E9 205 Machine Learning for Signal Processing

Neural Networks

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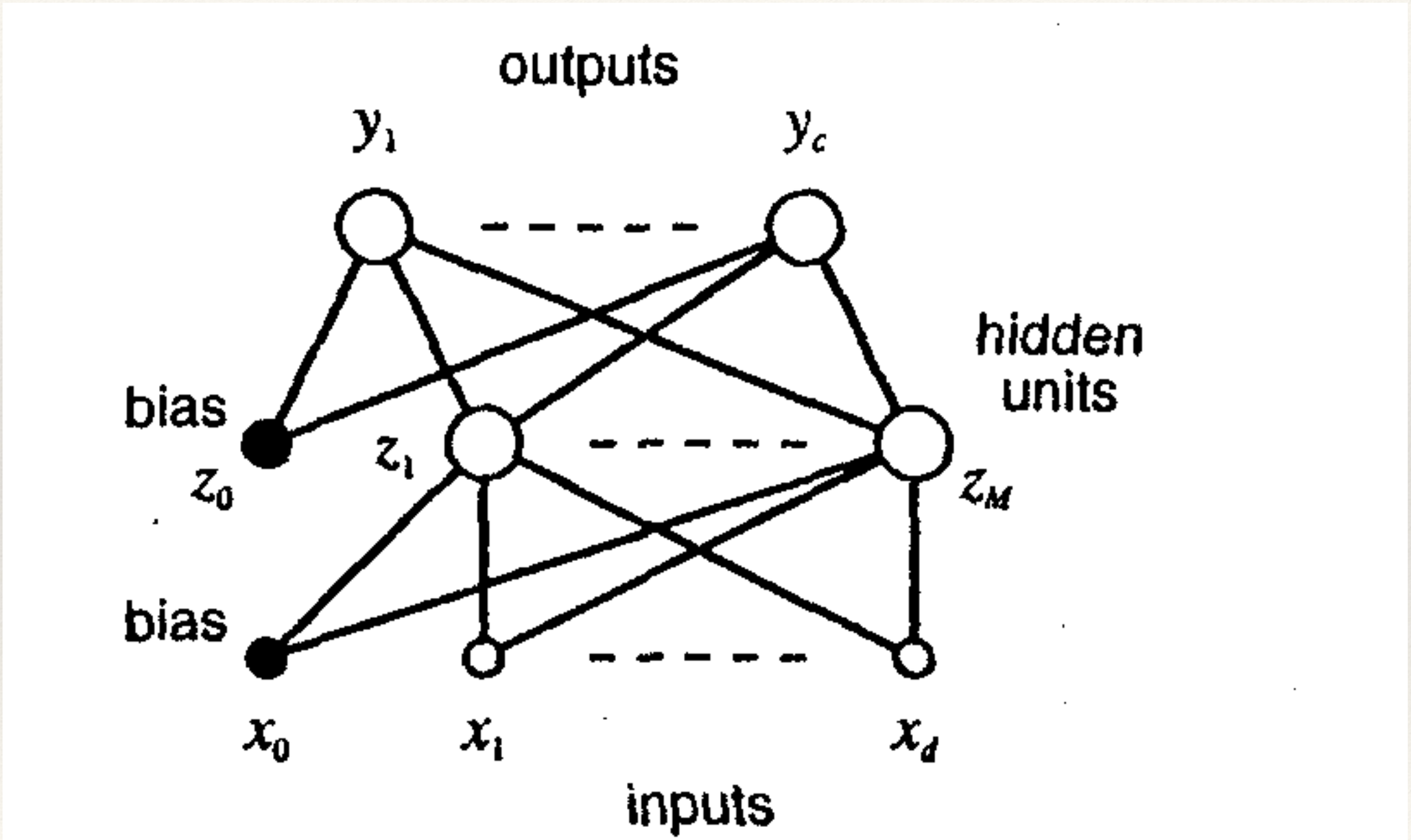
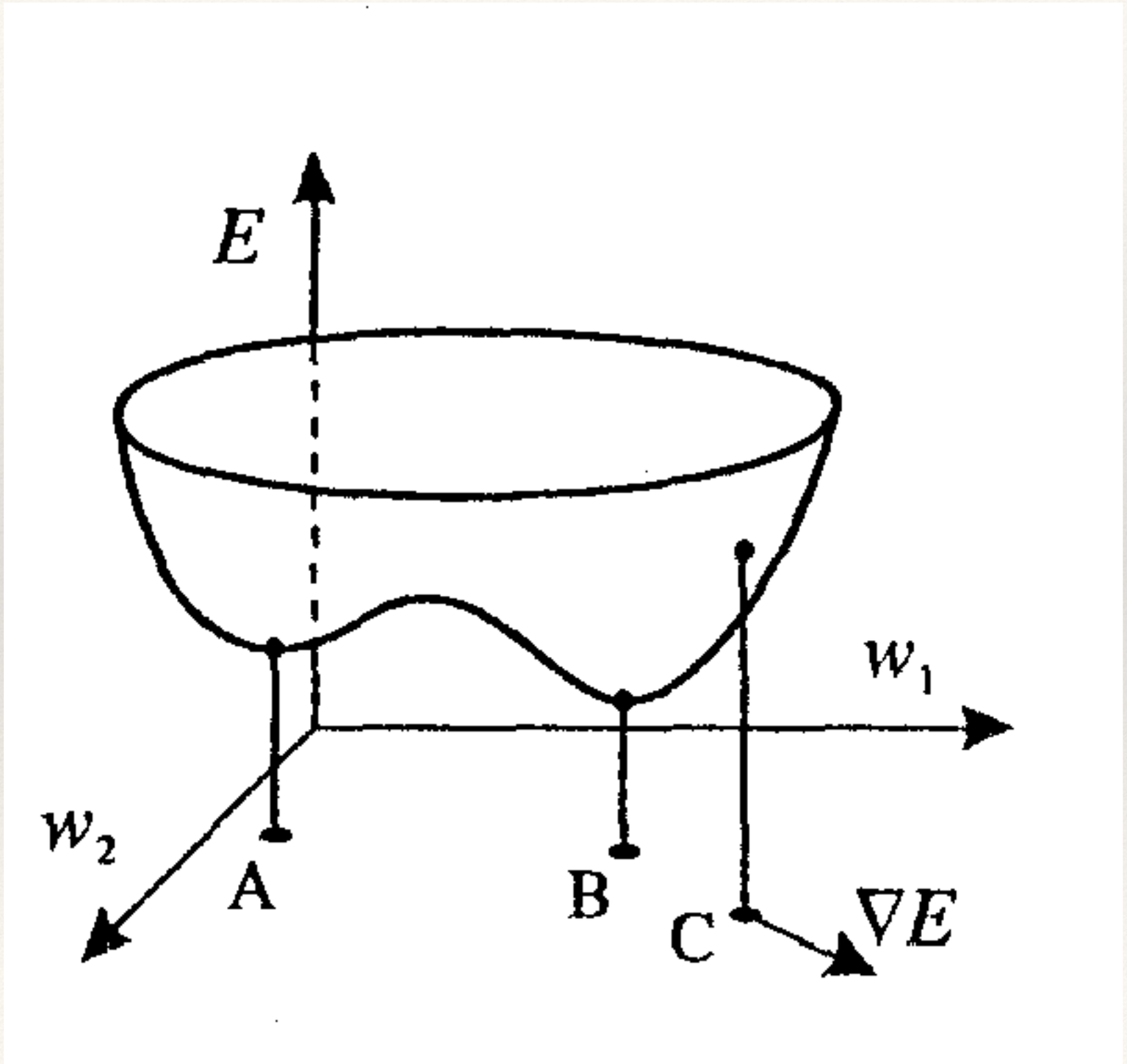
Neural Networks - Recap



