

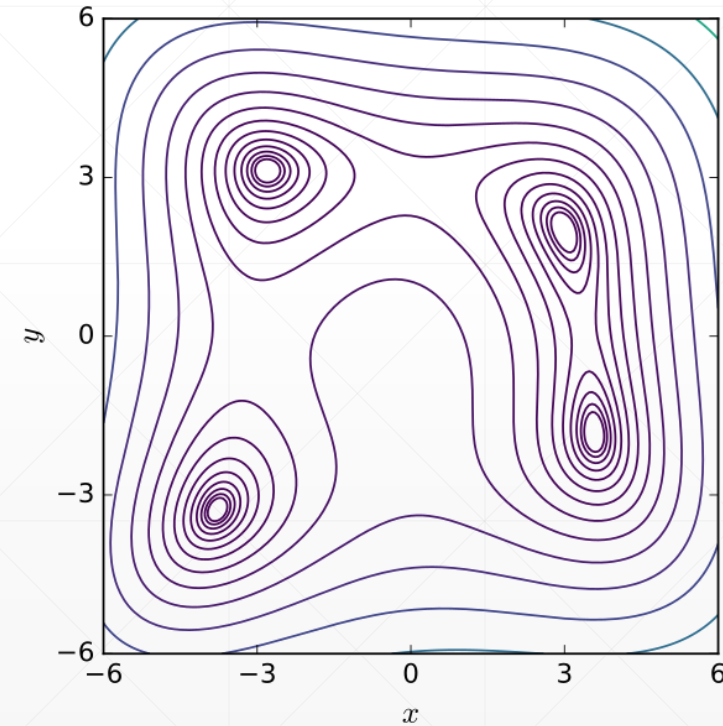
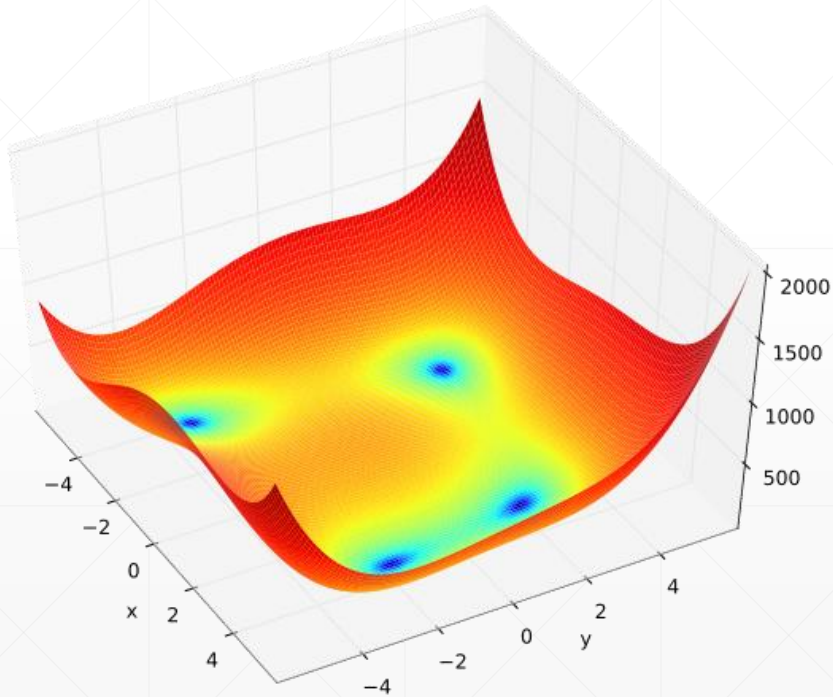


