

Machine Learning Homework #3

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1. C

a. $0.01 * (1-(8+1)/10) = 0.001$

b. $0.01 * (1-(8+1)/25) = 0.0064$

c. $0.01 * (1-(8+1)/100) = 0.0091$

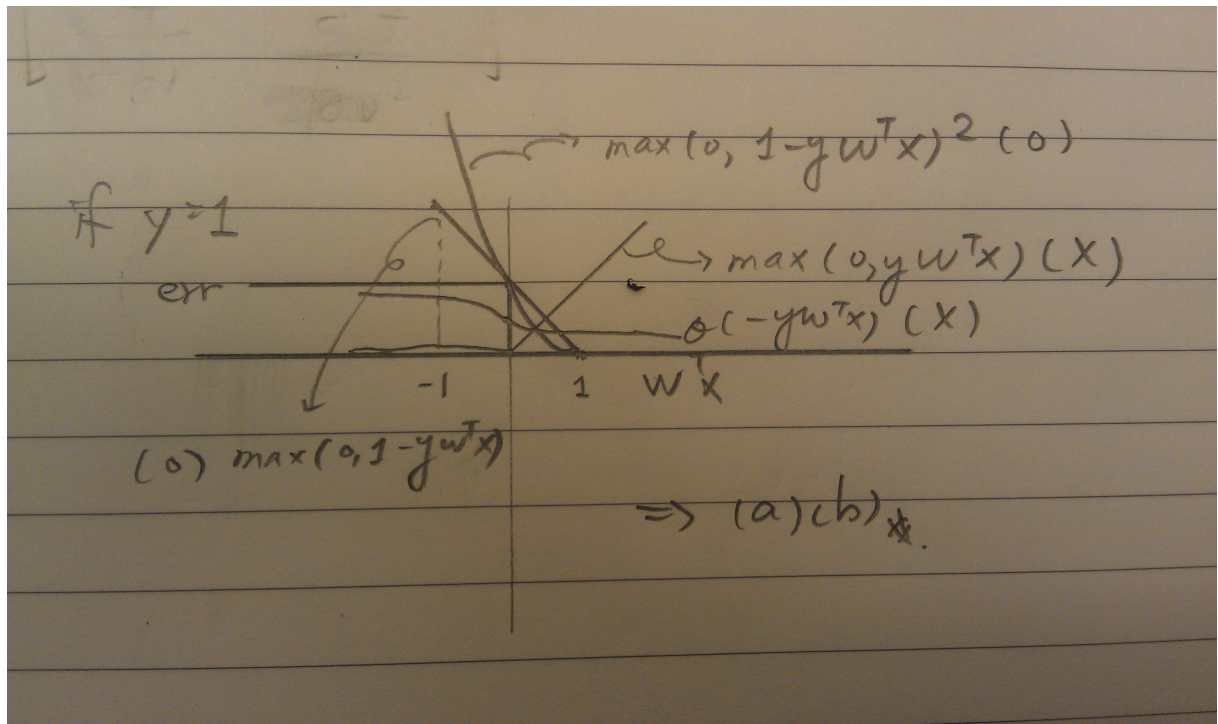
d. $0.01 * (1-(8+1)/500) = 0.00982$

- select (c).

2.

/izz

3. A,B



4. D

(a)(b)在 $yw^T x = 1$ 有一個轉折不連續，不可微分；(c)在0亦有轉折不連續，不可微分。(d)連續可微。

5. D

When $w^T x$ is large enough, (d) is like PLA. (accroding to slide #11 page 11)

6.

$$E(u, v) = e^u + e^{2v} + e^{uv} + u^2 - 2uv + 2v^2 - 3u - 2v$$

$$\nabla E(u, v) = \left(\frac{\partial E}{\partial u}, \frac{\partial E}{\partial v} \right)$$

$$\frac{\partial E}{\partial u} = e^u + ve^{uv} + 2u - 2v - 3$$

$$\frac{\partial E}{\partial v} = 2e^{2v} + ue^{uv} - 2u + 4v - 2$$

$$\nabla E(u, v) = (-2, 0)$$

7.

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$ python hw3p7.py
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1. (-1.931353352832366, -0.02)
2. (-1.8643679281636854, -0.036968701451556445)
3. (-1.7989738194344052, -0.05137792829437576)
4. (-1.7351130572126412, -0.06361748194580197)
5. (-1.6727365278776065, -0.07400946260992759)

8. 3/8/-1/-2/0/3

DATE

$$\sum_{\substack{0 \leq l, m \leq n \\ l+m \leq n}} \frac{1}{l!m!} \frac{\partial^{l+m}}{\partial x^l \partial y^m} (x_0, y_0) \Delta x^l \Delta y^m + \epsilon_n$$

$$f(x_0, y_0) + f_x(x_0, y_0) \Delta x + f_y(x_0, y_0) \Delta y + \frac{1}{2} [f_{xx} \Delta x^2 + 2f_{xy} \Delta x \Delta y + f_{yy} \Delta y^2]$$

$$f: e^u + e^{2v} + e^{uv} + u^2 - 2uv + 2v^2 - 3u -$$

$$f_u: e^u + ve^{uv} + 2u - 2v - 3$$

$$f_v: 2e^{2v} + ue^{uv} - 2u + 4v - 2$$

$$f_{uv} = e^{uv} + ue^{uv} - 2$$

$$f_{uu} = e^u + v^2 e^{uv} + 2$$

$$f_{vv} = 4e^{2v} + u^2 e^{uv} + 4$$

$$f = e^0 + e^0 + e^0 + 0 - 0 + 0 - 0 - 0 = 3$$

$$f_u = e^0 + 0 - 3 = -2$$

$$f_v = 2e^0 - 2 = 0$$

$$f_{uv} = e^0 - 2 = -1$$

$$f_{uu} = e^0 + 2 = 3$$

$$f_{vv} = 4e^0 + 4 = 8$$

9. A

$$\nabla E + \nabla^2 E = 0 \quad p$$

$$p = -(\nabla^2 E)^{-1} \nabla E$$

select (a).

10.

```
$ python hw3p10.py
```

1. (0.07692307692307693, 0.0)
2. (0.143561753527925, 0.0029023140091422642)

3. (0.20120879953531765, 0.007341944796713773)
4. (0.25110373042431666, 0.012467030623187523)
5. (0.294360105434023, 0.017763043039507893)

11. A

Can not let x_1 and x_3 be the same side but x_2 and x_4 be another side, so (b),(c),(d) can not be shattered. – select (a).

12.

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13. A

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$ python hw3p13.py
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err avg = 0.186798 close to (a)

14. A

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$ python hw3p14.py
```

15. C

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$ python hw3p14.py
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16.

/IZZ

17.

/IZZ

18. 0.477

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$ python hw3p18.py
```

19. 0.477

```
$ python hw3p19.py
```

20. 0.477

```
$ python hw3p20.py
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