In [10]:
```python
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
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"""

import numpy as np
import matplotlib as mpl
import matplotlib.pyplot as plt
import requiredFunctions.sompy as sompy
# Settings for plots
width = 10
height = 10

mpl.rcParams['figure.figsize'] = (width, height)
mpl.rcParams['font.size'] = 18
mpl.rcParams['figure.titlesize'] = 'small'
mpl.rcParams['legend.fontsize'] = 'small'
mpl.rcParams['xtick.major.size'] = 12
mpl.rcParams['xtick.minor.size'] = 8
mpl.rcParams['xtick.labelsize'] = 18
mpl.rcParams['ytick.major.size'] = 12
mpl.rcParams['ytick.minor.size'] = 8
mpl.rcParams['ytick.labelsize'] = 18
cmap = plt.get_cmap('tab20')
cmap = mpl.colors.ListedColormap(cmap((1, 7, 5)))

# Data in column form, transpose into row form
data = np.loadtxt('../data/animals.txt').T
names = ['Dove', 'Hen', 'Duck', 'Goose', 'Owl', 'Hawk', 'Eagle', 'Fox', 'Dog',
         'Wolf', 'Cat', 'Tiger', 'Lion', 'Horse', 'Zebra', 'Cow', 'Bear']
nrows = 16
ncols = 16
'''
NOTE! Library used requires to run setup.py first (located in requiredFunctions)
'''
som = sompy.SOMFactory.build(data, (nrows, ncols))
som.train(verbose=0, train_rough_radiusin=2, train_finetune_radiusin=2,
          train_rough_len=2500, train_finetune_len=0)
u_matrix = som.build_u_matrix(som)
