Computational Fabrication

Assignment 4 Report

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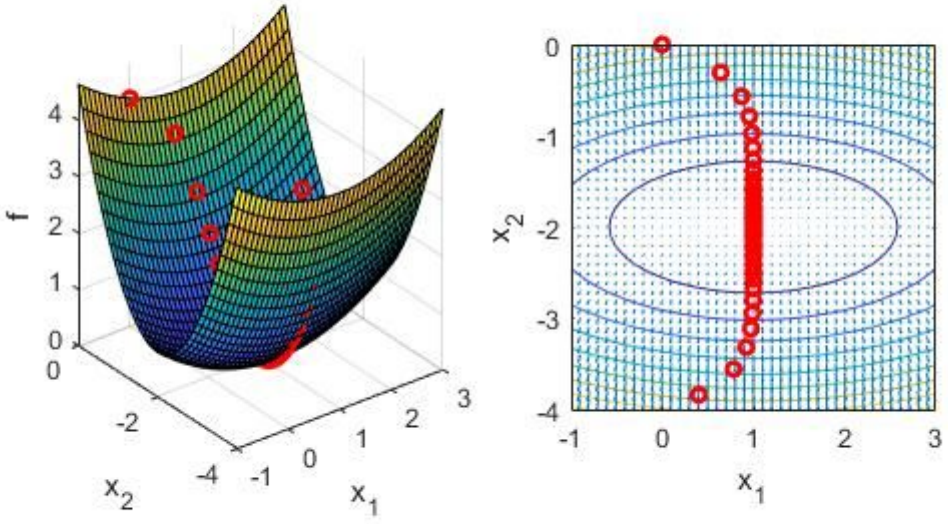
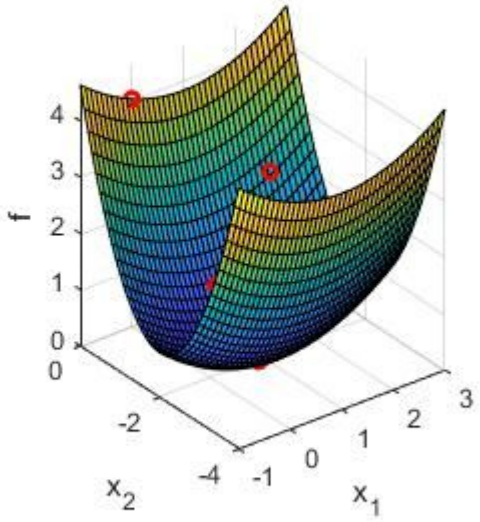
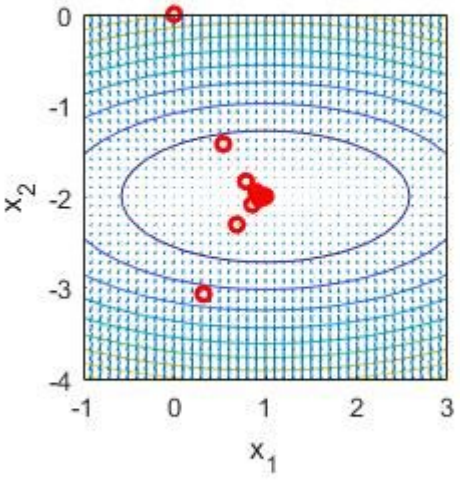
- **driver(0)**

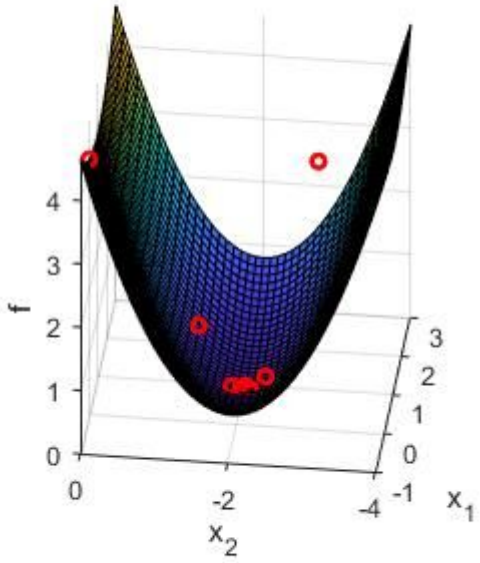
  - **Gradient Descent:**
    - **alpha = 1.0: # of iterations = 183;**

