

## Proof (cont.)

- *Step 3:*  $Z_t = 2\sqrt{\epsilon_t(1 - \epsilon_t)}$
- Proof:

$$\begin{aligned} Z_t &= \sum_i D_t(i) \exp(-\alpha_t y_i h_t(x_i)) \\ &= \sum_{i: y_i \neq h_t(x_i)} D_t(i) e^{\alpha_t} + \sum_{i: y_i = h_t(x_i)} D_t(i) e^{-\alpha_t} \\ &= \epsilon_t e^{\alpha_t} + (1 - \epsilon_t) e^{-\alpha_t} \\ &= 2\sqrt{\epsilon_t(1 - \epsilon_t)} \end{aligned}$$