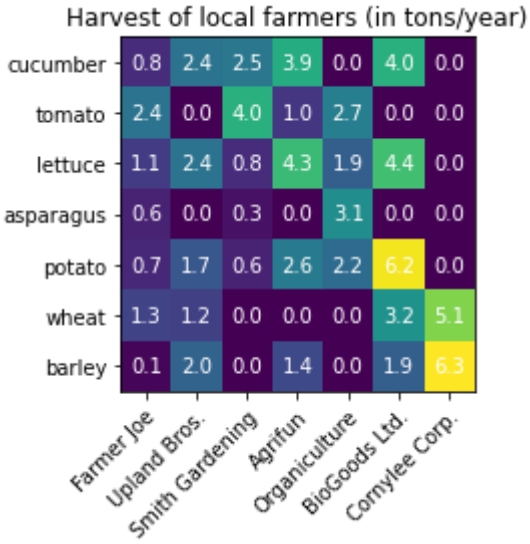
In [3]:

```
#ANNOTATED HEATMAP
import numpy as np
import matplotlib
import matplotlib.pyplot as plt

vegetables = ["cucumber", "tomato", "lettuce", "asparagus",
              "potato", "wheat", "barley"]
farmers = ["Farmer Joe", "Upland Bros.", "Smith Gardening",
           "Agrifun", "Organiculture", "BioGoods Ltd.", "Cornylee Corp."]

harvest = np.array([[0.8, 2.4, 2.5, 3.9, 0.0, 4.0, 0.0],
                    [2.4, 0.0, 4.0, 1.0, 2.7, 0.0, 0.0],
                    [1.1, 2.4, 0.8, 4.3, 1.9, 4.4, 0.0],
                    [0.6, 0.0, 0.3, 0.0, 3.1, 0.0, 0.0],
                    [0.7, 1.7, 0.6, 2.6, 2.2, 6.2, 0.0],
                    [1.3, 1.2, 0.0, 0.0, 0.0, 3.2, 5.1],
                    [0.1, 2.0, 0.0, 1.4, 0.0, 1.9, 6.3]])


fig, ax = plt.subplots()
im = ax.imshow(harvest)


ax.set_xticks(np.arange(len(farmers)), labels=farmers)
ax.set_yticks(np.arange(len(vegetables)), labels=vegetables)


plt.setp(ax.get_xticklabels(), rotation=45, ha="right",
         rotation_mode="anchor")


for i in range(len(vegetables)):
    for j in range(len(farmers)):
        text = ax.text(j, i, harvest[i, j],
                       ha="center", va="center", color="w")

ax.set_title("Harvest of local farmers (in tons/year)")
fig.tight_layout()
plt.show()
```

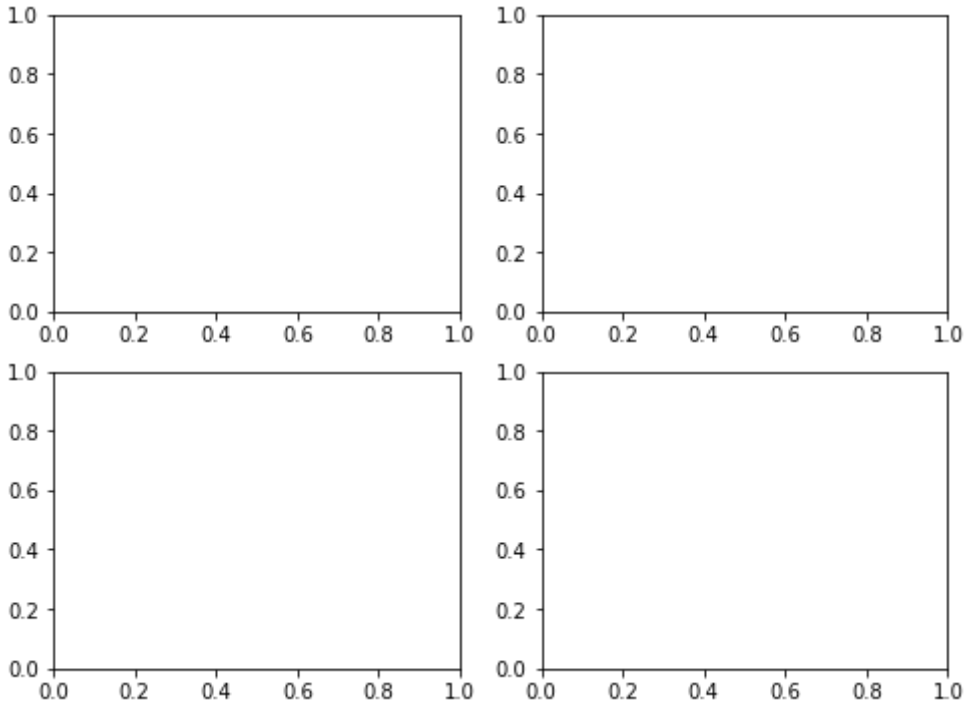


In [7]:

```
np.random.seed(19680801)
```

```
fig, ((ax, ax2), (ax3, ax4)) = plt.subplots(2, 2, figsize=(8, 6))

# Replicate the above example with a different font size and colormap.

im, _ = heatmap(harvest, vegetables, farmers, ax=ax,
                cmap="Wistia", cbarlabel="harvest [t/year]")
annotate_heatmap(im, valfmt="{x:.1f}", size=7)

# Create some new data, give further arguments to imshow (vmin),
# use an integer format on the annotations and provide some colors.

data = np.random.randint(2, 100, size=(7, 7))
y = ["Book {}".format(i) for i in range(1, 8)]
x = ["Store {}".format(i) for i in list("ABCDEFG")]
im, _ = heatmap(data, y, x, ax=ax2, vmin=0,
                cmap="magma_r", cbarlabel="weekly sold copies")
annotate_heatmap(im, valfmt="{x:d}", size=7, threshold=20,
                 textcolors=("red", "white"))

# Sometimes even the data itself is categorical. Here we use a
# `matplotlib.colors.BoundaryNorm` to get the data into classes
# and use this to colorize the plot, but also to obtain the class
# labels from an array of classes.

data = np.random.randn(6, 6)
y = ["Prod. {}".format(i) for i in range(10, 70, 10)]
x = ["Cycle {}".format(i) for i in range(1, 7)]

qrates = list("ABCDEFG")
norm = matplotlib.colors.BoundaryNorm(np.linspace(-3.5, 3.5, 8), 7)
fmt = matplotlib.ticker.FuncFormatter(lambda x, pos: qrates[::-1][norm(x)])

im, _ = heatmap(data, y, x, ax=ax3,
                cmap=plt.get_cmap("PiYG", 7), norm=norm,
                cbar_kw=dict(ticks=np.arange(-3, 4), format=fmt),
                cbarlabel="Quality Rating")

annotate_heatmap(im, valfmt=fmt, size=9, fontweight="bold", threshold=-1,
                 textcolors=("red", "black"))

# We can nicely plot a correlation matrix. Since this is bound by -1 and 1,
# we use those as vmin and vmax. We may also remove leading zeros and hide
# the diagonal elements (which are all 1) by using a
# `matplotlib.ticker.FuncFormatter`.

corr_matrix = np.corrcoef(harvest)
im, _ = heatmap(corr_matrix, vegetables, vegetables, ax=ax4,
                cmap="PuOr", vmin=-1, vmax=1,
                cbarlabel="correlation coeff.")


def func(x, pos):
    return "{:.2f}".format(x).replace("0.", ".").replace("1.00", "")

annotate_heatmap(im, valfmt=matplotlib.ticker.FuncFormatter(func), size=7)


plt.tight_layout()
plt.show()
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
~\AppData\Local\Temp\ipykernel_12752\619406883.py in <module>
      5 # Replicate the above example with a different font size and colormap.
      6
----> 7 im, _ = heatmap(harvest, vegetables, farmers, ax=ax,
      8                  cmap="Wistia", cbarlabel="harvest [t/year]")
      9 annotate_heatmap(im, valfmt="{x:.1f}", size=7)

NameError: name 'heatmap' is not defined
```