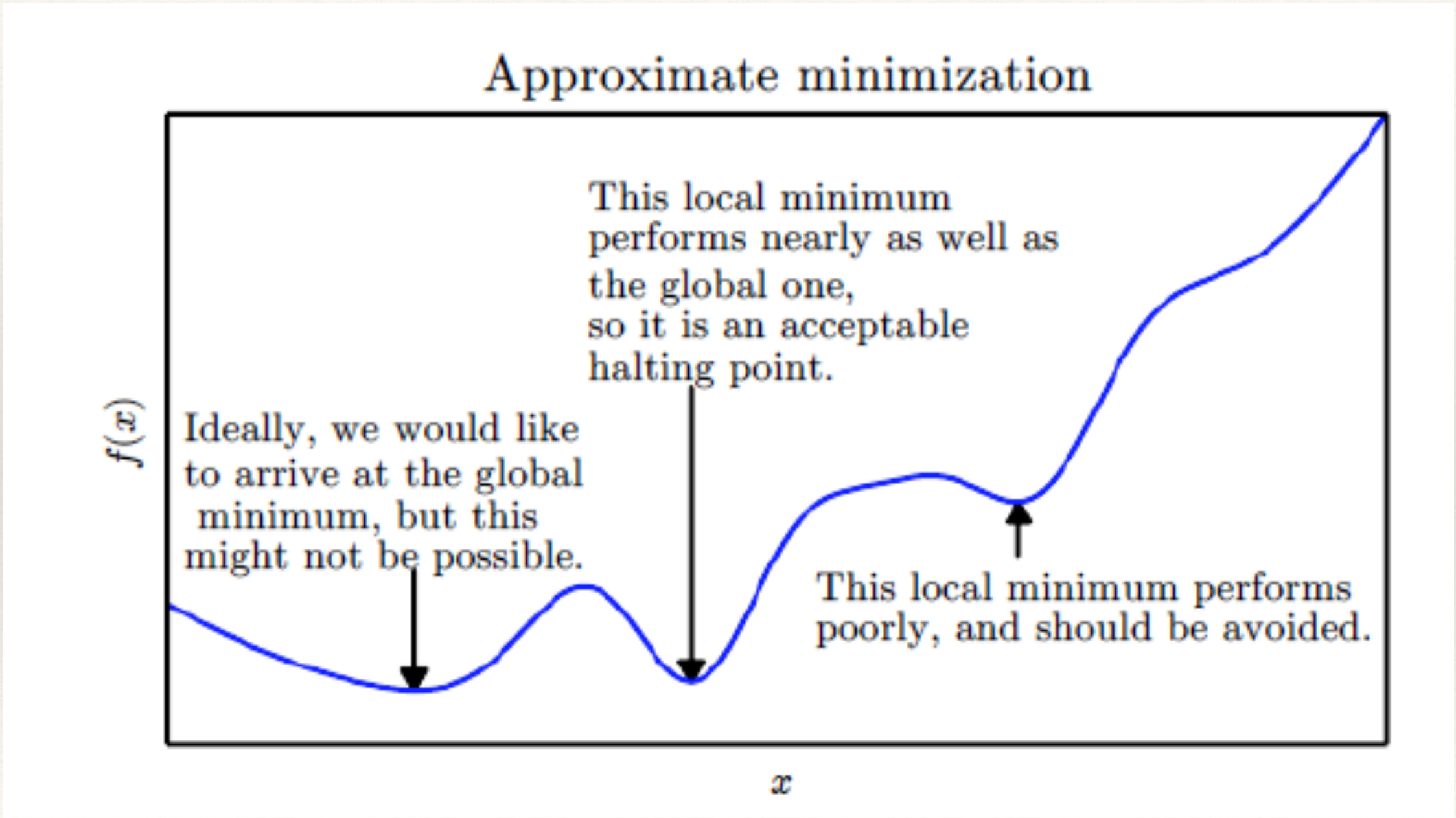
Neural Networks - Recap

- Need for multiple hidden layers
- Activation function at hidden layers.
- Computation of gradient using back propagation.
- Error function and output layer activation
  - Linear activation with MSE loss
  - Cross entropy loss function
- Neural networks estimate posterior probabilities
  - Shown for MSE loss function.

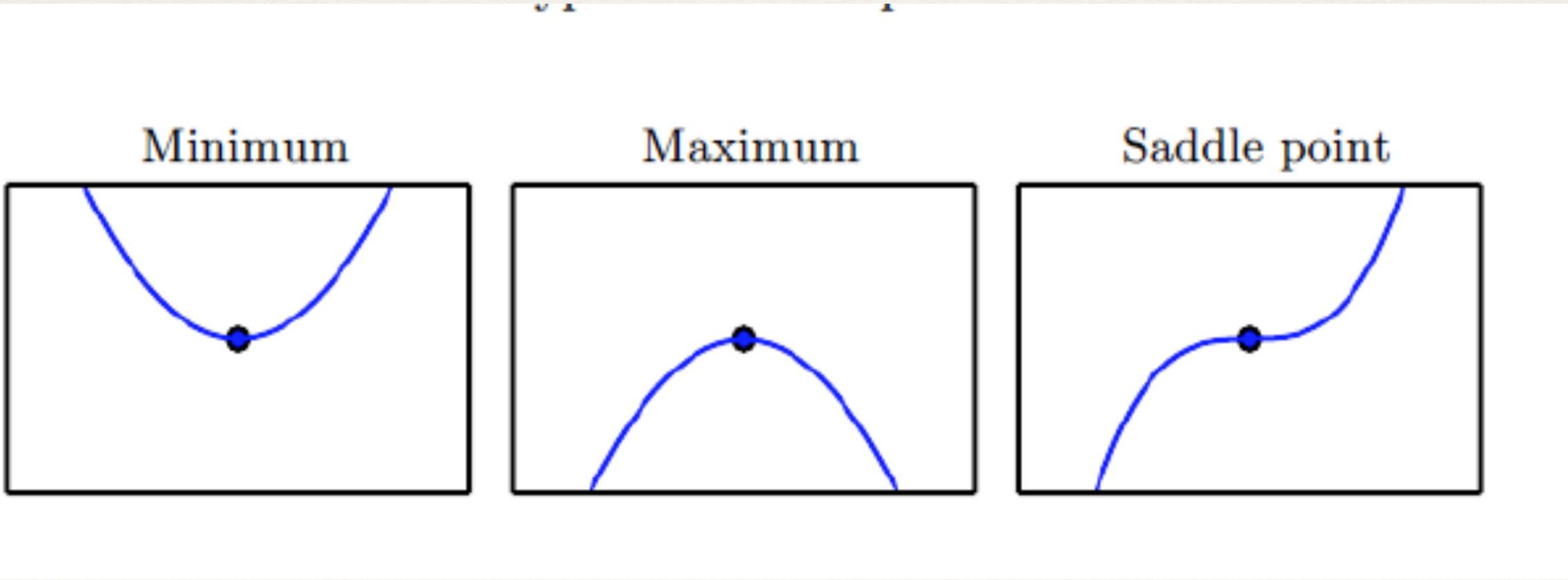
Typical Error Surface



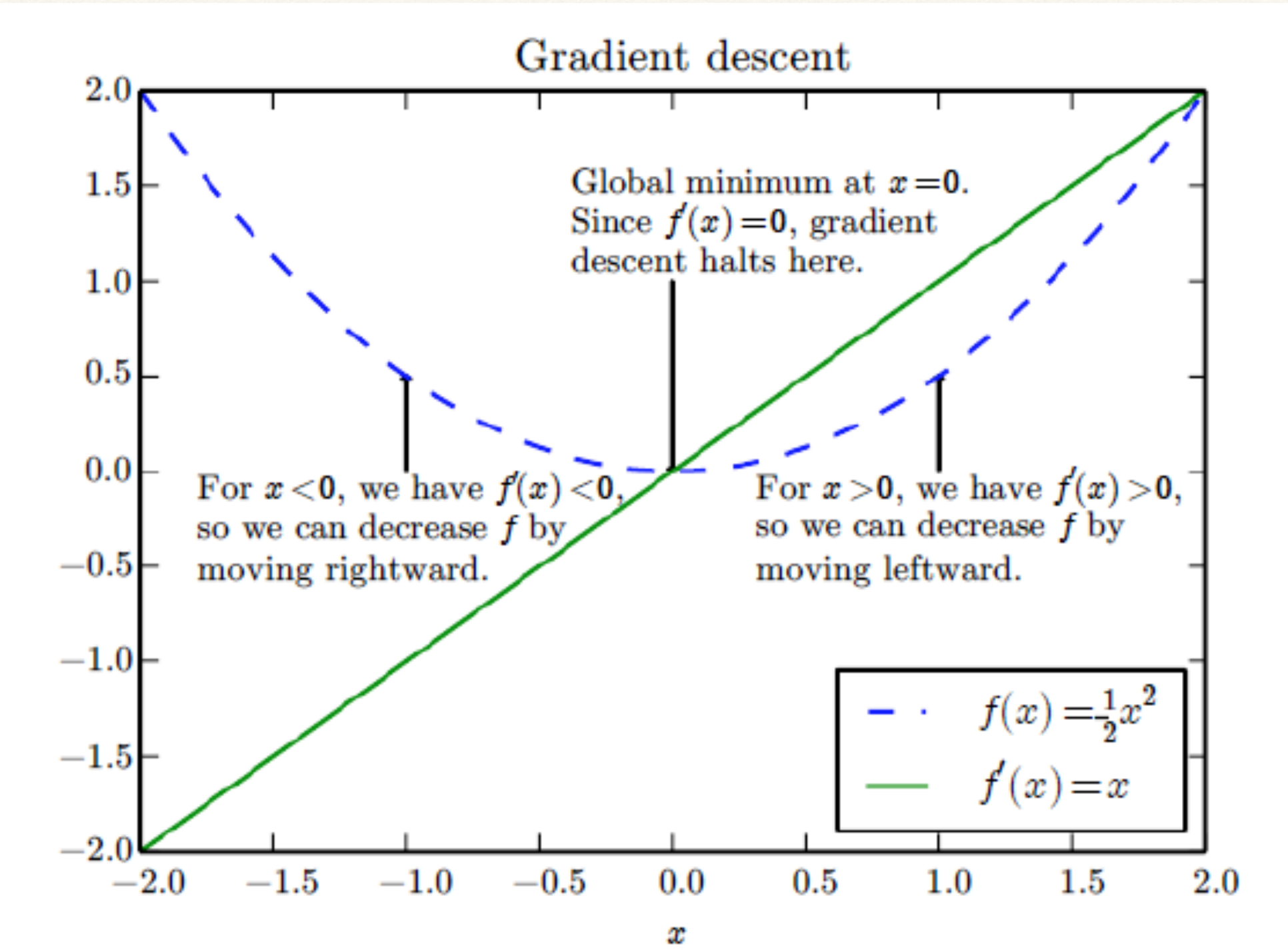
Error Surface in 1-D



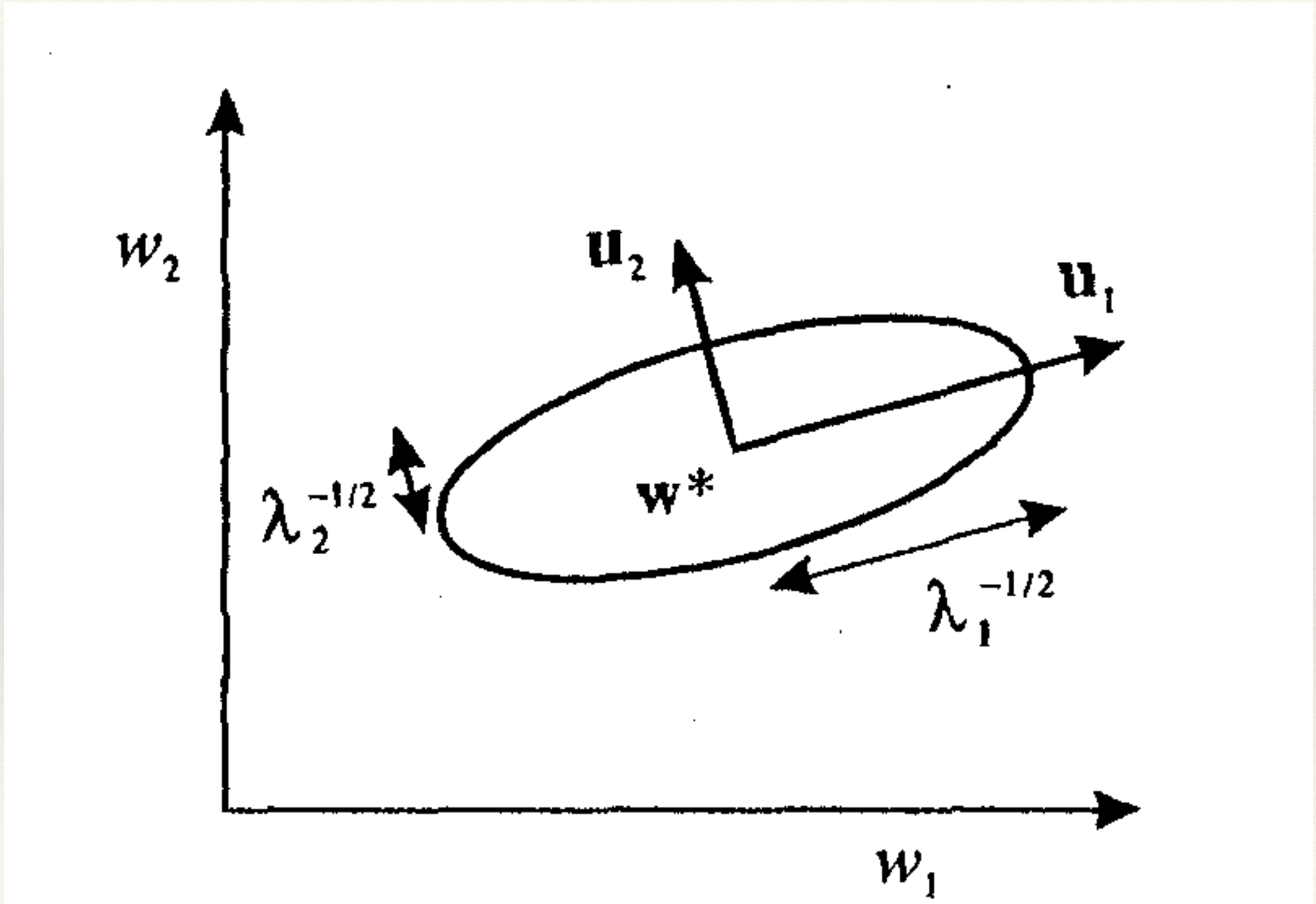
Saddle Points



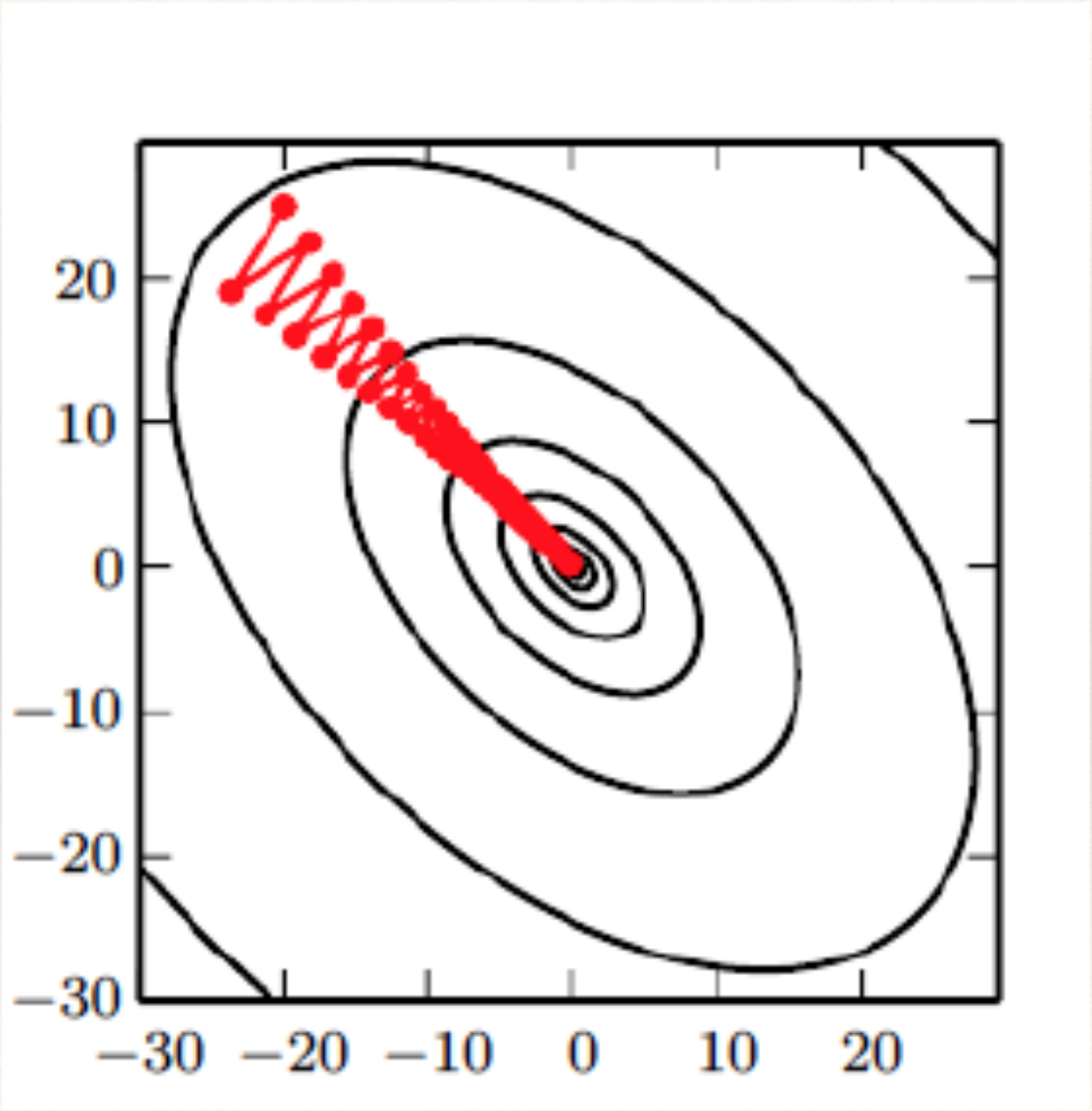
Gradient Descent Algorithm



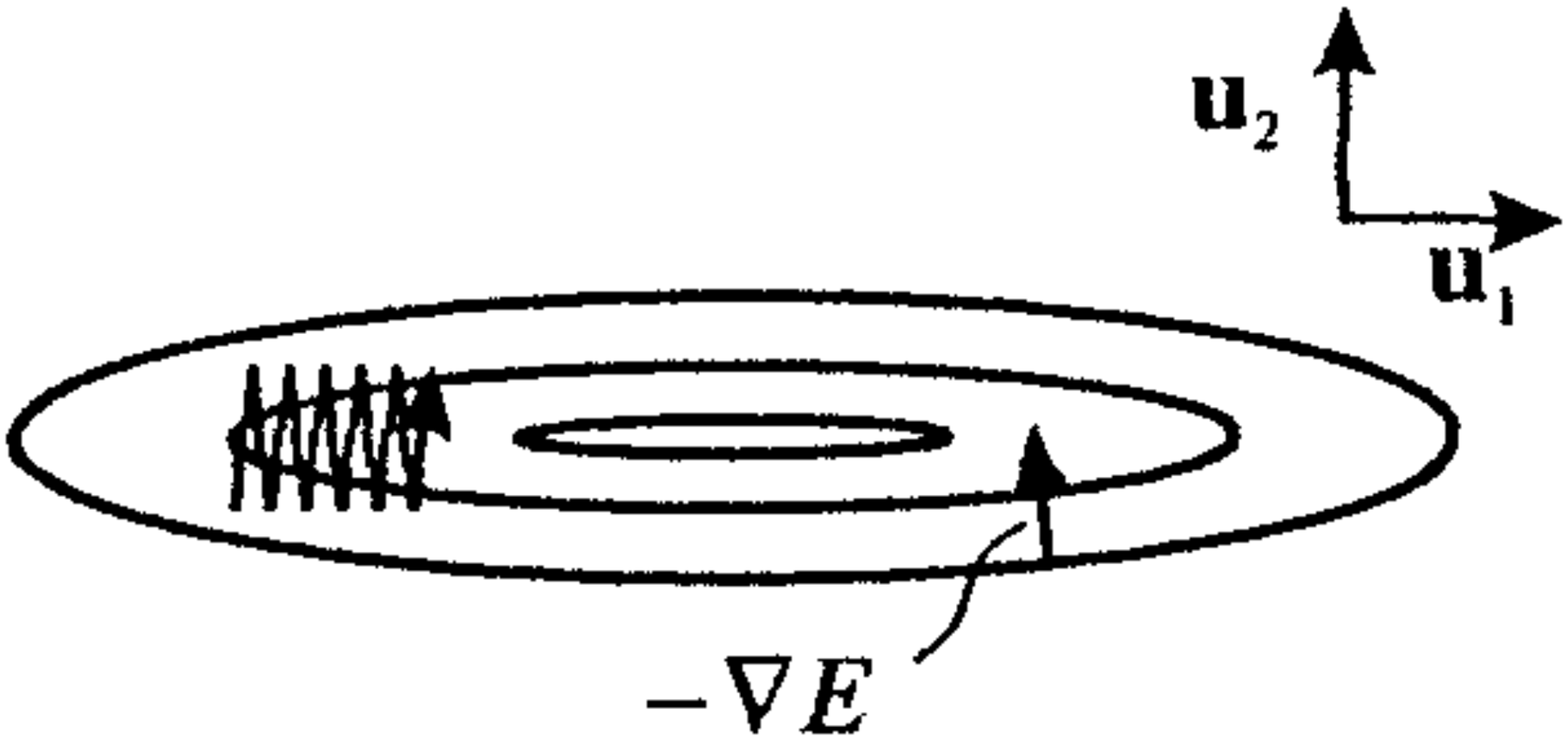
Weight Update Rule



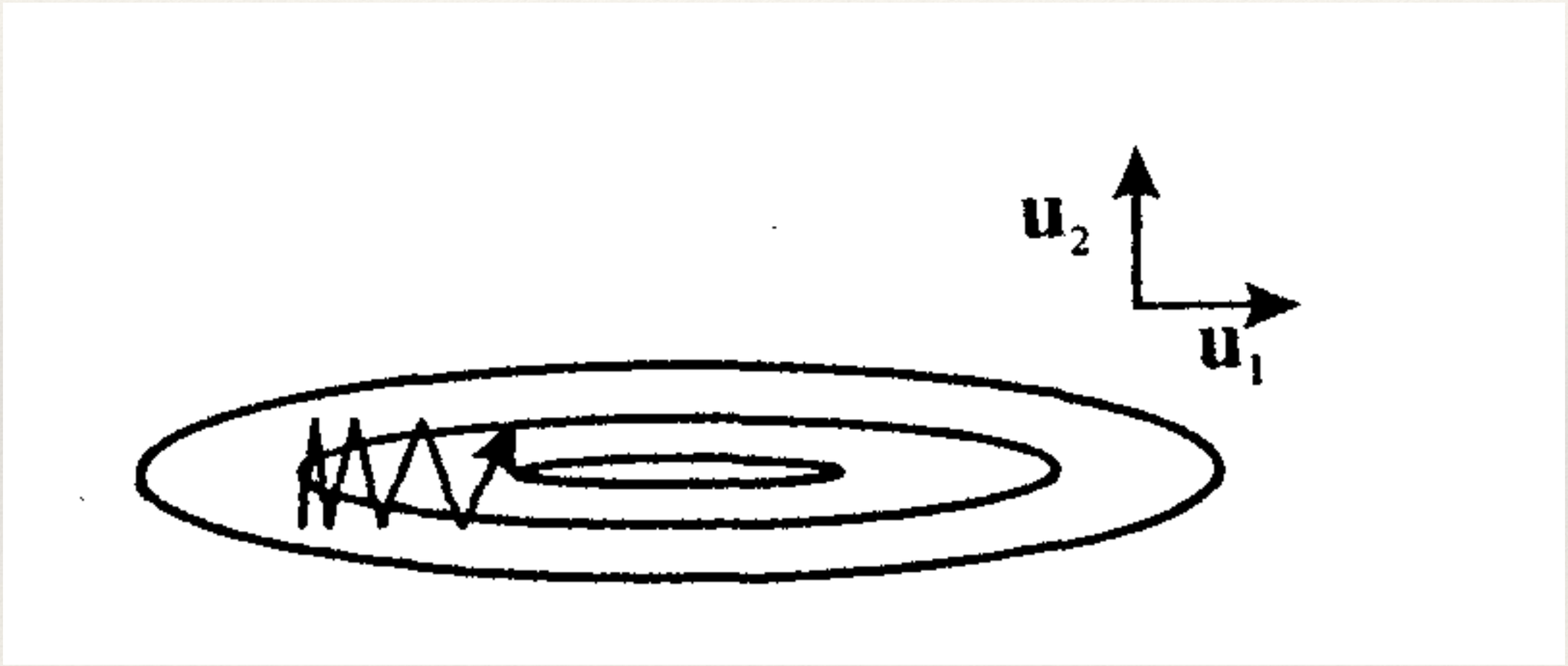
Slow Convergence of Gradient Descent



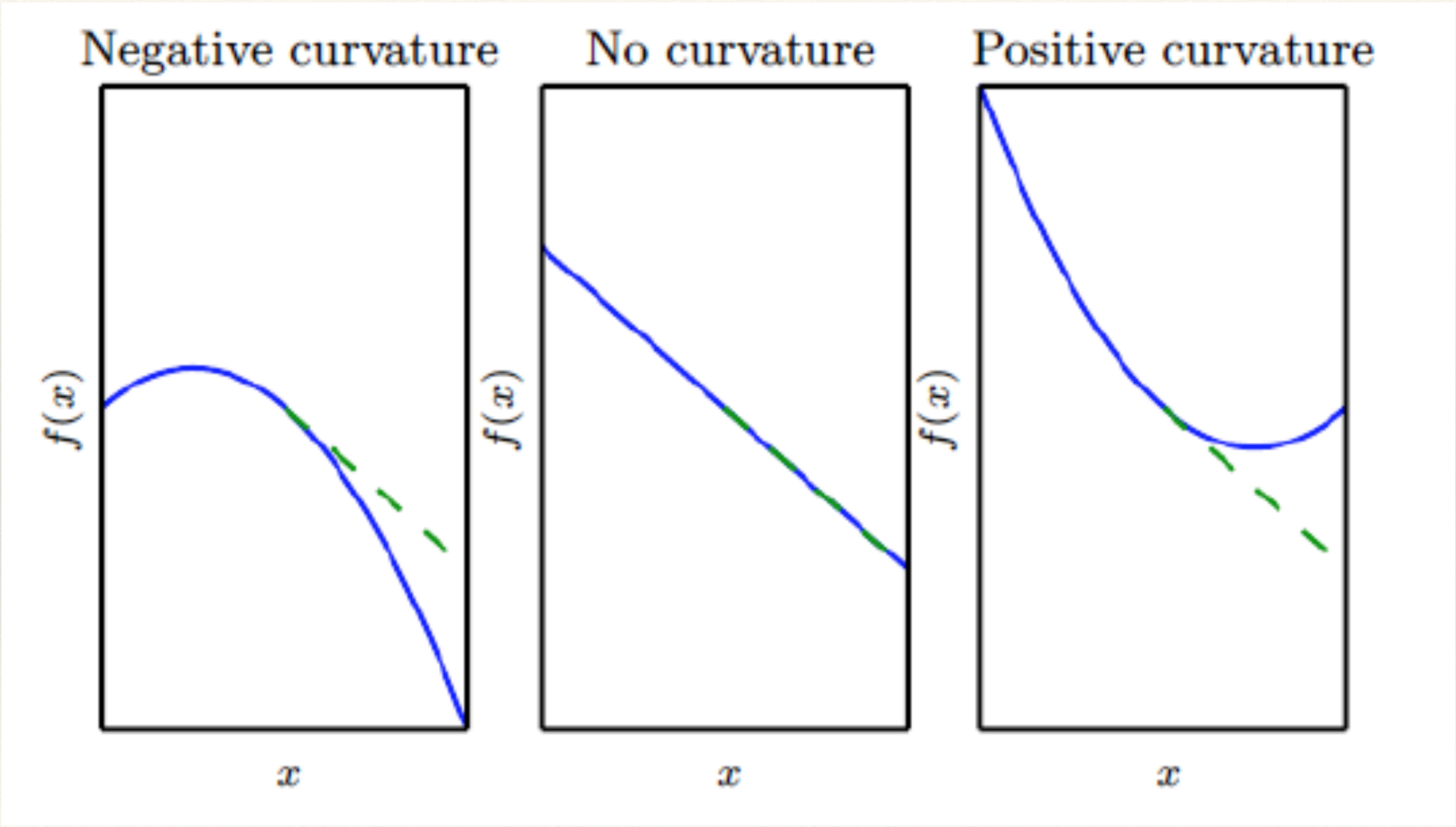
Gradient Descent Properties



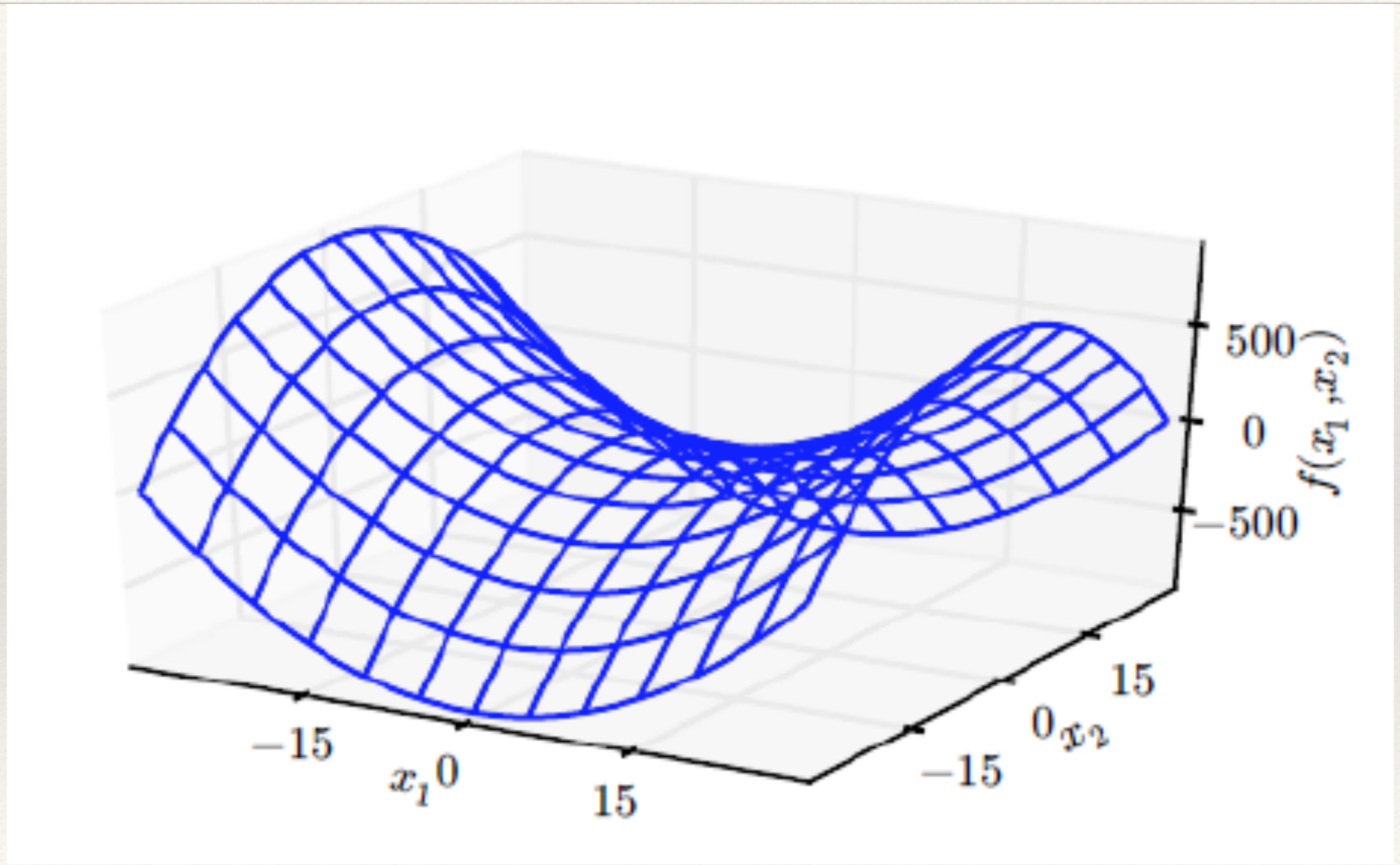
Gradient Descent With Momentum



Second Order Effects in Learning



Second Order Effects in Multi-dimensions



Newton's method