

2016302580320-任思远-第六次作业

4.9

$$\begin{aligned}\hat{p}_N(x) &= \frac{1}{N} \sum_{i=1}^N \delta(x - x_i) \\ &= \frac{1}{\sqrt{2\pi} \cdot N \cdot V_N} \sum_{i=1}^N e^{-\frac{(x-x_i)^2}{2h_N^2}}\end{aligned}$$

取 $N = 6, R_6 = [0, 6.4], h_N = 1 \dots 4$, 得 $\hat{p}_6(x) = \frac{1}{\sqrt{2\pi} \cdot 6 \cdot h} \sum_{i=1}^6 e^{-\frac{(x-x_i)^2}{2h^2}}$

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3 from scipy.stats import norm
4
5 xi = [3.2, 3.6, 3, 6, 2.5, 1.1]
6 h = np.arange(1, 4, 0.5)
7
8
9 def p6(x: float, hN: float) -> float:
10     return sum(map(norm.pdf, map(lambda _xi: (x - _xi) /
11     hN, xi))) / len(xi) / hN ** 1
12
13 x = np.arange(0, 6, 0.1)
14
```

```

15 for hN in h:
16     p6_hN = lambda x: p6(x, hN)
17     y = list(map(p6_hN, x))
18     plt.plot(x, y)
19
20 plt.legend(list(map(lambda hN: "hN = " + str(hN), h)),
21            loc='upper left')
22 plt.xlabel("x")
23 plt.ylabel("probability")
24 plt.show()

```