In [1]:

```
def heatmap(data, row_labels, col_labels, ax=None,
            cbar_kw={}, cbarlabel="", **kwargs):

    if not ax:
        ax = plt.gca()

    # Plot the heatmap
    im = ax.imshow(data, **kwargs)

    # Create colorbar
    cbar = ax.figure.colorbar(im, ax=ax, **cbar_kw)
    cbar.ax.set_ylabel(cbarlabel, rotation=-90, va="bottom")

    # Show all ticks and label them with the respective list entries.
    ax.set_xticks(np.arange(data.shape[1]), labels=col_labels)
    ax.set_yticks(np.arange(data.shape[0]), labels=row_labels)

    # Let the horizontal axes labeling appear on top.
    ax.tick_params(top=True, bottom=False,
                   labeltop=True, labelbottom=False)

    # Rotate the tick labels and set their alignment.
    plt.setp(ax.get_xticklabels(), rotation=-30, ha="right",
             rotation_mode="anchor")

    # Turn spines off and create white grid.
    ax.spines[:].set_visible(False)

    ax.set_xticks(np.arange(data.shape[1]+1)-.5, minor=True)
    ax.set_yticks(np.arange(data.shape[0]+1)-.5, minor=True)
```

```
    ax.grid(which="minor", color="w", linestyle='-', linewidth=3)
    ax.tick_params(which="minor", bottom=False, left=False)

    return im, cbar


def annotate_heatmap(im, data=None, valfmt="{x:.2f}",
                     textcolors=("black", "white"),
                     threshold=None, **textkw):


    if not isinstance(data, (list, np.ndarray)):
        data = im.get_array()

    # Normalize the threshold to the images color range.
    if threshold is not None:
        threshold = im.norm(threshold)
    else:
        threshold = im.norm(data.max())/2.

    # Set default alignment to center, but allow it to be
    # overwritten by textkw.
    kw = dict(horizontalalignment="center",
              verticalalignment="center")
    kw.update(textkw)

    # Get the formatter in case a string is supplied
    if isinstance(valfmt, str):
        valfmt = matplotlib.ticker.StrMethodFormatter(valfmt)

    # Loop over the data and create a `Text` for each "pixel".
    # Change the text's color depending on the data.
    texts = []
    for i in range(data.shape[0]):
        for j in range(data.shape[1]):
            kw.update(color=textcolors[int(im.norm(data[i, j]) > threshold)])
            text = im.axes.text(j, i, valfmt(data[i, j], None), **kw)
            texts.append(text)

    return texts
```

In [3]:

```
#HATCH FILLED HISTOGRAMS
import itertools
from functools import partial

import numpy as np
import matplotlib.pyplot as plt
import matplotlib.ticker as mticker
from cycler import cycler


def filled_hist(ax, edges, values, bottoms=None, orientation='v',
                **kwargs):


    print(orientation)
    if orientation not in 'hv':
        raise ValueError("orientation must be in {{'h', 'v'}} "
                         "not {o}".format(o=orientation))

    kwargs.setdefault('step', 'post')
    kwargs.setdefault('alpha', 0.7)
    edges = np.asarray(edges)
```

