Übungen Musterklassifikation
Wintersemester 2002/2003
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Musterlösung Blatt 3

Lösung 3.2

Einschub über die Ableitung der Integrationsgrenzen:

$$\begin{aligned}\frac{\partial}{\partial b}\int_a^b y(x)dx &= \frac{\partial}{\partial b}\Big[F(b)-F(a)\Big] \text{ mit } F(x) \text{ Stammfunktion von } y(x)\\ &= \frac{\partial}{\partial b}\Big[F(b)\Big] = \frac{\partial F}{\partial x}(b) = y(b)\end{aligned}$$

$$\begin{aligned}
\frac{\partial \epsilon}{\partial a_\nu} &= \frac{\partial}{\partial a_\nu}\int_{a_{\nu-1}}^{a_\nu}(f-b_{\nu-1})^2 p(f)df + \frac{\partial}{\partial a_\nu}\int_{a_\nu}^{a_{\nu+1}}(f-b_\nu)^2 p(f)df \stackrel{!}{=} 0\\
\Leftrightarrow\quad & \frac{\partial \epsilon}{\partial a_\nu} = (a_\nu-b_{\nu-1})^2 p(a_\nu) - (a_\nu-b_\nu)^2 p(a_\nu) \stackrel{!}{=} 0\\
(p(a_\nu)\neq 0) \Leftarrow\quad & (a_\nu-b_{\nu-1})^2 = (a_\nu-b_\nu)^2\\
\Leftrightarrow\quad & \Big[a_\nu-b_{\nu-1}=a_\nu-b_\nu\Big] \vee \Big[-(a_\nu-b_{\nu-1}) = a_\nu-b_\nu\Big]\\
\Leftrightarrow\quad & \Big[b_\nu=b_{\nu-1}\Big] \vee \Big[a_\nu = \frac{b_{\nu-1}+b_\nu}{2}\Big]\\
\text{d.h.}\quad & a_\nu = \frac{b_{\nu-1}+b_\nu}{2} \Rightarrow \frac{\partial \epsilon}{\partial a_\nu} = 0 \text{ wenn } p(a_\nu)\neq 0
\end{aligned}$$

$\Box_1$

$$\begin{aligned}
\frac{\partial \epsilon}{\partial b_\nu} &= \frac{\partial}{\partial b_\nu}\int_{a_\nu}^{a_{\nu+1}}(f-b_\nu)^2 p(f)df = \int_{a_\nu}^{a_{\nu+1}} -2(f-b_\nu)p(f)df\\
&= -2\int_{a_\nu}^{a_{\nu+1}} fp(f)df + 2b_\nu\int_{a_\nu}^{a_{\nu+1}} p(f)df \stackrel{!}{=} 0\\
\Leftrightarrow\quad & b_\nu = \frac{\int_{a_\nu}^{a_{\nu+1}} fp(f)df}{\int_{a_\nu}^{a_{\nu+1}} p(f)df}
\end{aligned}$$

$\Box_2$