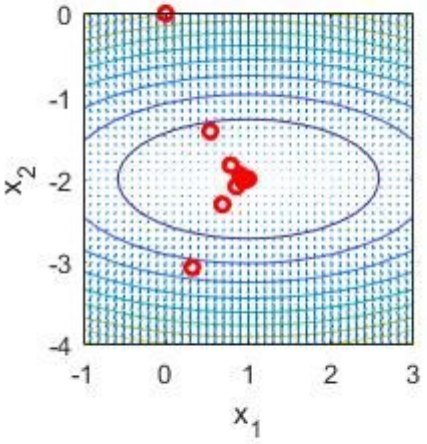


    - **optimized alpha = 0.8: # of iterations = 34;**

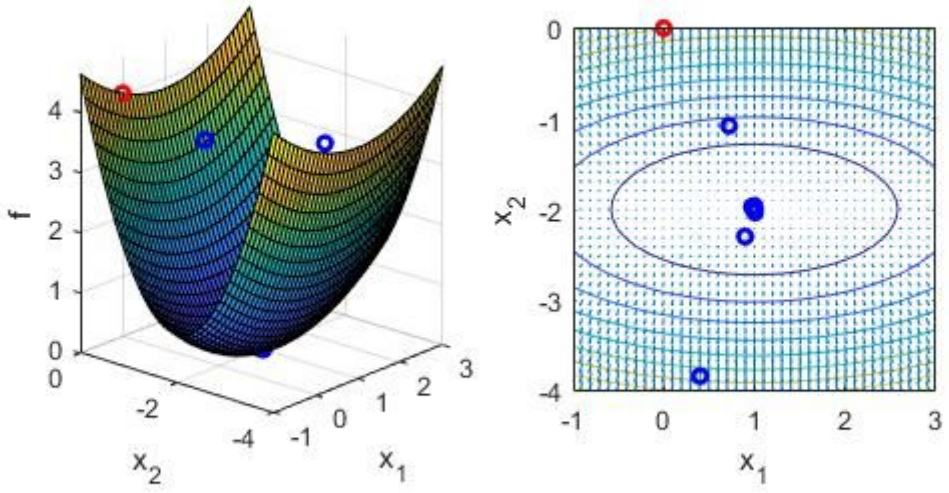




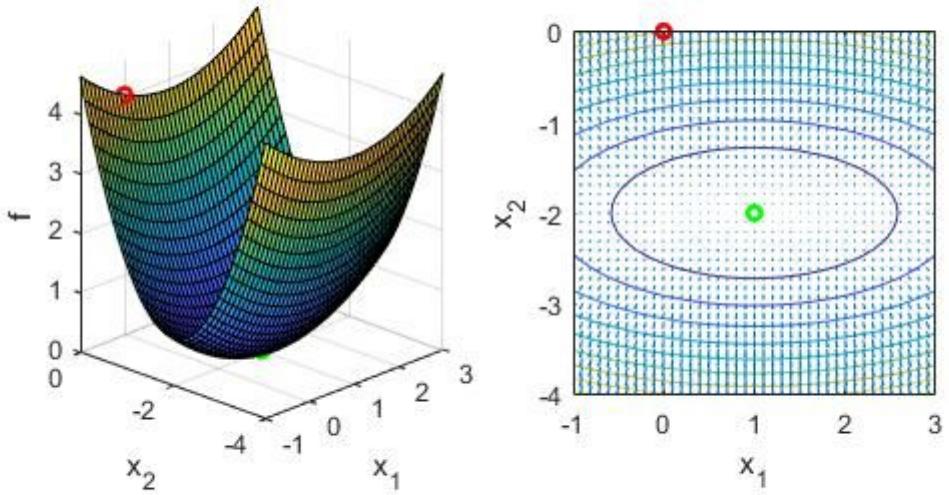




- **Momentum**:
  - **optimized beta = 0.2, alpha = 1.0: # of iterations = 20;**



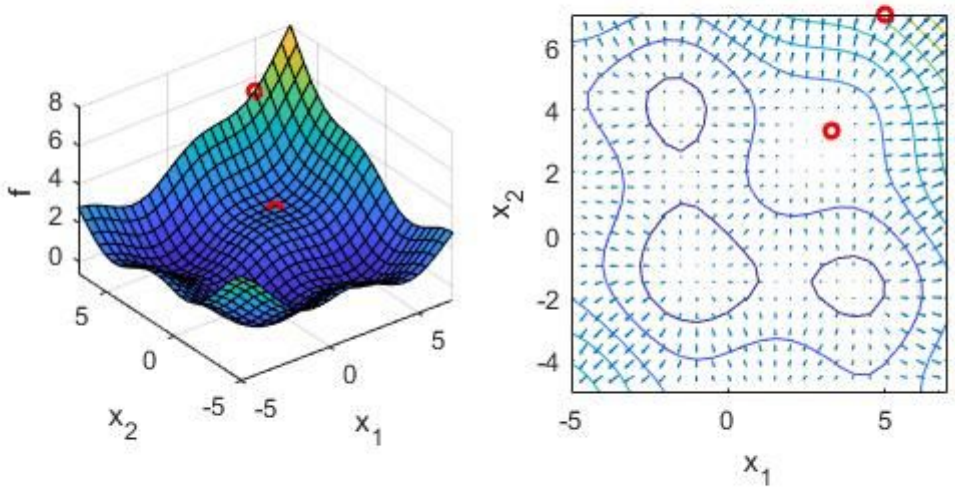
- **Newton: It worked. The function is a quadratic function, so the newton method could find the exact extremum in one step.**
  - **# iterations = 2;**