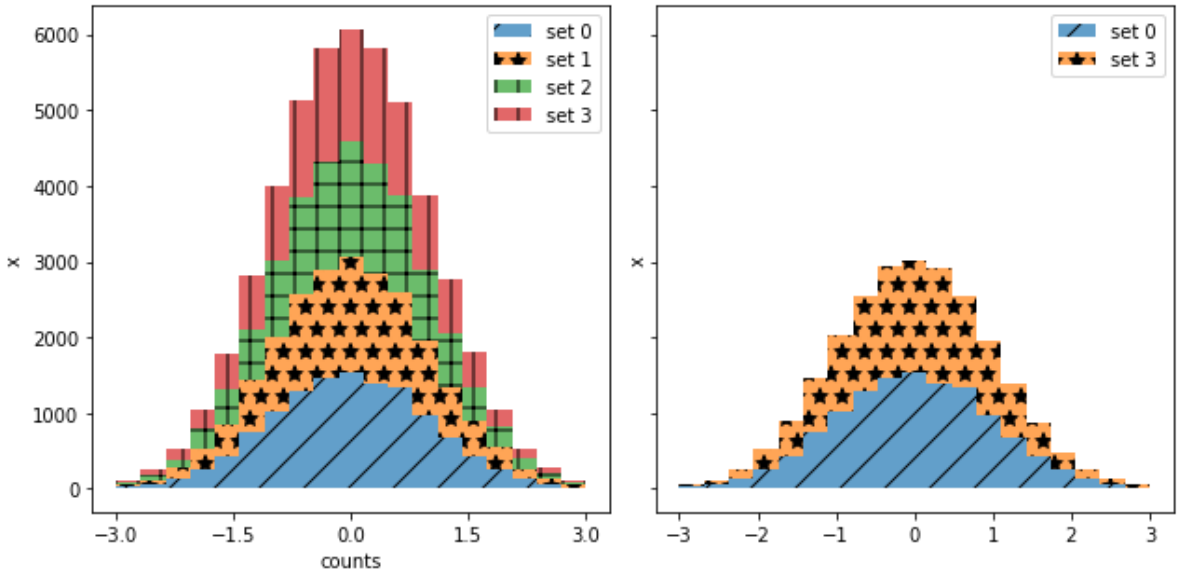
```
    values = np.asarray(values)
    if len(edges) - 1 != len(values):
        raise ValueError('Must provide one more bin edge than value not: '
                         'len(edges): {lb} len(values): {lv}'.format(
                             lb=len(edges), lv=len(values)))

    if bottoms is None:
        bottoms = 0
    bottoms = np.broadcast_to(bottoms, values.shape)

    values = np.append(values, values[-1])
    bottoms = np.append(bottoms, bottoms[-1])
    if orientation == 'h':
        return ax.fill_betweenx(edges, values, bottoms,
                                **kwargs)
    elif orientation == 'v':
        return ax.fill_between(edges, values, bottoms,
                               **kwargs)
    else:
        raise AssertionError("you should never be here")


def stack_hist(ax, stacked_data, sty_cycle, bottoms=None,
               hist_func=None, labels=None,
               plot_func=None, plot_kwargs=None):

    # deal with default binning function
    if hist_func is None:
        hist_func = np.histogram

    # deal with default plotting function
    if plot_func is None:
        plot_func = filled_hist

    # deal with default
    if plot_kwargs is None:
        plot_kwargs = {}
    print(plot_kwargs)
    try:
        l_keys = stacked_data.keys()
        label_data = True
        if labels is None:
            labels = l_keys

    except AttributeError:
        label_data = False
        if labels is None:
            labels = itertools.repeat(None)

    if label_data:
        loop_iter = enumerate((stacked_data[lab], lab, s)
                              for lab, s in zip(labels, sty_cycle))
    else:
        loop_iter = enumerate(zip(stacked_data, labels, sty_cycle))

    arts = {}
    for j, (data, label, sty) in loop_iter:
        if label is None:
            label = 'dflt set {n}'.format(n=j)
        label = sty.pop('label', label)
        vals, edges = hist_func(data)
        if bottoms is None:
            bottoms = np.zeros_like(vals)
        top = bottoms + vals
```

```
        print(sty)
        sty.update(plot_kwargs)
        print(sty)
        ret = plot_func(ax, edges, top, bottoms=bottoms,
                        label=label, **sty)
        bottoms = top
        arts[label] = ret
    ax.legend(fontsize=10)
    return arts


# set up histogram function to fixed bins
edges = np.linspace(-3, 3, 20, endpoint=True)
hist_func = partial(np.histogram, bins=edges)

# set up style cycles
color_cycle = cycler(facecolor=plt.rcParams['axes.prop_cycle'][:4])
label_cycle = cycler(label=['set {n}'.format(n=n) for n in range(4)])
hatch_cycle = cycler(hatch=['/', '*', '+', '|'])

# Fixing random state for reproducibility
np.random.seed(19680801)

stack_data = np.random.randn(4, 12250)
dict_data = dict(zip((c['label'] for c in label_cycle), stack_data))
```

