Probability Theory

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1 Set Theory

Let C_1, C_2 be coutable sets and $X_i : \Omega \longmapsto \mathcal{C}_\rangle \quad i \in \{1,2\}$ be random variables.

$$
\begin{aligned}
P\{X_1 + X_2 \in B\} &= \int_{\mathbb{R}} P_{X_1}(B - x_2) dP_{X_2}(x_2) && \text{Definition} \\
& && (1) \\
&= \int_{\mathbb{R}} \sum_{c_i \in \mathcal{C}_\infty} p_{X_1}(c_i) \nVdash_{\{B - x_2\}}(c_i) dP_{X_2}(x_2) && \text{Expanding } P_{X_1} \\
& && (2) \\
&= \int_{\mathbb{R}} \sum_{c_i \in \mathcal{C}_\infty} p_{X_1}(c_i) \nVdash_{\{B - c_i\}}(x_2) dP_{X_2}(x_2) && c_i \in B - x_2 \implies x_2 \in B - c_i \\
& && (3) \\
&= \sum_{c_i \in \mathcal{C}_\infty} p_{X_1}(c_i) P_{X_2}(B - c_i) && (4) \\
&= \sum_{c_i \in \mathcal{C}_\infty} \sum_{b_i \in \mathcal{C}_\in} p_{X_1}(c_i) p_{X_2}(b_i) \nVdash_{\{B - c_i\}}(b_i) && (5) \\
&= \boxed{\sum_{c_i \in \mathcal{C}_\infty} \sum_{b_i \in \{B - c_i\}} p_{X_1}(c_i) p_{X_2}(b_i)} && (6)
\end{aligned}
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1.1 Subsection

Structuring a document is easy!