', 'Running', and 'Clusters'. Below these, a message states 'Select items to perform actions on them.' The main area shows a file browser with a path '/ aurelio.vivas / capacitación' highlighted. To the right, there are buttons for 'Upload', 'New', and a refresh icon. The 'New' button has been clicked, opening a dropdown menu. This menu has a 'Notebook:' section with 'Python 3' selected and highlighted by a blue box. Below this is an 'Other:' section with options for 'Text File', 'Folder', and 'Terminal'. A blue arrow points from the text 'Crear un notebook de Python 3' to the 'Python 3' option in the dropdown menu. At the bottom of the interface, a message reads 'The notebook list is empty.'

Crear mi primer notebook

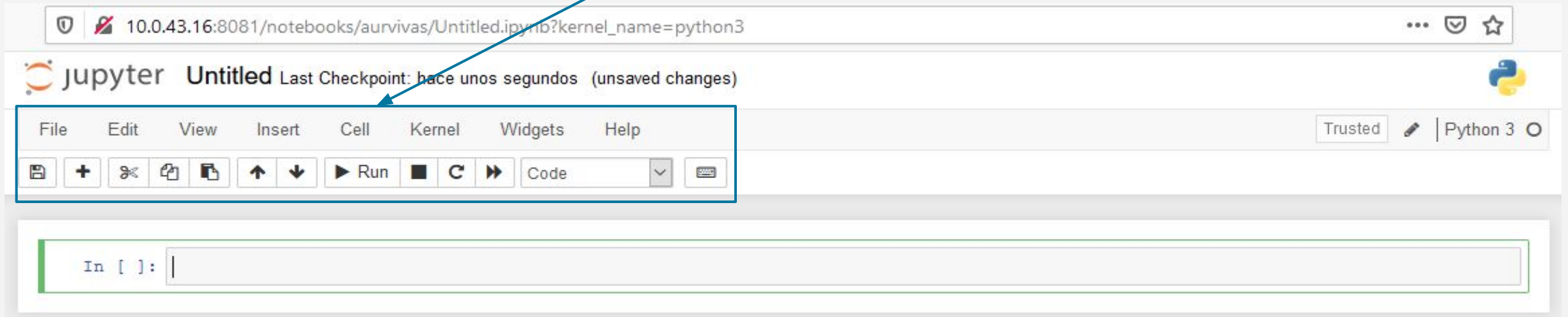
Nombre del notebook



The screenshot displays the Jupyter Notebook web interface. The browser's address bar shows the URL `10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3`. The Jupyter logo is on the left, and the notebook title **Untitled** is in the center, with a blue box highlighting it and a blue arrow pointing to it from the text 'Nombre del notebook' above. To the right of the title, it says 'Last Checkpoint: hace unos segundos (unsaved changes)'. The top menu bar includes 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', 'Widgets', and 'Help'. On the right of the menu bar, there is a 'Trusted' status indicator, a pencil icon, and 'Python 3'. Below the menu bar is a toolbar with icons for saving, creating new notebooks, deleting, copying, pasting, undo, redo, and running code. The main area shows a code cell with the prompt `In []:` and a cursor.

Crear mi primer notebook

Barra de herramientas



The screenshot displays the Jupyter Notebook web interface. At the top, the browser address bar shows the URL `10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3`. Below the browser bar, the Jupyter logo and the text "Untitled" are visible, followed by a status message: "Last Checkpoint: hace unos segundos (unsaved changes)". A blue arrow points from the text "Barra de herramientas" to the toolbar. The toolbar is a horizontal bar containing menu names (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a series of icons for file operations (save, new, copy, paste, undo, redo), execution (run, interrupt, restart), and cell management (code, raw, markdown). To the right of the toolbar, there is a "Trusted" status indicator, a pencil icon, and the text "Python 3". Below the toolbar, the first code cell is visible, starting with the prompt "In []:" followed by a cursor.

Crear mi primer notebook

Barra de herramientas

The screenshot displays the Jupyter Notebook web interface. At the top, the browser address bar shows the URL `10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3`. Below the browser, the Jupyter header includes the logo, the text "jupyter", the notebook title "Untitled", and a status message "Last Checkpoint: hace unos segundos (unsaved changes)". A menu bar with options like File, Edit, View, Insert, Cell, Kernel, Widgets, and Help is visible. The toolbar below the menu contains icons for saving, creating a new notebook, cutting, copying, pasting, undo, redo, running the cell, and other actions. Two blue boxes highlight the "Save" icon (floppy disk) and the "Run" button (play icon). On the right of the toolbar, there is a "Trusted" status indicator and a "Python 3" kernel selector. The main area of the notebook shows a single code cell with the prompt `In []:` and a cursor.

Crear mi primer notebook

Barra de estado

The screenshot displays the Jupyter Notebook web interface. At the top, the browser address bar shows the URL `10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3`. Below the browser bar, the Jupyter header includes the logo, the name "Untitled", and a message: "Last Checkpoint: hace unos segundos (unsaved changes)". A menu bar with options like File, Edit, View, Insert, Cell, Kernel, Widgets, and Help is visible. Below the menu is a toolbar with icons for saving, creating new files, copying, pasting, undo, redo, and running code. The main area contains a single code cell with the prompt `In []:` and a cursor. At the bottom right, a status bar is highlighted with a blue box and a blue arrow pointing to it from the text "Barra de estado". This status bar shows the text "Trusted" with a shield icon, a pencil icon, and "Python 3" with a Python logo icon.

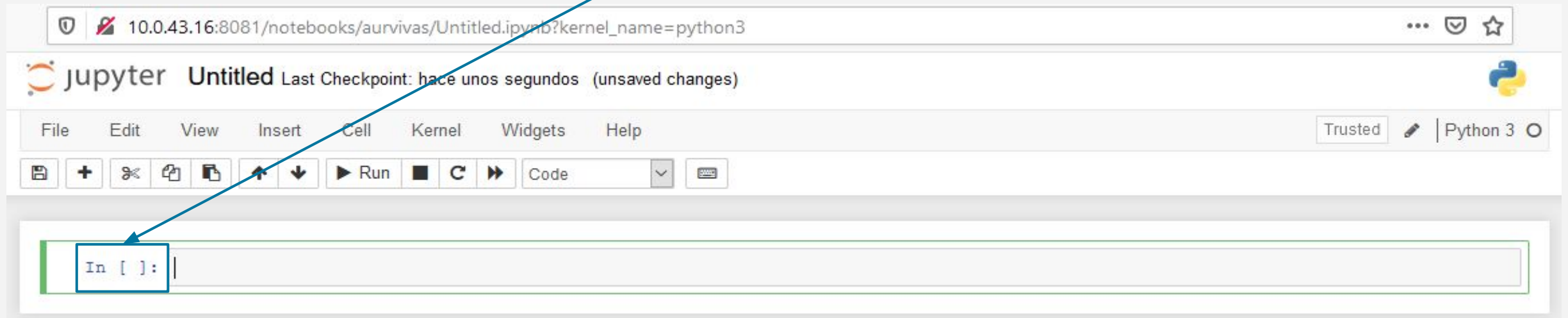
Crear mi primer notebook

Celda

The screenshot displays the Jupyter Notebook web interface. At the top, the browser address bar shows the URL: `10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3`. Below the address bar, the Jupyter logo and the title 'Untitled' are visible, along with a status message: 'Last Checkpoint: hace unos segundos (unsaved changes)'. The main menu bar includes 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', 'Widgets', and 'Help'. On the right side of the menu bar, there is a 'Trusted' button, a pencil icon, and the text 'Python 3'. The toolbar below the menu bar contains various icons for file operations (save, new, copy, paste, undo, redo) and cell actions (run, clear, reset, execute). A blue box highlights the 'Run' button and the cell type dropdown menu, which is currently set to 'Code'. A blue arrow points from the word 'Celda' to the first code cell. The code cell itself is highlighted with a blue border and contains the prompt 'In []: ' followed by a cursor.

Crear mi primer notebook

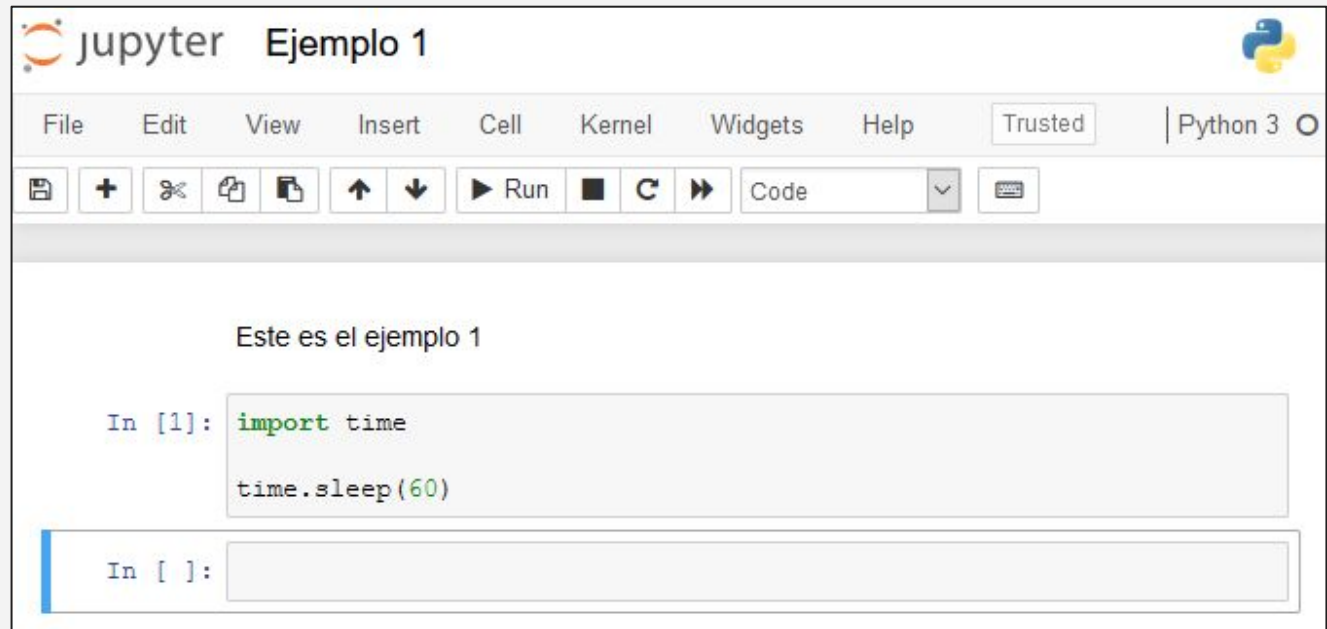
Estado de la celda



The screenshot displays the Jupyter Notebook web interface. The browser address bar shows the URL: 10.0.43.16:8081/notebooks/aurvivas/Untitled.ipynb?kernel_name=python3. The Jupyter header includes the logo, the name 'Untitled', and a message: 'Last Checkpoint: hace unos segundos (unsaved changes)'. Below the header is a menu bar with options: File, Edit, View, Insert, Cell, Kernel, Widgets, and Help. To the right of the menu bar are buttons for 'Trusted' and 'Python 3'. Below the menu bar is a toolbar with icons for saving, creating a new cell, deleting a cell, duplicating a cell, moving a cell up/down, running the cell, and other actions. The main area shows a single code cell with the prompt 'In []: |'. A blue arrow points from the text 'Estado de la celda' to the 'In []:' prompt, indicating the current state of the cell.

Ejemplo

1. Cambiar el nombre del notebook a "Ejemplo 1".
2. Crear una celda con formato "Markdown" y colocar el siguiente texto "Este es el ejemplo 1".
3. Crear una celda con formato "Code" y colocar el código mostrado en el ejemplo.
4. Ejecutar la celda que contiene el código.
5. Validar los diferentes estados del notebook.
6. [Guardar los cambios.](#)



Ejemplo

1. Apagar el notebook

1



The screenshot shows the Jupyter interface with the 'Running' tab selected. A table lists the running notebooks. The notebook 'Ejemplo 1.ipynb' is highlighted with a blue box and its selection checkbox is checked.

Name	Last Modified	File size
...	hace unos segundos	
<input checked="" type="checkbox"/> Ejemplo 1.ipynb	Running hace 16 minutos	826 B

2



The screenshot shows the Jupyter interface with the 'Running' tab selected. The 'Shutdown' button is highlighted with a blue box. The notebook 'Ejemplo 1.ipynb' is selected with a checkbox.

Name	Last Modified	File size
...	hace unos segundos	
<input checked="" type="checkbox"/> Ejemplo 1.ipynb	Running hace 17 minutos	826 B

3



The screenshot shows the Jupyter interface with the 'Running' tab selected. The notebook 'Ejemplo 1.ipynb' is highlighted with a blue box and its selection checkbox is checked. The status of the notebook is still 'Running'.

Name	Last Modified	File size
...	hace unos segundos	
<input checked="" type="checkbox"/> Ejemplo 1.ipynb	Running hace 18 minutos	826 B

Programación en Python usando notebooks

Ejercicio

1. Descargar el notebook de la práctica en mi computador
 - a. [Enlace](#)
2. Subir el notebook a mi carpeta personal en la plataforma Open Data Cube del Banco.



Departamento de Ingeniería
de Sistemas y Computación

Introducción a Python

Introducción

Python es un lenguaje de programación de propósito general que puede ser usado en variedad de aplicaciones. Python incluye estructuras de datos de alto nivel que permiten construir aplicaciones complejas rápidamente.

En el presente notebook se describen los elementos fundamentales del lenguaje de programación Python a manera de introducción.

Contenido

1. [Sintaxis](#)
2. [Variables](#)
3. [Variables y tipos de datos](#)
4. [Condicionales](#)
5. [Ciclos](#)
6. [Funciones](#)
7. [Módulos](#)

Siguiente sesión

1. **Registro en la plataforma de copernicus (Realizado)-**
<https://scihub.copernicus.eu/userguide/SelfRegistration>
2. **Manejo de la herramienta Open Data Cube**
 - a. Introducción al Open Data Cube
 - b. Flujo de trabajo para el procesamiento de imágenes satelitales
 - i. Definición del área de estudio.
 - ii. Exploración de datos disponibles sobre el área de estudio en el Data Cube Explorer.
 - iii. Descarga de una imagen satelital
 - iv. Proceso de indexación
 - v. Consulta del área de estudio
 - vi. Entendimiento de las características de la imagen obtenida
 - vii. Aplicación de algoritmos de análisis
 - viii. Visualización de resultados

Gracias