In [4]:

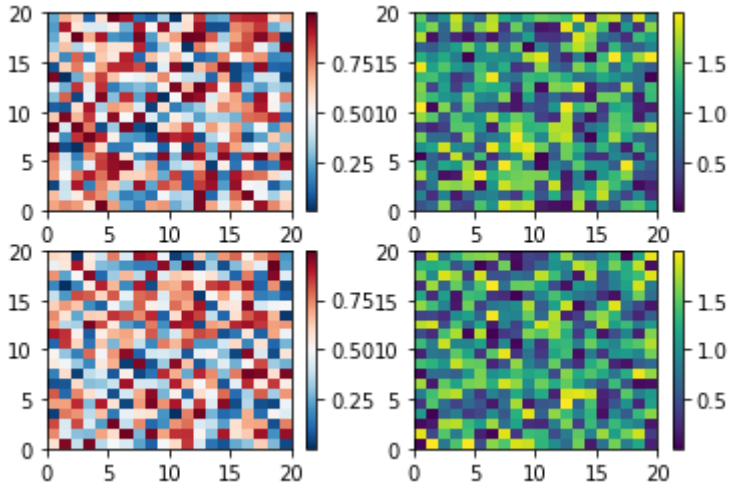
```
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(9, 4.5),
                               tight_layout=True, sharey=True)

arts = stack_hist(ax1, dict_data, color_cycle + hatch_cycle,
                  hist_func=hist_func)

arts = stack_hist(ax2, dict_data, color_cycle + hatch_cycle,
                  hist_func=hist_func, labels=['set 0', 'set 3'])
ax1.xaxis.set_major_locator(mticker.MaxNLocator(5))
ax1.set_xlabel('counts')
ax1.set_ylabel('x')
ax2.set_ylabel('x')

plt.show()
```

```
{}
{'facecolor': '#1f77b4', 'hatch': '/'}
{'facecolor': '#1f77b4', 'hatch': '/'}
v
{'facecolor': '#ff7f0e', 'hatch': '*'}
{'facecolor': '#ff7f0e', 'hatch': '*'}
v
{'facecolor': '#2ca02c', 'hatch': '+'}
{'facecolor': '#2ca02c', 'hatch': '+'}
v
{'facecolor': '#d62728', 'hatch': '|'}
{'facecolor': '#d62728', 'hatch': '|'}
v
{}
{'facecolor': '#1f77b4', 'hatch': '/'}
{'facecolor': '#1f77b4', 'hatch': '/'}
v
{'facecolor': '#ff7f0e', 'hatch': '*'}
{'facecolor': '#ff7f0e', 'hatch': '*'}
v
```



