Task 2 List Generation

```
In[ ]:= SetDirectory["C:\\Users\\Saesun Kim\\Documents\\Team10\\Week2_Rydberg_Atoms"]
        data = Import["task2_data.dat", "List"];
```

```
Out[ ]= C:\Users\Saesun Kim\Documents\Team10\Week2_Rydberg_Atoms
```

```
In[ ]:= dataList = Table[StringTake[data[[i]], 6], {i, 1, Length[data]}];
```

```
Out[ ]= {{110100, 2877}, {010101, 2845}, {011100, 2808}, {011101, 276}, {001100, 79}, {100100, 69},
  {000101, 86}, {110001, 7}, {011000, 73}, {010100, 60}, {110101, 297}, {111100, 283},
  {010001, 87}, {110000, 86}, {100110, 1}, {001010, 10}, {111000, 8}, {101100, 6},
  {001101, 3}, {011001, 6}, {100101, 7}, {000100, 2}, {000011, 10}, {100010, 6},
  {000111, 1}, {010000, 1}, {101010, 1}, {001011, 2}, {000001, 1}, {001000, 1}, {100000, 1}}
```

```
In[ ]:= Block[{t = SortBy[Tally[dataList], Last]},
         TableForm[t, TableHeadings → {None, {"Number", "Frequency"}}]]
```

Out[ ]//TableForm=

Number	Frequency
000001	1
000111	1
001000	1
010000	1
100000	1
100110	1
101010	1
000100	2
001011	2
001101	3
011001	6
100010	6
101100	6
100101	7
110001	7
111000	8
000011	10
001010	10
010100	60
100100	69
011000	73
001100	79
000101	86
110000	86
010001	87
011101	276
111100	283
110101	297
011100	2808
010101	2845
110100	2877

Task1-2 (The bit-string order is Reversed!)

In[556]:=
```
graph =
 {{0.3461717838632017, 1.4984640297338632}, {0.6316400411846113, 2.5754677320579895},
  {1.3906262250927481, 2.164978861396621}, {0.66436005100802, 0.6717919819739032},
  {0.8663329771713457, 3.3876341010035995}, {1.1643107343501296, 1.0823066243402013}}
```

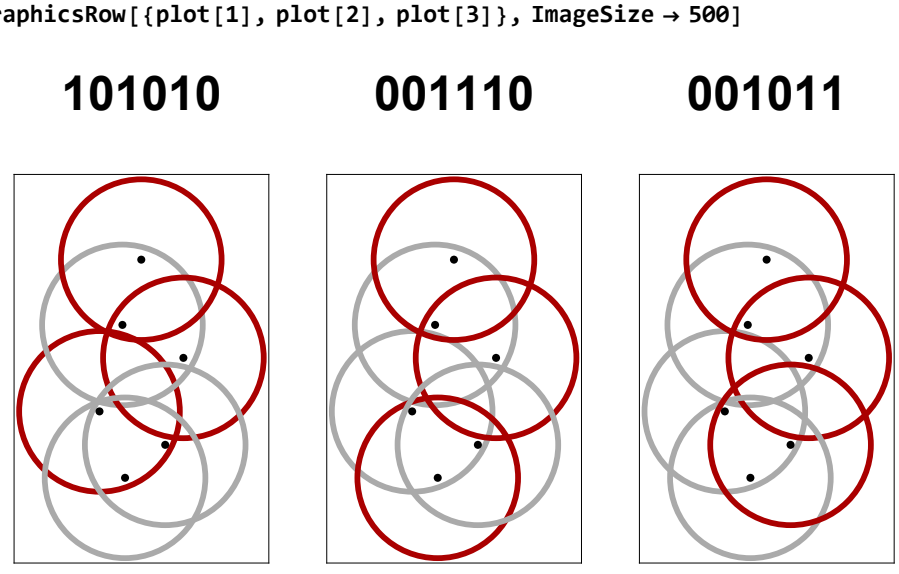
Out[556]=
```
{{0.346172, 1.49846}, {0.63164, 2.57547}, {1.39063, 2.16498},
 {0.66436, 0.671792}, {0.866333, 3.38763}, {1.16431, 1.08231}}
```

In[557]:=
```
labels = {"1", "2", "3", "4", "5", "6"};
```

In[558]:=
```
solutions = {{1, 3, 5}, {3, 4, 5}, {3, 5, 6}};
solLabels = {"101010", "001110", "001011"};
plot[i1_] := Module[{T, colorList, bList, circles, color2, color1, dots},
  T = 1;
  color1 = Lighter[Gray];
  color2 = Darker[Red];
  colorList = {If[MemberQ[solutions[[i1]], 1], color2, color1],
    If[MemberQ[solutions[[i1]], 2], color2, color1],
    If[MemberQ[solutions[[i1]], 3], color2, color1],
    If[MemberQ[solutions[[i1]], 4], color2, color1], If[MemberQ[solutions[[i1]], 5], color2,
     color1], If[MemberQ[solutions[[i1]], 6], color2, color1]};
  bList = {#} & /@ graph;
  circles =
   {colorList[[#]], AbsoluteThickness[3], Circle[graph[[#]], T]} & /@ Table[i, {i, 1, 6}];
  dots = {Black, Disk[graph[[#]], 0.05]} & /@ Table[i, {i, 1, 6}];
  Graphics[Flatten[{circles, dots}, 1], Frame → True, FrameTicks → None,
   PlotLabel → Style[ToString[solLabels[[i1]]], Bold, 25, Black]]]
```

In[561]:=
```
GraphicsRow[{plot[1], plot[2], plot[3]}, ImageSize → 500]
```

Out[561]=



In[439]:=
```
SetDirectory["C:\\Users\\Saesun Kim\\Documents\\Team10\\Week2_Rydberg_Atoms\\Graphics"]
Export["101010c.jpg", plot[1]]
Export["001110c.jpg", plot[2]]
Export["001011c.jpg", plot[3]]
```

Out[439]= C:\Users\Saesun Kim\Documents\Team10\Week2_Rydberg_Atoms\Graphics

Out[440]= 101010c.jpg

Out[441]= 001110c.jpg

Out[442]= 001011c.jpg

Task 3 List Generation

In[485]:=
```
SetDirectory["C:\\Users\\Saesun Kim\\Documents\\Team10\\Week2_Rydberg_Atoms"]
data = Import["task3_data.dat", "List"];
```

Out[485]= C:\Users\Saesun Kim\Documents\Team10\Week2_Rydberg_Atoms

In[487]:=
```
dataList = Table[StringTake[data[[i]], 12], {i, 1, Length[data]}];
```

In[488]:=
```
Block[{t = SortBy[Tally[dataList], Last]},
 TableForm[t, TableHeadings → {None, {"Number", "Frequency"}}]]
```

Out[488]//TableForm=

Number	Frequency
000000011011	1
000001000011	1
000001000110	1
000001011011	1
000010010001	1
000010011011	1
000011000011	1
000011000100	1
000100010001	1
000100011000	1
000101011001	1
000111000110	1
001000011011	1
001001010011	1
001100011001	1
010000011000	1
010000101011	1
010000110011	1
010000111001	1
010001000100	1
010001011011	1
010010011001	1
010100011001	1
010101010001	1
011000000001	1
011000001011	1

```
011000001100    1
011000010001    1
011000100011    1
011000100110    1
011001000011    1
011001000110    1
011100011001    1
100000010001    1
100000100001    1
100000100010    1
100000101011    1
100001000010    1
100001000100    1
100001000111    1
100001011001    1
100011000011    1
100011000110    1
100011011001    1
100100010011    1
100100011001    1
100101000110    1
101000010000    1
101000011010    1
101001000110    1
101010010011    1
110000011001    1
110001000110    1
110001010000    1
110001010001    1
110001010010    1
111000000001    1
111000000010    1
111000010000    1
111000010001    1
111000010010    1
111000011000    1
000010010011    2
000100011011    2
000101000011    2
010000001001    2
010000011011    2
011000000010    2
011000010000    2
100000011011    2
100000111001    2
100001100110    2
111000001001    2
000000011001    3
000011010001    3
000100010011    3
```

```
000110011001    3
100010011001    3
111000000110    3
111000011011    3
010000100110    4
010101000110    4
100000010011    4
111001010011    4
000101010001    5
010001011001    5
101000000011    5
010000010011    6
100001010010    6
010001010001    7
101000011000    7
010000100011    8
100000100110    8
101000001001    8
010001010010    9
011000000011    9
100001010001    9
101000010001    10
011000011000    11
100000011001    14
100000100011    14
100001000011    17
101000000110    17
001000011001    19
010001000011    19
010001000110    19
011000000110    19
011000001001    20
010000011001    23
100001000110    23
010000101001    25
111000011001    25
010011010011    26
100000101001    26
000101000110    27
011000010010    27
100101010011    28
101000010010    30
000011000110    32
100011010011    33
000010011001    35
000111010011    36
001000010011    37
010101010011    38
101000011011    45
111000010011    49
```

```
000100011001    51
011000011011    53
110001010011    56
101001010011    90
011001010011    99
000001010011    125
011000011001    283
101000011001    292
000101010011    964
000011010011    974
011000010011    1255
101000010011    1276
100001010011    1753
010001010011    1772
```

Task 2 Visualization (The bit-string order is Reversed!)

In[528]:=
```
graph1 = {{1.19, 4.25}, {2.71, 3.48}, {1.19, 3.51}, {2, 3.38}, {1.12, 2.86}, {1.70, 2.42},
   {2.36, 2.54}, {1.52, 1.48}, {2.15, 1.54}, {2.14, 1.87}, {1.72, 0.86}, {2.29, 0.87}};
solLabels = {"011000010011", "101000010011", "100001010011", "010001010011"};
Do[f[j] = {}, {j, 1, 4}];
Do[If[StringPart[solLabels[[j]], i] == "1", f[j] = Append[f[j], 13 - i]],
 {i, 1, 12}, {j, 1, 4}]
solutions = Table[f[j], {j, 1, 4}]
```

Out[532]=
```
{{11, 10, 5, 2, 1}, {12, 10, 5, 2, 1}, {12, 7, 5, 2, 1}, {11, 7, 5, 2, 1}}
```

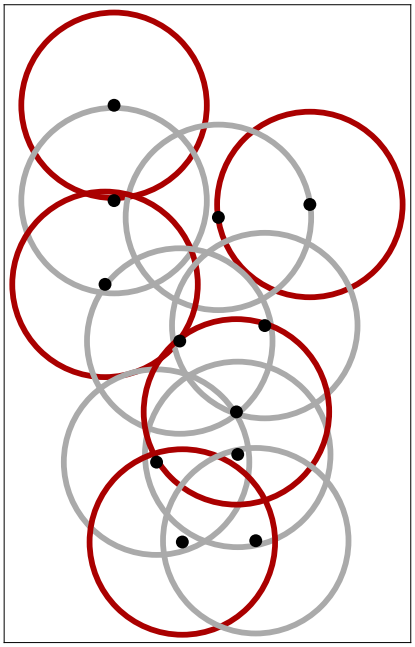
In[542]:=
```
plot[i1_] := Module[{T, colorList, bList, circles, color2, color1, dots},
  T = 0.72;
  color1 = Lighter[Gray];
  color2 = Darker[Red];
  colorList = {If[MemberQ[solutions[[i1]], 1], color2, color1],
    If[MemberQ[solutions[[i1]], 2], color2, color1],
    If[MemberQ[solutions[[i1]], 3], color2, color1],
    If[MemberQ[solutions[[i1]], 4], color2, color1], If[MemberQ[solutions[[i1]], 5], color2,
     color1], If[MemberQ[solutions[[i1]], 6], color2, color1],
    If[MemberQ[solutions[[i1]], 7], color2, color1], If[MemberQ[solutions[[i1]], 8],
     color2, color1], If[MemberQ[solutions[[i1]], 9], color2, color1],
    If[MemberQ[solutions[[i1]], 10], color2, color1], If[MemberQ[solutions[[i1]], 11],
     color2, color1], If[MemberQ[solutions[[i1]], 12], color2, color1]};
  bList = {#} & /@ graph;
  circles =
   {colorList[[#]], AbsoluteThickness[3], Circle[graph1[[#]], T]} & /@ Table[i, {i, 1, 12}];
  dots = {Black, Disk[graph1[[#]], 0.05]} & /@ Table[i, {i, 1, 12}];
  Graphics[Flatten[{circles, dots}, 1], Frame → True, FrameTicks → None,
   PlotLabel → Style[ToString[solLabels[[i1]]], Bold, 25, Black]]]
```