xx, yy = np.meshgrid(np.arange(0,nrows, 1), np.arange(0,ncols, 1))

# Part A
all_nodes = som.bmu_ind_to_xy(som.find_bmu(data)[0])[:,:2]
fig, ax = plt.subplots()
ax.axis('off')
ax.scatter(xx, yy, u_matrix*1000, edgecolor='gray', marker='h', facecolors='none
')
for i in range(len(all_nodes)):
    ax.text(all_nodes[i,1], all_nodes[i,0], names[i], rotation=-45,
            horizontalalignment='center', verticalalignment='center')
fig.tight_layout(pad=0.5)
#fig.savefig('../prob1b.eps', dpi=500)
```
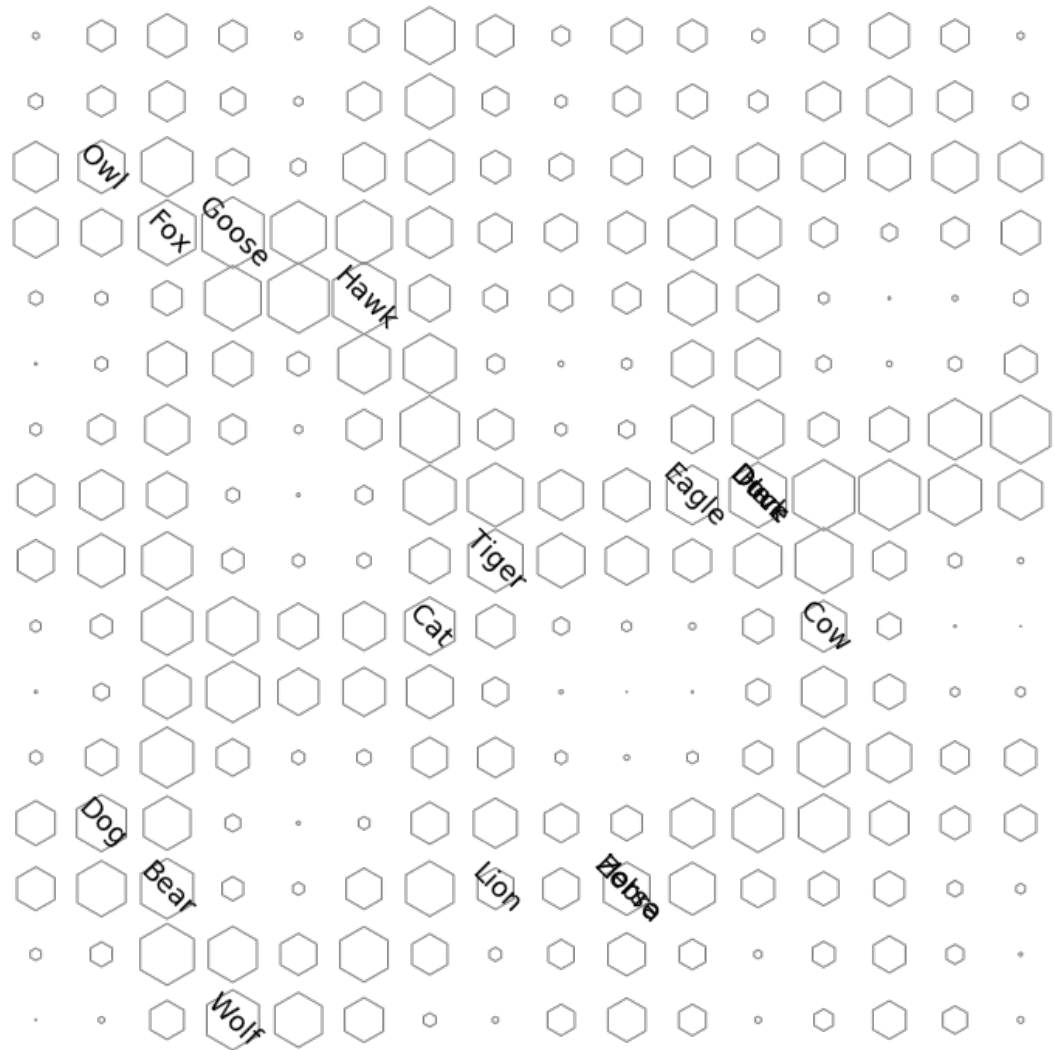
In [11]:
```python
# Part B
# Feautre 1
sizes = np.asarray([som.codebook.matrix[:,0].reshape(nrows, ncols),
                    som.codebook.matrix[:,1].reshape(nrows, ncols),
                    som.codebook.matrix[:,2].reshape(nrows, ncols)])
size_labels = sizes.argmax(axis=0)

fig2 = plt.figure()
ax2, ax3, ax4 = [plt.subplot2grid((4,4), (0,0), colspan=2, rowspan = 2, fig=fig
2),
                 plt.subplot2grid((4,4), (0,2), colspan=2, rowspan = 2, fig=fig
2),
                 plt.subplot2grid((4,4), (2,1), colspan=2, rowspan = 2, fig=fig
2)]
ax2.axis('off')
ax2.scatter(xx, yy, u_matrix*250, c=size_labels, cmap=cmap,
            edgecolor='gray', marker='h', facecolors='none')
ax2.text(10, 13, 'Small', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')
ax2.text(3, 13, 'Medium', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')
ax2.text(9, 5, 'Large', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')

# Feature 2
legs = np.asarray([som.codebook.matrix[:,3].reshape(nrows, ncols),
                   som.codebook.matrix[:,4].reshape(nrows, ncols)])
legs_labels = legs.argmax(axis=0)

ax3.axis('off')
ax3.scatter(xx, yy, u_matrix*250, c=legs_labels, cmap=cmap,
            edgecolor='gray', marker='h', facecolors='none')
ax3.text(6, 4, '4 Legs', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')
ax3.text(10, 12, '2 Legs', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')

# Feature 3
hunts = np.asarray([som.codebook.matrix[:,-4].reshape(nrows, ncols),
                    -som.codebook.matrix[:,-4].reshape(nrows, ncols)])
hunts_labels = hunts.argmax(axis=0)

ax4.axis('off')
ax4.scatter(xx, yy, u_matrix*250, c=hunts_labels, cmap=cmap,
            edgecolor='gray', marker='h', facecolors='none')
ax4.text(13, 11, "Don't Hunt", fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')
ax4.text(7, 7, 'Hunt', fontsize='medium', fontweight='bold',
         horizontalalignment='center', verticalalignment='center')
fig2.tight_layout(pad=0.5)
#fig2.savefig('../prob1c.eps', dpi=500)
```
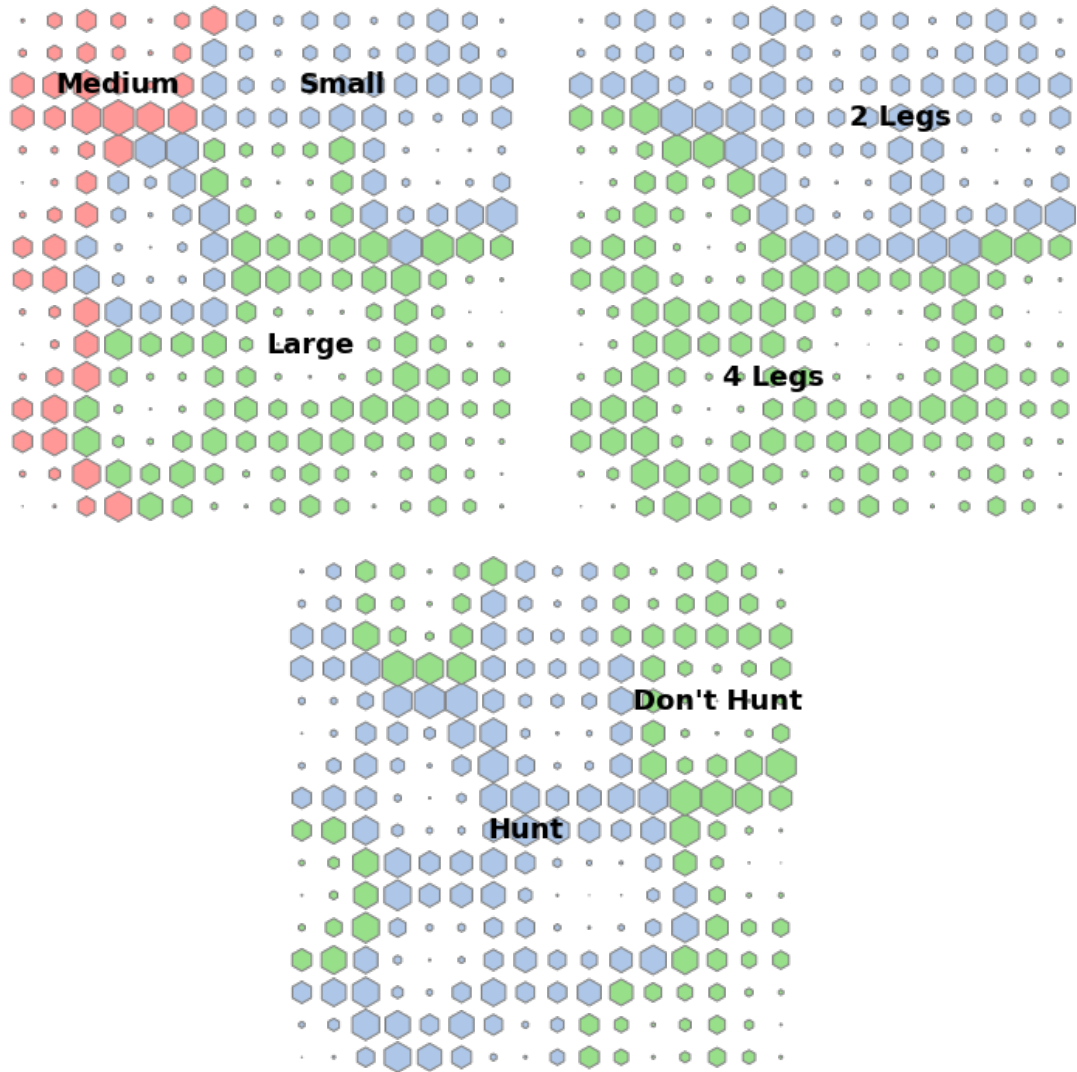
Medium **Small**

Large

2 Legs

4 Legs

Don't Hunt

Hunt

In [ ]: