

Note: All figures/questions use the following distribution of nodes: (rng seeded with 117)

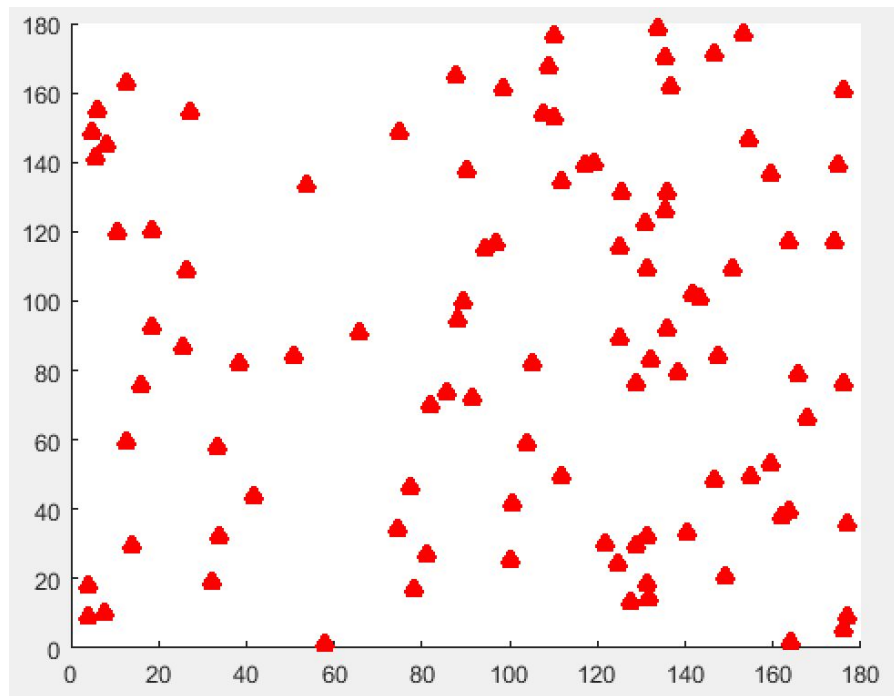


Fig 1: 100 Randomly Distributed Nodes

1.

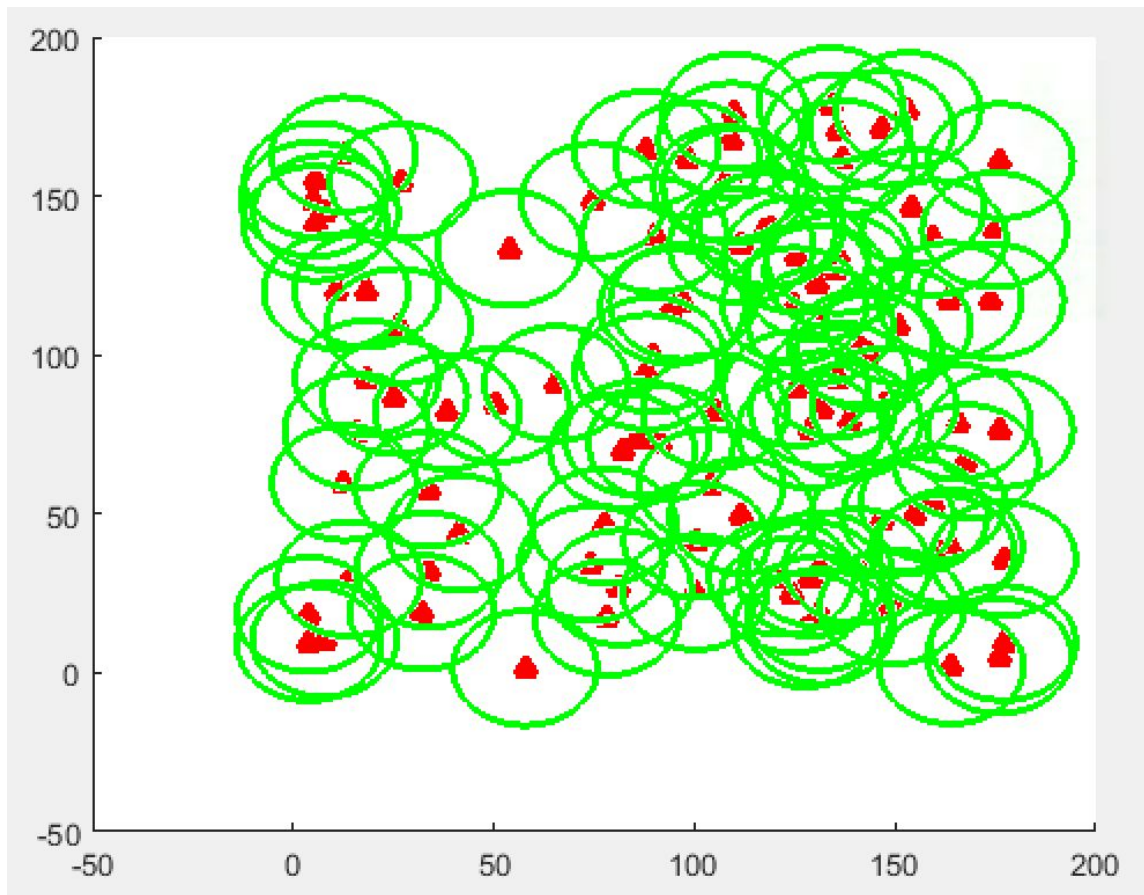


Fig. 1: All Nodes With Their Green Communication Circles (Note: nodes are placed between 0 and 180 on both axis but the circles push the graph out to 200)

2.

Row	Neighbor Indices
1	46; 78
2	
3	5; 55
4	6; 14; 48; 95; 100
5	3
6	4; 81; 88
7	21; 22; 38
8	15; 36; 79

9	10; 45; 80
10	9; 58; 80
11	53; 54; 64; 73; 82
12	33
13	57; 66; 67; 92
14	4; 59; 95; 100
15	8; 36; 79
16	30; 39; 47; 51; 65
17	63
18	53; 54; 64; 73; 82
19	40; 58
20	32
21	7; 22; 38; 63
22	7; 21; 38
23	83; 87
24	90
25	87
26	27; 44
27	26
28	69
29	30; 66; 67; 75
30	16; 29; 39; 47; 66; 67
31	77; 86
32	20; 84; 93
33	12; 75
34	35; 71; 85; 99

35	34; 71; 76; 99
36	8; 15; 79
37	41; 74
38	7; 21; 22; 63
39	16; 30; 47; 51; 65
40	19
41	37
42	
43	57; 60; 67; 92
44	26
45	9
46	1; 78
47	16; 30; 39; 51
48	4; 69; 95
49	79
50	55
51	16; 39; 47; 65; 72; 85; 89
52	
53	11; 18; 54; 64; 69; 73
54	11; 18; 53; 64; 69; 73; 82
55	3; 50
56	71
57	13; 43; 60; 67; 92
58	10; 19
59	14; 100
60	43; 57; 67; 92

61	94
62	78
63	17; 21; 38
64	11; 18; 53; 54; 73; 82
65	16; 39; 51
66	13; 29; 30; 67; 75
67	13; 29; 30; 43; 57; 60; 66; 92
68	97
69	28; 48; 53; 54; 73
70	
71	34; 35; 56; 99
72	51; 85; 89; 99
73	11; 18; 53; 54; 64; 69; 82
74	37
75	29; 33; 66
76	35
77	31; 86
78	1; 46; 62
79	8; 15; 36; 49
80	9; 10
81	6; 88
82	11; 18; 54; 64; 73
83	23; 87
84	32; 93
85	34; 51; 72; 89; 99
86	31; 77

87	23; 25; 83
88	6; 81
89	51; 72; 85
90	24; 97
91	94; 98
92	13; 43; 57; 60; 67
93	32; 84
94	61; 91; 98
95	4; 14; 48; 100
96	
97	68; 90
98	91; 94
99	34; 35; 71; 72; 85
100	4; 14; 59; 95

3.

