Backtracking - N Reinas

In [2]:

```
import numpy as np
import matplotlib.pyplot as plt
```

In [3]:

```
tablero = [4, 7, 2, 6, 1, 0, 3, 5]

for row, col in enumerate(tablero):
  print(f"Hay una reina en la fila {row} columna {col}")
```

```
Hay una reina en la fila 0 columna 4
Hay una reina en la fila 1 columna 7
Hay una reina en la fila 2 columna 2
Hay una reina en la fila 3 columna 6
Hay una reina en la fila 4 columna 1
Hay una reina en la fila 5 columna 0
Hay una reina en la fila 6 columna 3
Hay una reina en la fila 7 columna 5
```

In [4]:

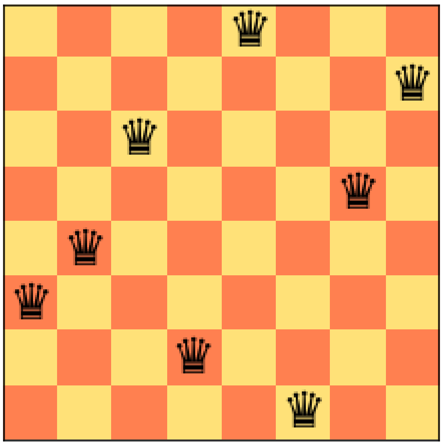
```
def draw(tablero):
  n = len(tablero)
  b = np.zeros((n, n, 3), dtype=int)
  b += [255, 128, 80]

  b[::2, ::2] = [255, 225, 120]
  b[1::2, 1::2] = [255, 225, 120]

  _, ax = plt.subplots()
  ax.imshow(b)
  for row, col in enumerate(tablero):
    ax.text(col, row, u"\u265b", fontsize=200/n, va="center", ha="center")
  ax.set(xticks=[], yticks=[])
```

In [5]:

```
draw(tablero)
```



In [6]:

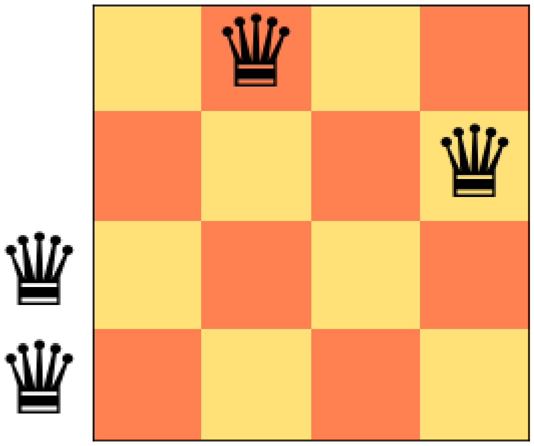
```
def validar(tablero, row, col):
  for row_i in range(row):
    col_i = tablero[row_i]
    delta = row - row_i
    if col in [col_i, col_i + delta, col_i - delta]:
      return False

  return True
```

In [7]:

```
# El uso del assert en Python nos permite verificar que una determinada condición sea True, y c
# se lanzará una excepción.

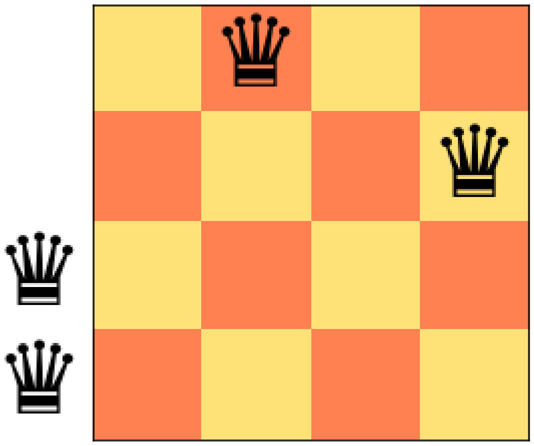
tablero = [1, 3, -1, -1]
assert validar(tablero, 2, 0) == True
draw(tablero)
```



In [13]:

```

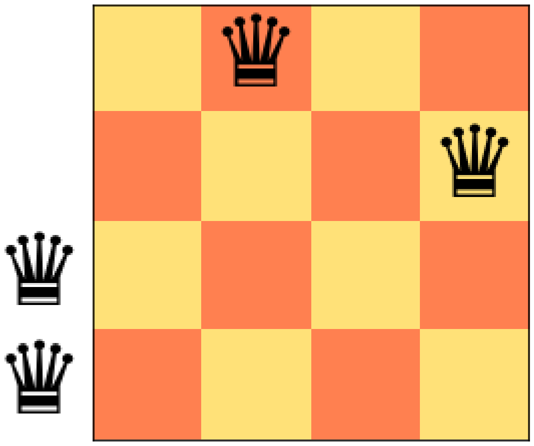
#Posiciones validas en la fil,col = 0,1 y 1,3
#Posicion no valida de una 3ra reina en el tablero, en la fil,col = 2,1
tablero = [1, 3, -1, -1]
assert validar(tablero, 2, 1) == False
draw(tablero)
```