Himmelblau函数优化

主讲：龙良曲

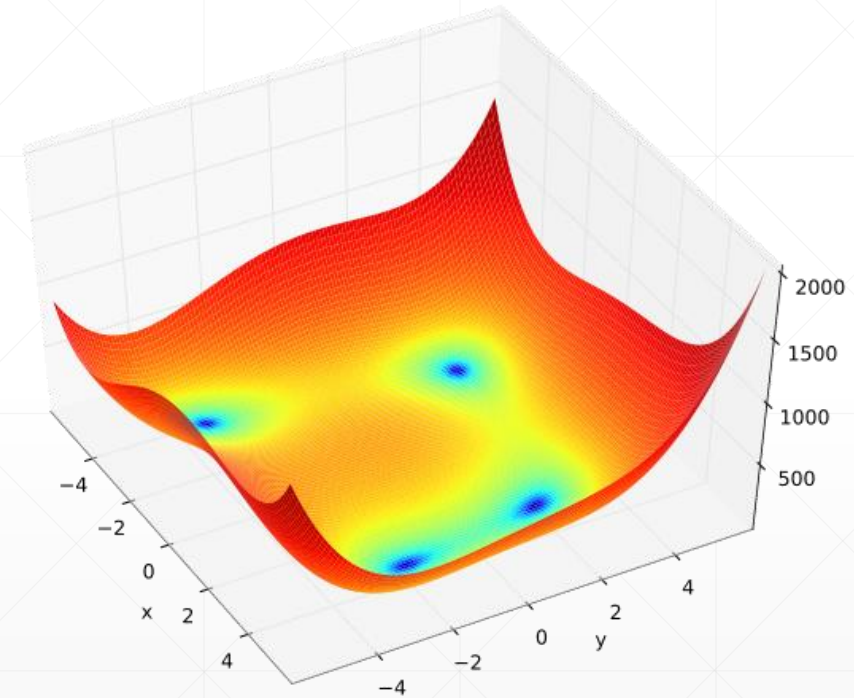
Himmelblau function

$$f(x, y) = (x^2 + y - 11)^2 + (x + y^2 - 7)^2.$$



Minima

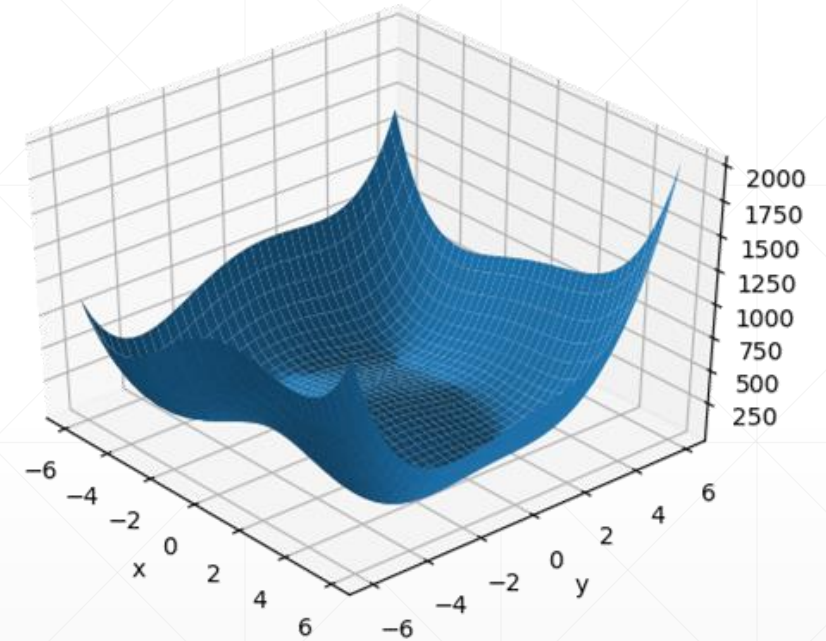
- $f(3.0, 2.0) = 0.0$,
- $f(-2.805118, 3.131312) = 0.0$,
- $f(-3.779310, -3.283186) = 0.0$.
- $f(3.584428, -1.848126) = 0.0$.



Plot



```
def himmelblau(x):  
    return (x[0]**2 + x[1] - 11)**2 + (x[0] + x[1]**2 - 7)**2  
  
x = np.arange(-6, 6, 0.1)  
y = np.arange(-6, 6, 0.1)  
print('x,y range:', x.shape, y.shape)  
X, Y = np.meshgrid(x, y)  
print('X,Y maps:', X.shape, Y.shape)  
Z = himmelblau([X, Y])  
  
fig = plt.figure('himmelblau')  
ax = fig.gca(projection='3d')  
ax.plot_surface(X, Y, Z)  
ax.view_init(60, -30)  
ax.set_xlabel('x')  
ax.set_ylabel('y')  
plt.show()
```



Gradient Descent



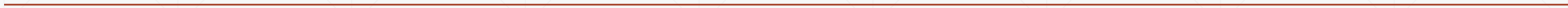
```
# [1., 0.], [-4, 0.], [4, 0.]
x = tf.constant([-4., 0.])

for step in range(200):

    with tf.GradientTape() as tape:
        tape.watch([x])
        y = himmelblau(x)

    grads = tape.gradient(y, [x])[0]
    x -= 0.01*grads
```

**JUST
DO
IT.**

The text 'JUST DO IT.' is rendered in a bold, black, sans-serif font. The letters are heavily textured with a splatter or ink-blot effect, giving them a gritty, dynamic appearance. The background is a light gray with a subtle, repeating diamond-shaped grid pattern. The overall composition is centered and minimalist.

下一课时

手写数字问题
(层)-实战

Thank You.