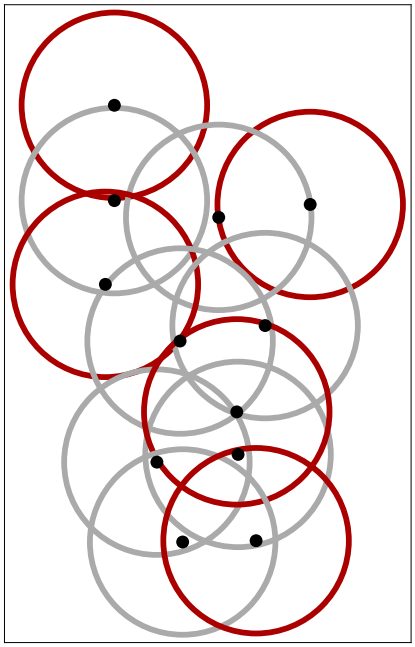
In[554]:=
```
GraphicsRow[{plot[1], plot[2]}, ImageSize → 500]
GraphicsRow[{plot[3], plot[4]}, ImageSize → 500]
```

011000010011

101000010011

Out[554]=

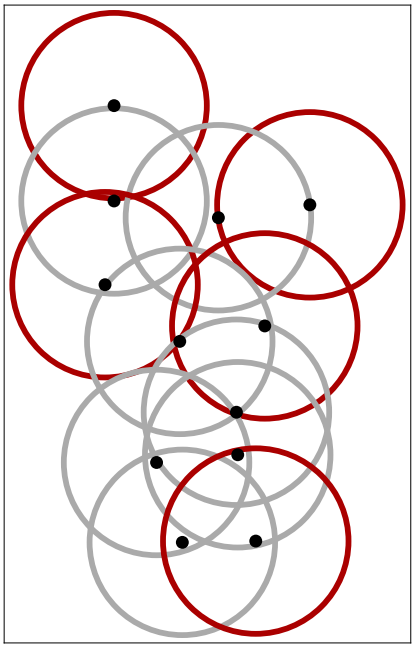


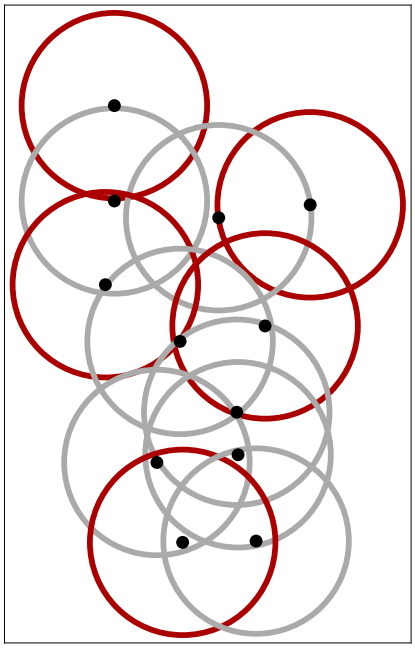


100001010011

010001010011

Out[555]=





In[551]:=
```
SetDirectory["C:\\Users\\Saesun Kim\\Documents\\Team10\\Week2_Rydberg_Atoms\\Graphics"]
Export["011000010011c.jpg", plot[1]]
Export["101000010011c.jpg", plot[2]]
```

Out[551]= C:\Users\Saesun Kim\Documents\Team10\Week2_Rydberg_Atoms\Graphics

Out[552]= 011000010011c.jpg

Out[553]= 101000010011c.jpg