In [14]:

```

#Posiciones validas en la fil,col = 0,1 y 1,3
#Posicion no valida de una 3ra reina en el tablero, en la fil,col = 2,2
tablero = [1, 3, -1, -1]
assert validar(tablero, 2, 2) == False
draw(tablero)
```



In [15]:

```
#Generalizamos una funcion para las N Reinas

def nqueens(tablero, row):
  n = len(tablero)
  if row == n:
    draw(tablero)
  else:
    for col in range(n):
      if validar(tablero, row, col):
        tablero[row] = col
        nqueens(tablero, row+1)
```

In [16]:

```
#Generamos una lista de 8 elementos
[-1]*4
```

Out[16]:

```
[-1, -1, -1, -1]
```

In [17]:

```
#Ejecutamos la funcion nqueens para 4 reinas
n = 16
nqueens([-1]*n, 0)
```

```
C:\Users\preye\AppData\Local\Temp/ipykernel_2080/2036741350.py:9: RuntimeWarning: More than 20
figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figu
re`) are retained until explicitly closed and may consume too much memory. (To control this war
ning, see the rcParam `figure.max_open_warning`).
  _, ax = plt.subplots()

---------------------------------------------------------------------------
MemoryError                               Traceback (most recent call last)
~\AppData\Local\Temp/ipykernel_2080/2201961297.py in <module>
      1 #Ejecutamos la funcion nqueens para 4 reinas
      2 n = 16
----> 3 nqueens([-1]*n, 0)

~\AppData\Local\Temp/ipykernel_2080/3387380846.py in nqueens(tablero, row)
      9       if validar(tablero, row, col):
     10         tablero[row] = col
---> 11         nqueens(tablero, row+1)

~\AppData\Local\Temp/ipykernel_2080/3387380846.py in nqueens(tablero, row)
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```

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~\AppData\Local\Temp/ipykernel_2080/3387380846.py in nqueens(tablero, row)
      4   n = len(tablero)
      5   if row == n:
----> 6     draw(tablero)
      7   else:
      8     for col in range(n):

~\AppData\Local\Temp/ipykernel_2080/2036741350.py in draw(tablero)
      7   b[1::2, 1::2] = [255, 225, 120]
      8 
----> 9   _, ax = plt.subplots()
     10   ax.imshow(b)
     11   for row, col in enumerate(tablero):
```

```
~\anaconda3\lib\site-packages\matplotlib\_api\deprecation.py in wrapper(*args, **kwargs)
    469                 "parameter will become keyword-only %(removal)s.",
    470                 name=name, obj_type=f"parameter of {func.__name__}()")
--> 471         return func(*args, **kwargs)
    472 
    473     return wrapper

~\anaconda3\lib\site-packages\matplotlib\pyplot.py in subplots(nrows, ncols, sharex, sharey, squeeze, subplot_kw, gridspec_kw, **fig_kw)
   1437 
   1438     """
-> 1439     fig = figure(**fig_kw)
   1440     axs = fig.subplots(nrows=nrows, ncols=ncols, sharex=sharex, sharey=sharey,
   1441                        squeeze=squeeze, subplot_kw=subplot_kw,

~\anaconda3\lib\site-packages\matplotlib\pyplot.py in figure(num, figsize, dpi, facecolor, edgecolor, frameon, FigureClass, clear, **kwargs)
    765         return num
    766 
--> 767     allnums = get_fignums()
    768     next_num = max(allnums) + 1 if allnums else 1
    769     fig_label = ''

~\anaconda3\lib\site-packages\matplotlib\pyplot.py in get_fignums()
    862 def get_fignums():
    863     """Return a list of existing figure numbers."""
--> 864     return sorted(_pylab_helpers.Gcf.figs)
    865 
    866 

MemoryError: 
---------------------------------------------------------------------------
MemoryError                               Traceback (most recent call last)
~\anaconda3\lib\site-packages\matplotlib_inline\backend_inline.py in show(close, block)
     38         close = InlineBackend.instance().close_figures
     39     try:
---> 40         for figure_manager in Gcf.get_all_fig_managers():
     41             display(
     42                 figure_manager.canvas.figure,

~\anaconda3\lib\site-packages\matplotlib\_pylab_helpers.py in get_all_fig_managers(cls)
     96     def get_all_fig_managers(cls):
     97         """Return a list of figure managers."""
---> 98         return list(cls.figs.values())
     99 
    100     @classmethod

MemoryError: 
```

```
In [ ]:
```