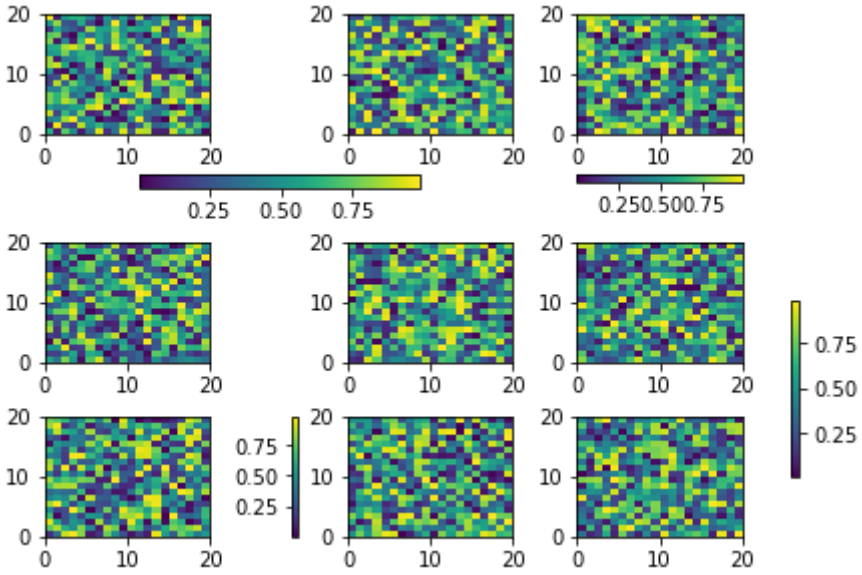
In [5]:

```
#PLACING COLOR BARS
import matplotlib.pyplot as plt
import numpy as np


# Fixing random state for reproducibility
np.random.seed(19680801)

fig, axs = plt.subplots(2, 2)
cmaps = ['RdBu_r', 'viridis']
for col in range(2):
    for row in range(2):
        ax = axs[row, col]
        pcm = ax.pcolormesh(np.random.random((20, 20)) * (col + 1),
                            cmap=cmaps[col])
        fig.colorbar(pcm, ax=ax)
plt.show()
```



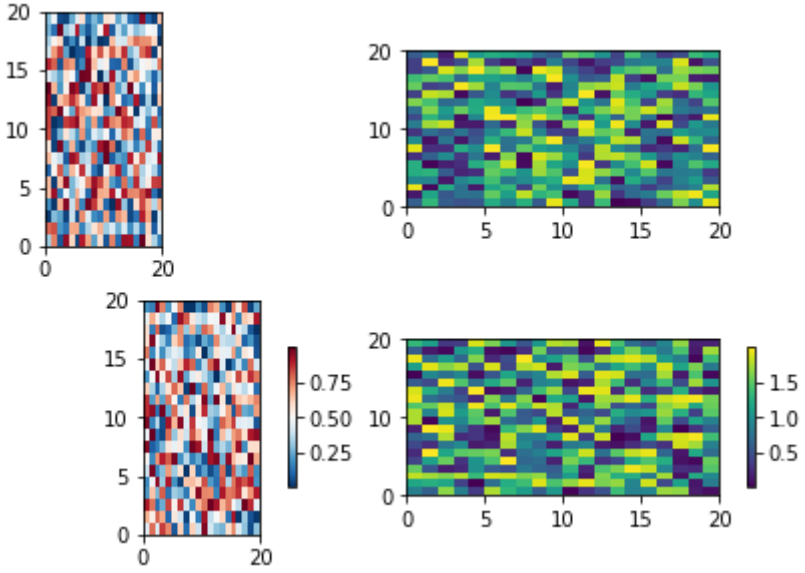
In [6]:

```
fig, axs = plt.subplots(3, 3, constrained_layout=True)
for ax in axs.flat:
    pcm = ax.pcolormesh(np.random.random((20, 20)))

fig.colorbar(pcm, ax=axs[0, :2], shrink=0.6, location='bottom')
fig.colorbar(pcm, ax=[axs[0, 2]], location='bottom')
fig.colorbar(pcm, ax=axs[1:, :], location='right', shrink=0.6)
fig.colorbar(pcm, ax=[axs[2, 1]], location='left')
plt.show()
```



In [7]:

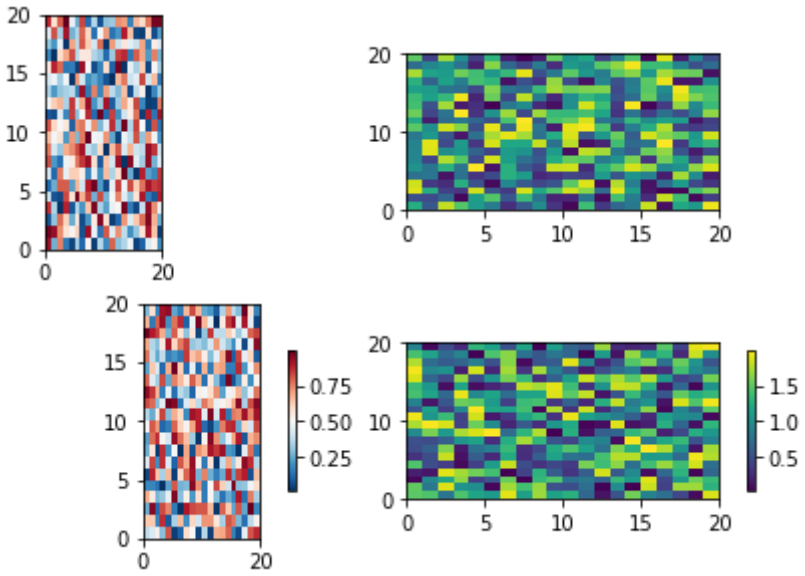
```
fig, axs = plt.subplots(2, 2,  constrained_layout=True)
cmaps = ['RdBu_r', 'viridis']
for col in range(2):
    for row in range(2):
        ax = axs[row, col]
        pcm = ax.pcolormesh(np.random.random((20, 20)) * (col + 1),
                            cmap=cmaps[col])
        if col == 0:
            ax.set_aspect(2)
        else:
            ax.set_aspect(1/2)
        if row == 1:
            fig.colorbar(pcm, ax=ax, shrink=0.6)
plt.show()
```



In [8]:

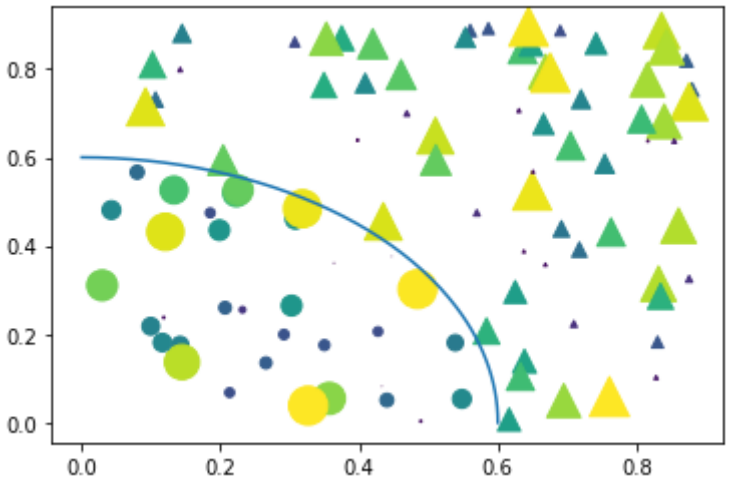
```
fig, axs = plt.subplots(2, 2,  constrained_layout=True)
cmaps = ['RdBu_r', 'viridis']
for col in range(2):
    for row in range(2):
        ax = axs[row, col]
        pcm = ax.pcolormesh(np.random.random((20, 20)) * (col + 1),
                            cmap=cmaps[col])
        if col == 0:
```

```
            ax.set_aspect(2)
        else:
            ax.set_aspect(1/2)
        if row == 1:
            fig.colorbar(pcm, ax=ax, shrink=0.6)
plt.show()
```



In [9]:

```
#SCATTERED MASK
import matplotlib.pyplot as plt
import numpy as np

# Fixing random state for reproducibility
np.random.seed(19680801)


N = 100
r0 = 0.6
x = 0.9 * np.random.rand(N)
y = 0.9 * np.random.rand(N)
area = (20 * np.random.rand(N))**2  # 0 to 10 point radii
c = np.sqrt(area)
r = np.sqrt(x ** 2 + y ** 2)
area1 = np.ma.masked_where(r < r0, area)
area2 = np.ma.masked_where(r >= r0, area)
plt.scatter(x, y, s=area1, marker='^', c=c)
plt.scatter(x, y, s=area2, marker='o', c=c)
# Show the boundary between the regions:
theta = np.arange(0, np.pi / 2, 0.01)
plt.plot(r0 * np.cos(theta), r0 * np.sin(theta))

plt.show()
```



In [ ]: