Lab1 Qeustion 2 (d)

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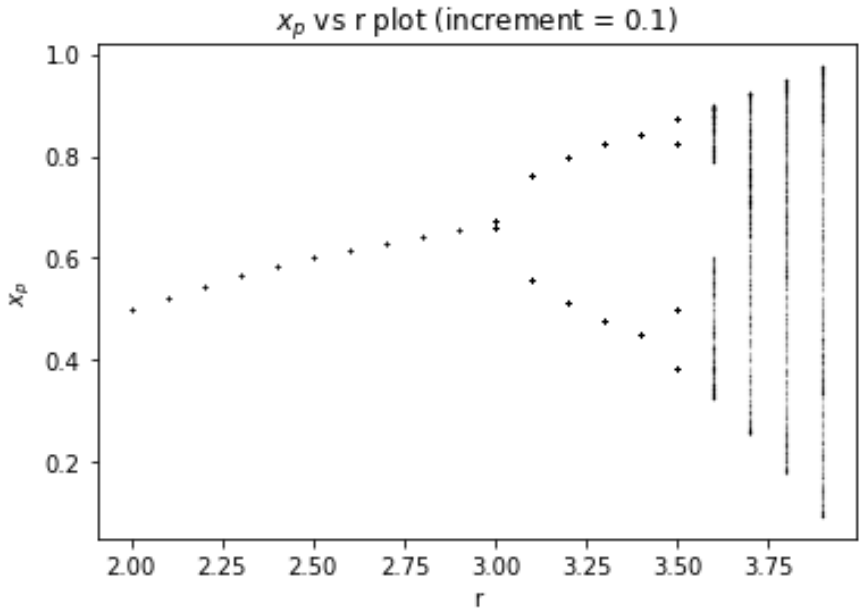
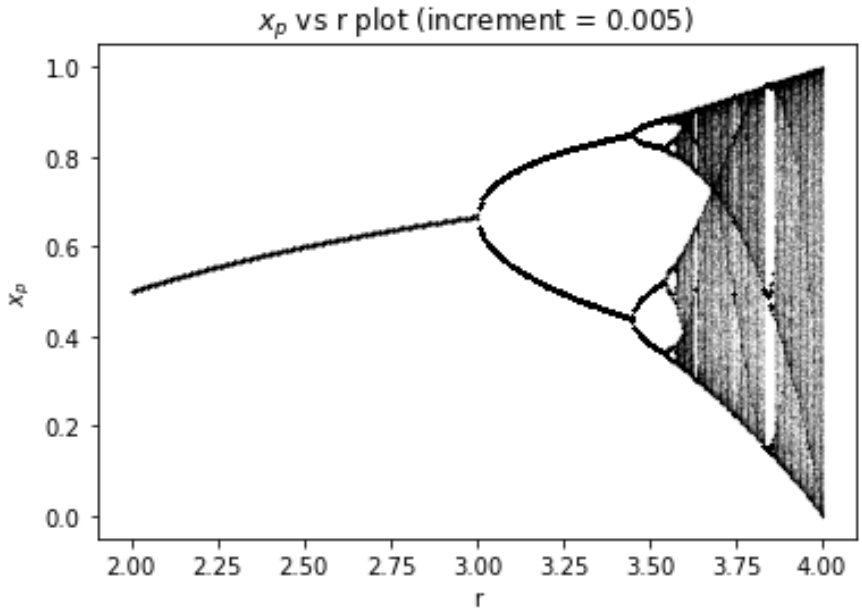
1 Plot


x_p vs r plot (increment = 0.1)
1.0
0.8
0.6
0.4
0.2
x_p
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
r


x_p vs r plot (increment = 0.005)
1.0
0.8
0.6
0.4
0.2
0.0
x_p
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
r

2 Comments

For $r < 3$ the x-r plot shows a single line. This corresponds to the observation in Q2(c), when $r = 2$ and $r = 2.5$, the plots converge.
For $r \in [3, 3.5]$, the x-r plot first splits at $r = 3$, it then splits again at around 3.4, then at around 3.5, this can be regarded as "frequency doubling". This corresponds to the x-p plot that at $r = 3$, the graph tends to oscillate.
For $r > 3.5$, the x-r plot turns chaotic, this can also be seen from the the x-p plot that when $r = 3.5$ and $r = 4$, the graphs are extremely wavy and chaotic.
We can conclude from the graph that, beyond around $r = 3.5$, the system can be considered chaotic.