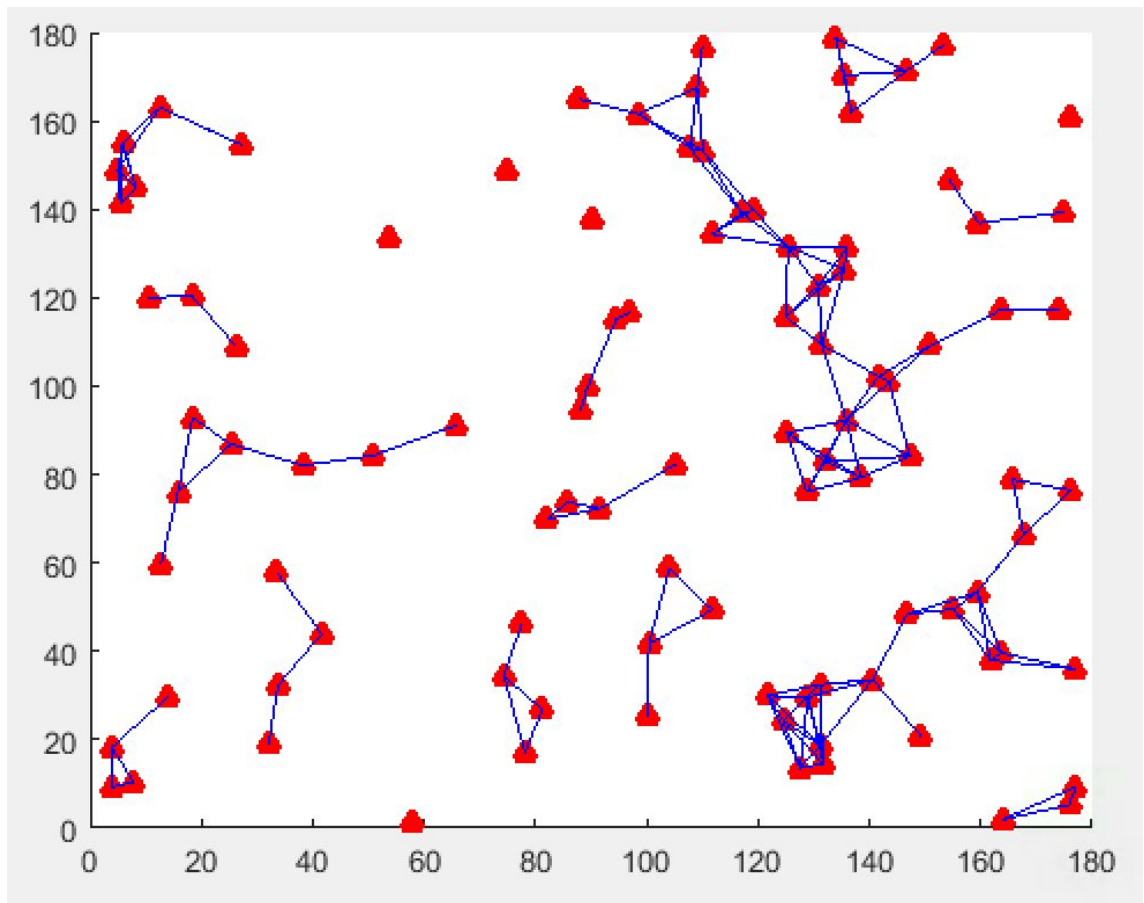


Fig 3: Neighbor Network of Fig. 1

Question 1 Code:

```
rng (117);
points = rand (100, 2) * 180;
figure ('Name', 'Point Map', 'NumberTitle', 'off')
scatter (points (:, 1), points (:,2), ...
'marker', '^', 'MarkerFaceColor', [1 0 0], 'MarkerEdgeColor', [1 0 0],
'LineWidth', 2)

%The two lines below are used to draw the circles around each node
radii = ones (100, 1) * 18;
viscircles (points, radii, 'Color', [0 1 0]);
```

Question 2 Code:

```
k = 1.2;
d = 15;
r = d * k;

rng (117);
points = rand (100, 2) * 180;
figure ('Name', 'Point Map', 'NumberTitle', 'off')
scatter (points (:, 1), points (:,2), ...
'marker', '^', 'MarkerFaceColor', [1 0 0], 'MarkerEdgeColor', [1 0 0],
'LineWidth', 2)

radii = ones (100, 1) * r;

neighbors = zeros (100, 100);

%for every point i
%for every point other than the current point j
%check if distance from i to j is <= radius
for i = 1:100
    t = 1;
    for j = 1:100
        if i == j
            %Skip
        elseif norm (points (i,:) - points (j,:)) <= r %the point is in
radius
            hold on
            a = points (i,:);
            b = points (j,:);
            neighbors (i,t) = j;
            t = t + 1;
        end
    end
end
end
```

Question 3 Code:

```
k = 1.2;
d = 15;
```



```

r = d * k;

rng (117);
points = rand (100, 2) * 180;
figure ('Name', 'Point Map', 'NumberTitle', 'off')
scatter (points (:, 1), points (:,2), ...
'marker', '^', 'MarkerFaceColor', [1 0 0], 'MarkerEdgeColor', [1 0 0],
'LineWidth', 2)

%The two lines below are used to draw the circles around each node
radii = ones (100, 1) * r;

%for every point i
%for every point other than the current point j
%check if distance from i to j is <= radius
for i = 1:100
    for j = 1:100
        if i == j
            %Skip
        elseif norm (points (i,:) - points (j,:)) <= r %the point is in
radius
            hold on
            a = points (i,:);
            b = points (j,:);
            plot ([a(1) b(1)], [a(2) b(2)], 'b');
        end
    end
end
end

```