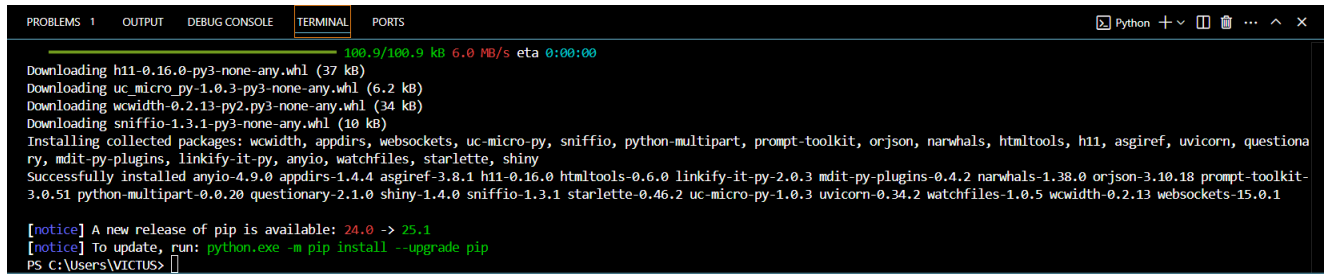
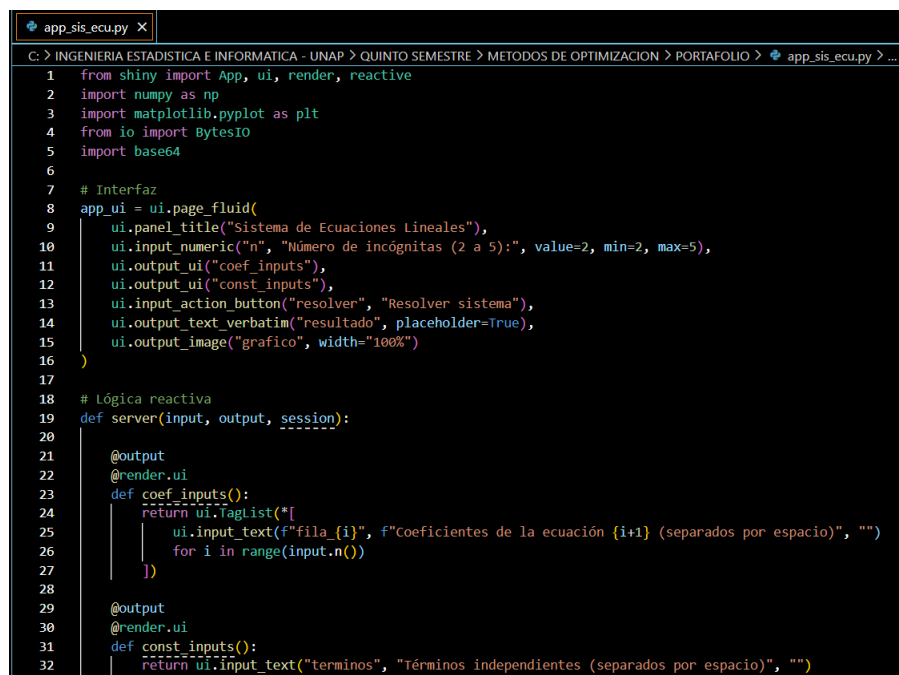