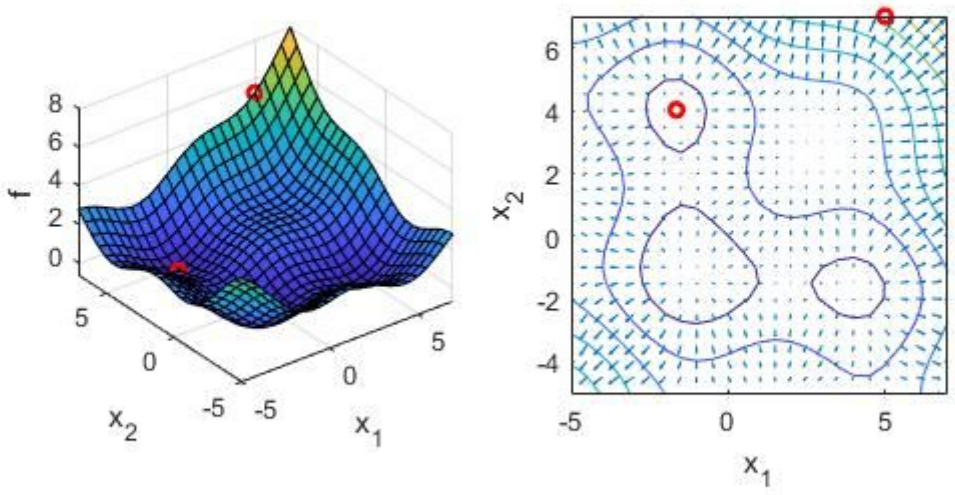
- **driver(1)**

    - **Gradient Descent:**
        - **optimized alpha = 3.0**

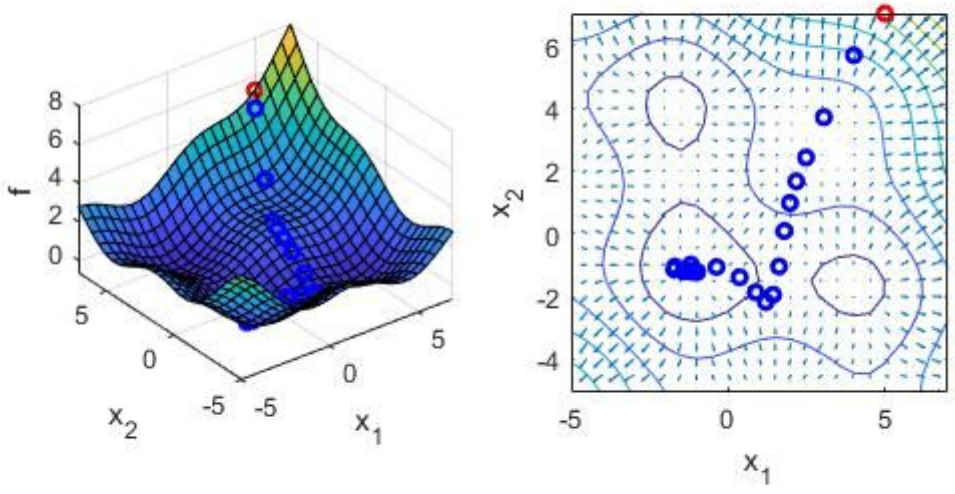
alpha = 1.0: # of iterations = 77



alpha = 3.0: # of iterations = 89;

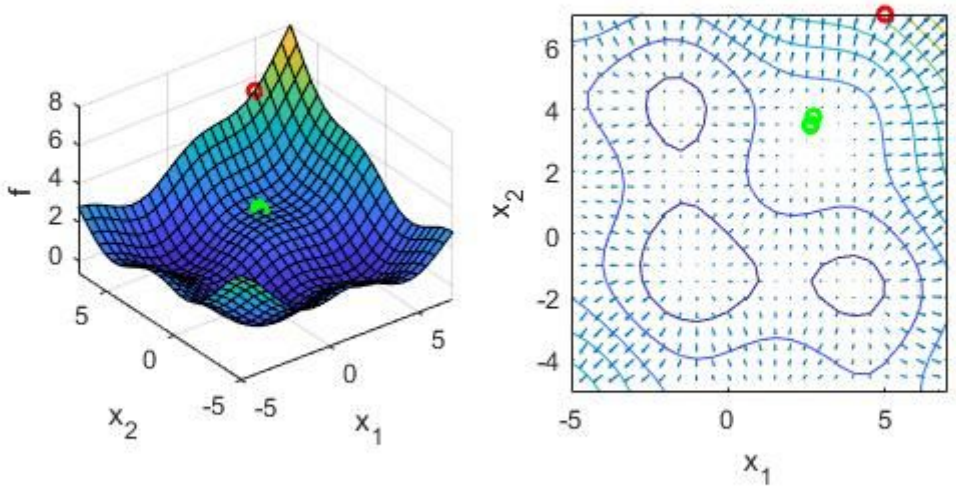


- **Momentum:**
  - **optimized beta = 0.6, alpha = 1.0: # of iterations = 62;**



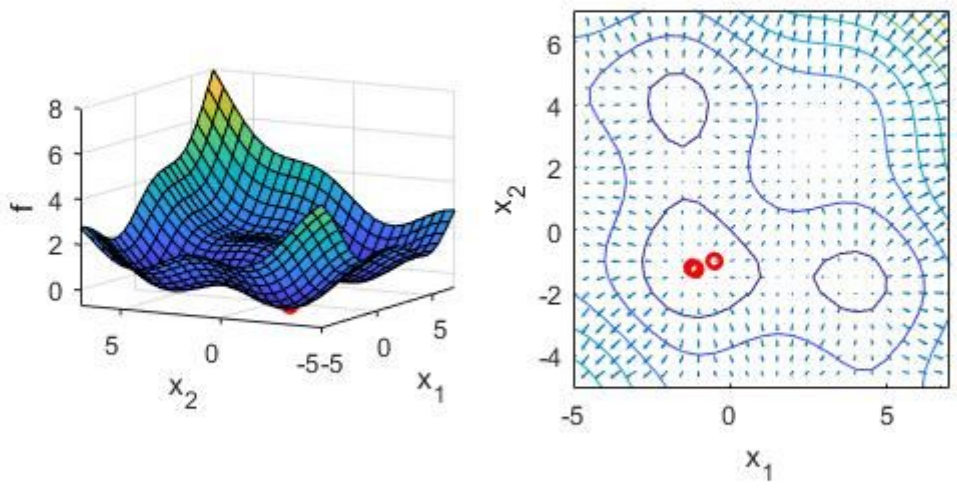
- **Newton:**

- **It didn't work. The Newton method could stuck in a saddle point in higher dimensions.**

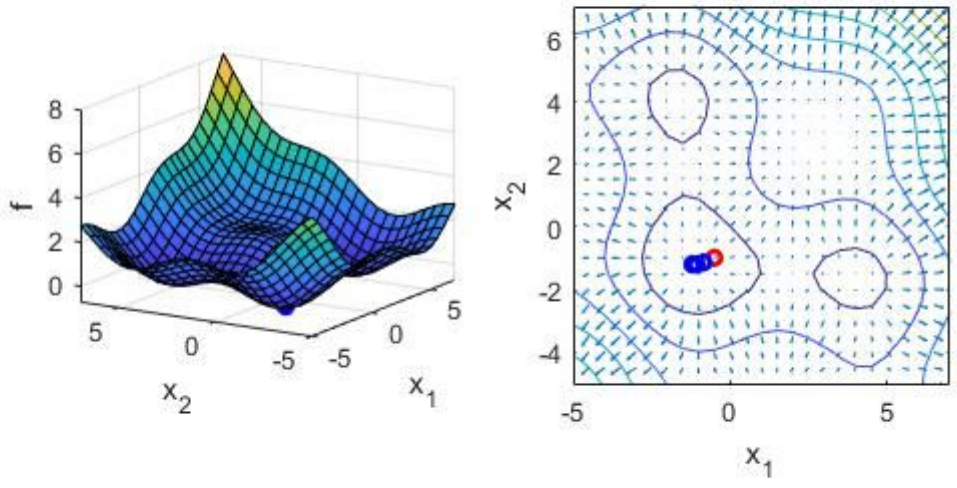


● driver(2)

- **Gradient Descent:**
  - **optimized alpha = 1.8: # of iterations = 7;**

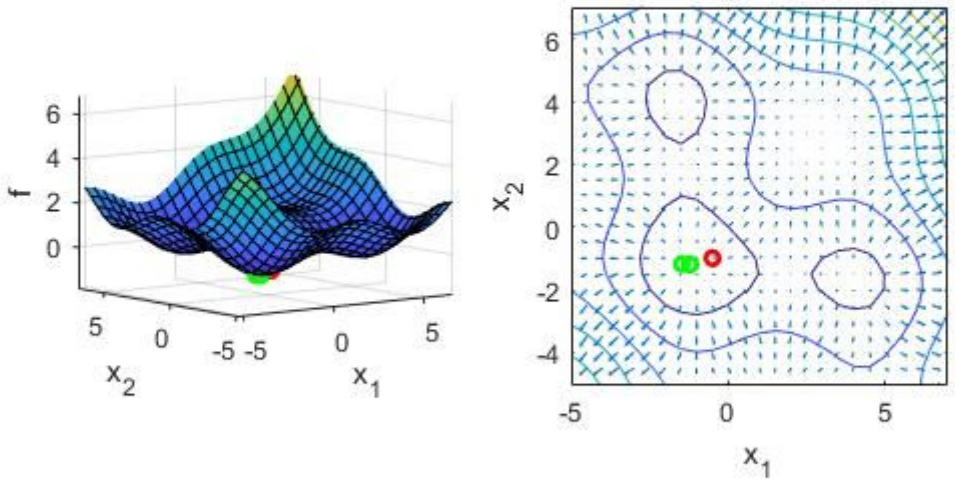


- **Momentum:**
  - **optimized beta = 0.1, alpha = 1.0: # of iterations = 14**



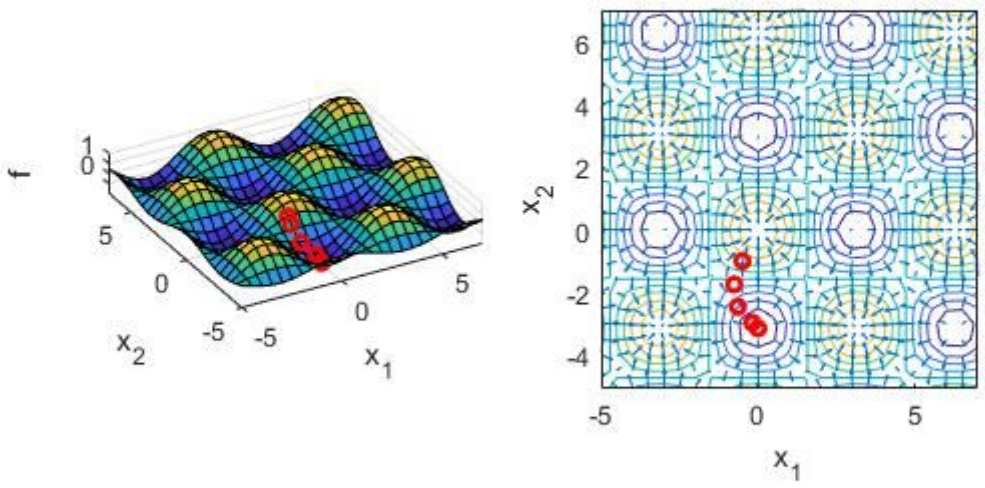
- **Newton:**

- **It worked. The initial guess is close to the solution so it didn't stop at some saddle points.**

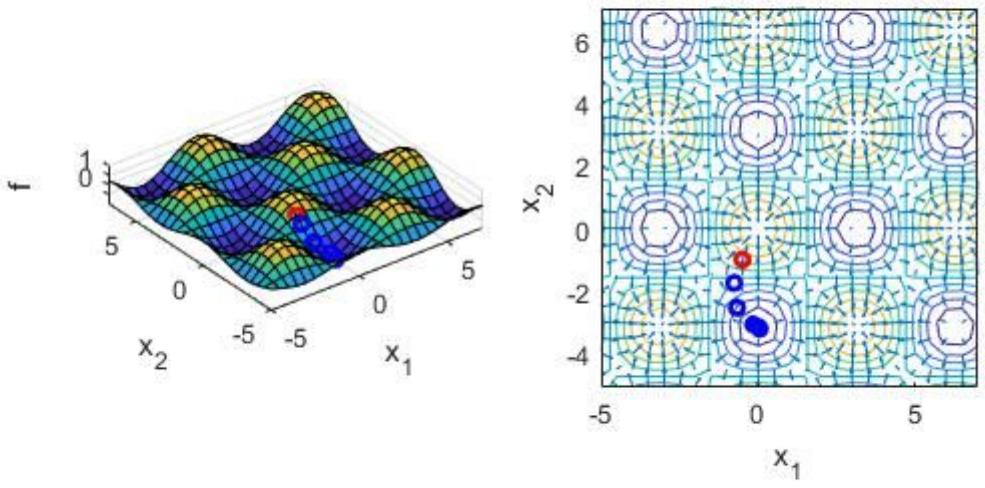


● driver(3) ----start far from the solution

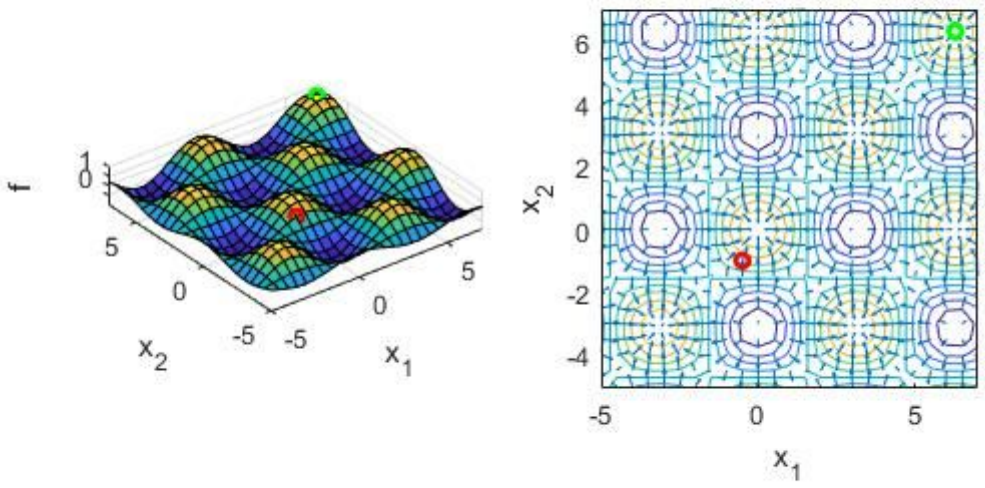
- **Gradient Descent:**
  - **optimized alpha = 1.0: # of iterations = 6**



- **Momentum:**
  - **optimized beta = 0.1, alpha = 1.0: # of iterations = 15**

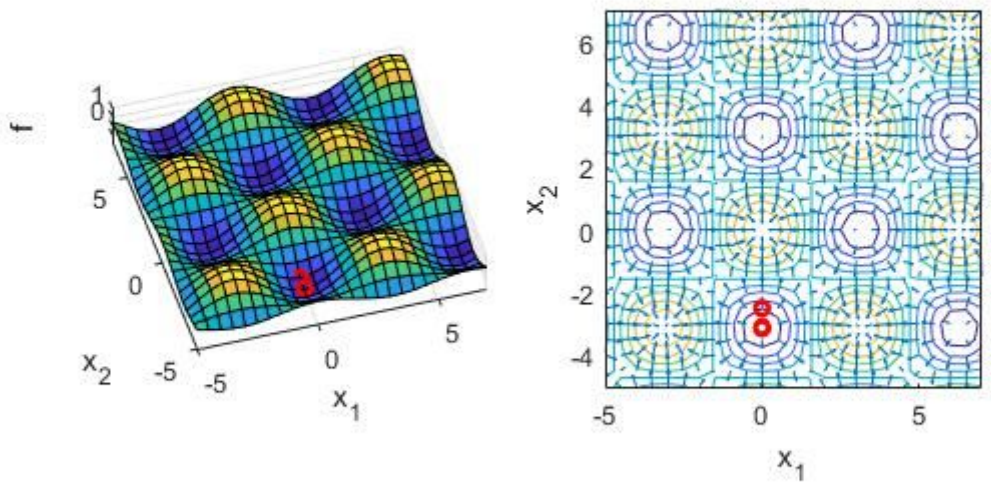


- **Newton:**
  - **It didn't work. The Newton method met a stationary point of the function (the green point shown in the picture). As a result, the method terminated at that point.**
  - **# of iterations = 4;**

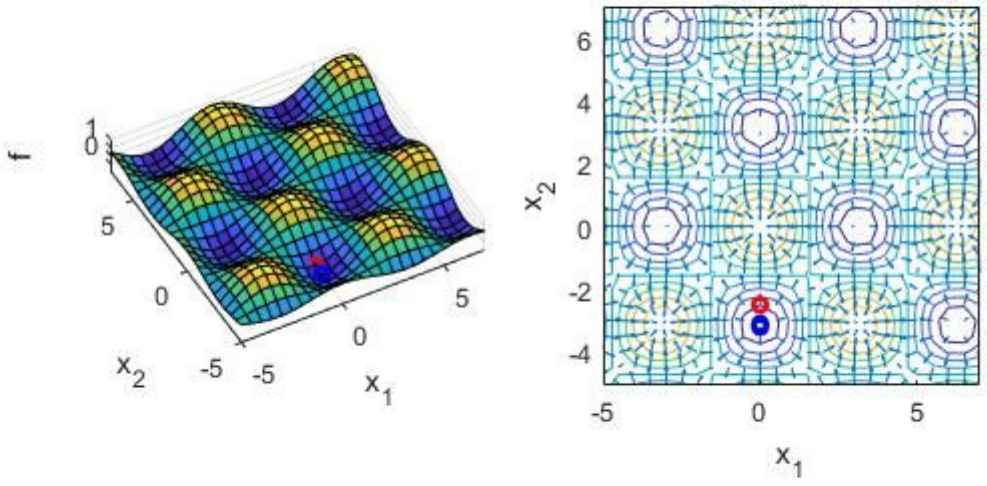


● driver(4) ----start close to the solution

- **Gradient Descent:**
  - **optimized alpha = 1.0: # of iterations = 4;**



- **Momentum:**
  - **optimized beta = 0.1, alpha = 1.0: # of iterations = 13;**



- **Newton:**
  - **It worked. # of iterations = 4; The initial guess is near the solution.**