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CSE 3521

Homework #9

* 1. A stop light at night

     Description automatically generated
  2. A picture containing light, sitting, night, stop

     Description automatically generated
  3. A close up of a light

     Description automatically generated
  4. A close up of a light

     Description automatically generated
  5. We think the last model best fits the data, since the value of SSE measures the discrepancy between the data and an estimation model. Hence, when we should choose the model has the smallest SSE value.
  6. Iteration 0: SSE=86.91664599999999
  7. Iteration 1: SSE=1.2257484260435025
  8. Iteration 2: SSE=0.002951589411860112
  9. Iteration 3: SSE=0.045031842180812805
  10. Iteration 4: SSE=0.000004780982168256427
  11. Iteration 5: SSE=2.209080239166643e-7
  12. Iteration 6: SSE=2.2090783285717636e-7
  13. Iteration 7: SSE=2.2090783285710132e-7
  14. Iteration 8: SSE=2.2090783285686171e-7
  15. Iteration 9: SSE=2.2090783285678834e-7
  16. Iteration 10: SSE=2.2090783285663804e-7
  17. A close up of a light

      Description automatically generated
  18. We do think this model fits the data better than previous one. After 10 iteration, the Gauss-Newton method is providing a smaller number compare to Polynomial (). The Gauss-Newton method’s performance depends on the iteration times. Hence, when we are utilizing Gauss-Newton method, we need to make sure to there are enough iterations.
  19. Iteration 0: SSE=86.91664599999999
  20. Iteration 1: SSE=9.823254279495549
  21. Iteration 2: SSE=1.9886924028316724
  22. Iteration 3: SSE=0.6616441968742724
  23. Iteration 4: SSE=0.4614402093746779
  24. Iteration 5: SSE=0.4304949859231547
  25. ...
  26. Iteration 4995: SSE=0.00020930544167242234
  27. Iteration 4996: SSE=0.00020925042055905206
  28. Iteration 4997: SSE=0.00020919546901500068
  29. Iteration 4998: SSE=0.00020914058694998782
  30. Iteration 4999: SSE=0.00020908577427385791
  31. Iteration 5000: SSE=0.0002090310308965403
  32. A close up of a light

      Description automatically generated
  33. The algorithm did not beat the Gauss-Newton method.
  34. When we are using 0.0015 as our learning rate, we will have after 5000 iteration, which is a better convergence rate.
  35. When we increase or decrease the learning rate dramatically, the fitness of the curve is worse than before.
  36. Compare to default value, when we increase the iterations, the fitness of the curve is improved. Oppositely, when we decrease the iterations, the fitness of the curve is degraded.