SISTEMA DE ECUACIONES



```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
100.9/100.9 kB 6.0 MB/s eta 0:00:00
Downloading h11-0.16.0-py3-none-any.whl (37 kB)
Downloading uc_micro_py-1.0.3-py3-none-any.whl (6.2 kB)
Downloading wcwidth-0.2.13-py2.py3-none-any.whl (34 kB)
Downloading sniffio-1.3.1-py3-none-any.whl (10 kB)
Installing collected packages: wcwidth, appdirs, websockets, uc-micro-py, sniffio, python-multipart, prompt-toolkit, orjson, narwhals, htmltools, h11, asgiref, uvicorn, questionary, mdit-py-plugins, linkify-it-py, anyio, watchfiles, starlette, shiny
Successfully installed anyio-4.9.0 appdirs-1.4.4 asgiref-3.8.1 h11-0.16.0 htmltools-0.6.0 linkify-it-py-2.0.3 mdit-py-plugins-0.4.2 narwhals-1.38.0 orjson-3.10.18 prompt-toolkit-3.0.51 python-multipart-0.0.20 questionary-2.1.0 shiny-1.4.0 sniffio-1.3.1 starlette-0.46.2 uc-micro-py-1.0.3 uvicorn-0.34.2 watchfiles-1.0.5 wcwidth-0.2.13 websockets-15.0.1
[notice] A new release of pip is available: 24.0 -> 25.1
[notice] To update, run: python.exe -m pip install --upgrade pip
PS C:\Users\VICTUS>
```

Figure 1: Instalación del software



```
app_sis_ecu.py X
C: > INGENIERIA ESTADISTICA E INFORMATICA - UNAP > QUINTO SEMESTRE > METODOS DE OPTIMIZACION > PORTAFOLIO > app_sis_ecu.py > ...
1 from shiny import App, ui, render, reactive
2 import numpy as np
3 import matplotlib.pyplot as plt
4 from io import BytesIO
5 import base64
6
7 # Interfaz
8 app_ui = ui.page_fluid(
9     ui.panel_title("Sistema de Ecuaciones Lineales"),
10     ui.input_numeric("n", "Número de incógnitas (2 a 5):", value=2, min=2, max=5),
11     ui.output_ui("coef_inputs"),
12     ui.output_ui("const_inputs"),
13     ui.input_action_button("resolver", "Resolver sistema"),
14     ui.output_text_verbatim("resultado", placeholder=True),
15     ui.output_image("grafico", width="100%")
16 )
17
18 # Lógica reactiva
19 def server(input, output, session):
20
21     @output
22     @render.ui
23     def coef_inputs():
24         return ui.TagList(*[
25             ui.input_text(f"fila {i}", f"Coeficientes de la ecuación {i+1} (separados por espacio)", "")
26             for i in range(input.n())
27         ])
28
29     @output
30     @render.ui
31     def const_inputs():
32         return ui.input_text("terminos", "Términos independientes (separados por espacio)", "")
```

Figure 2: Código 1

```

app_sis_ecu.py X
C: > INGENIERIA ESTADISTICA E INFORMATICA - UNAP > QUINTO SEMESTRE > METODOS DE OPTIMIZACION > PORTAFOLIO > app_sis_ecu.py > ...
19 def server(input, output, session):
20     @reactive.calc
21     @reactive.event(input.resolver)
22     def resolver_sistema():
23         n = input.n()
24         A, b = [], []
25
26         for i in range(n):
27             fila_str = input[f"fila_{i}"]().strip()
28             fila = list(map(float, fila_str.split()))
29             if len(fila) != n:
30                 raise ValueError(f"La ecuación {i+1} no tiene {n} coeficientes.")
31             A.append(fila)
32
33         b_str = input.terminos().strip()
34         b = list(map(float, b_str.split()))
35         if len(b) != n:
36             raise ValueError("El número de términos independientes no coincide con el número de incógnitas.")
37
38         A_np = np.array(A)
39         b_np = np.array(b)
40         solucion = np.linalg.solve(A_np, b_np)
41
42         return A_np, b_np, solucion
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57

```

Figure 3: Código 2

```

app_sis_ecu.py X
C: > INGENIERIA ESTADISTICA E INFORMATICA - UNAP > QUINTO SEMESTRE > METODOS DE OPTIMIZACION > PORTAFOLIO > app_sis_ecu.py > ...
19 def server(input, output, session):
20     @output
21     @render.text
22     def resultado():
23         try:
24             A_np, b_np, solucion = resolver_sistema()
25             return "Solución del sistema:\n" + "\n".join([f"x{i+1} = {solucion[i]:.4f}" for i in range(len(solucion))])
26         except ValueError as ve:
27             return f"⚠️ {ve}"
28         except np.linalg.LinAlgError as e:
29             return f"El sistema no tiene solución única:\n{str(e)}"
30         except Exception as e:
31             return f"💣 Error inesperado:\n{str(e)}"
32
33     @output
34     @render.image
35     def grafico():
36         try:
37             A_np, b_np, solucion = resolver_sistema()
38             if A_np.shape[0] != 2:
39                 return None
40
41             fig, ax = plt.subplots()
42             x_vals = np.linspace(-10, 10, 400)
43
44             for i in range(2):
45                 a, b_val = A_np[i]
46                 c = b_np[i]
47                 if b_val != 0:
48                     y_vals = (c - a * x_vals) / b_val
49                     ax.plot(x_vals, y_vals, label=f"Ecuación {i+1}")
50                 else:
51                     x_const = c / a
52                     ax.axvline(x=x_const, label=f"Ecuación {i+1}")
53
54             return fig
55
56
57
58
59
60
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62
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64
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67
68
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72
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75
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89
90

```

Figure 4: Código 3

```
app_sis_ecu.py X
C: > INGENIERIA ESTADISTICA E INFORMATICA - UNAP > QUINTO SEMESTRE > METODOS DE OPTIMIZACION > PORTAFOLIO > app_sis_ecu.py > ...
19 def server(input, output, session):
73     def grafico():
91         ax.set_xlabel("x")
92         ax.set_ylabel("y")
93         ax.set_title("Representación gráfica del sistema")
94         ax.axhline(0, color="black", linewidth=0.5)
95         ax.axvline(0, color="black", linewidth=0.5)
96         ax.grid(True)
97         ax.legend()
98         ax.plot(*solucion, 'ro')
99
100         buf = BytesIO()
101         plt.savefig(buf, format="png")
102         plt.close(fig)
103         return {"src": f"data:image/png;base64,{base64.b64encode(buf.getvalue()).decode()}", "alt": "Gráfico del sistema"}
104
105     except Exception:
106         return None
107
108 # Ejecutar la app
109 app = App(app_ui, server)
110
111
```

Figure 5: Código 4

```
C:\WINDOWS\system32\cmd. X + v
INFO: Will watch for changes in these directories: ['C:\\INGENIERIA ESTADISTICA E INFORMATICA - UNAP\\QUINTO SEMESTRE\\METODOS DE OPTIMIZACION\\PORTAFOLIO']
INFO: Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO: Started reload process [20672] using WatchFiles
INFO: Started server process [27712]
INFO: Waiting for application startup.
INFO: Application startup complete.
WARNING: WatchFiles detected changes in 'app_sis_ecu.py'. Reloading...
INFO: Shutting down
INFO: Waiting for application shutdown.
INFO: Application shutdown complete.
INFO: Finished server process [27712]
INFO: Started server process [22440]
INFO: Waiting for application startup.
INFO: Application startup complete.
WARNING: WatchFiles detected changes in 'app_sis_ecu.py'. Reloading...
INFO: Shutting down
INFO: Waiting for application shutdown.
INFO: Application shutdown complete.
INFO: Finished server process [22440]
INFO: Started server process [29588]
INFO: Waiting for application startup.
INFO: Application startup complete.
WARNING: WatchFiles detected changes in 'app_sis_ecu.py'. Reloading...
INFO: Shutting down
INFO: Waiting for application shutdown.
INFO: Application shutdown complete.
INFO: Finished server process [29588]
INFO: Started server process [27256]
INFO: Waiting for application startup.
```

Figure 6: Ejecutable del sistema

Sistema de Ecuaciones Lineales

Número de incógnitas (2 a 5):

2

Coeficientes de la ecuación 1
(separados por espacio)

1 1

Coeficientes de la ecuación 2
(separados por espacio)

5 -2

Términos independientes (separados
por espacio)

7 -7

Resolver sistema

✓ Solución del sistema:
x1 = 1.0000
x2 = 6.0000

Figure 7: Prueba final del sistema