Продолжим доказательство верхней границы с прошлой практики. Критерий правдоподобия:

$$\begin{aligned}
c &= \operatorname{argmax}_{c \in C} P(c \mid y) \\
&= \operatorname{argmax} \sum x_i y_i \\
&= \operatorname{argmax} \sum y_i (1 - 2y_i) \\
&= \operatorname{argmin} \sum y_i c_i
\end{aligned}$$

Пусть $c^* = c \oplus \hat{c}, c^* \in C \setminus \{0\}, y^* = 1 + \eta_j$

$$\begin{aligned}
P_{err} &= P \left\{ \bigcup_{c \in C \setminus \hat{c}} P(c \mid y) > P(\hat{c} \mid y) \right\} \\
&= P \left\{ \bigcup \left(\sum y_i c_i \right) < \left(\sum y_i \hat{c_i} \right) \right\} \\
&= P \left\{ \bigcup \sum y_i (c_i - \hat{c}_i) < 0 \right\} \\
&= P \left\{ \bigcup \sum y_i (c_i \oplus \hat{c}_i) \cdot (-1)^{\hat{c}_i} < 0 \right\} \\
&= P \left\{ \bigcup \sum y_i^* c_i^* < 0 \right\} \\
&\leq \sum P \left(\sum y_i^* c_i^* < 0 \right) \\
&\leq \sum P \left(\sum_{j=1}^{\mathrm{wt}(c^*)} y_j^* < 0 \right) \\
&= \sum_{i=d}^{n} A_i P(\mathcal{N}(i, \sqrt{i}\sigma) < 0)
\end{aligned}$$

Т.к. $y^* \in \mathcal{N}(1, \sigma), \sum_{j=1}^{\mathrm{wt}(c^*)} y^* \in \mathcal{N}(\mathrm{wt}(c^*), \sqrt{\mathrm{wt}(c^*)}\sigma)$