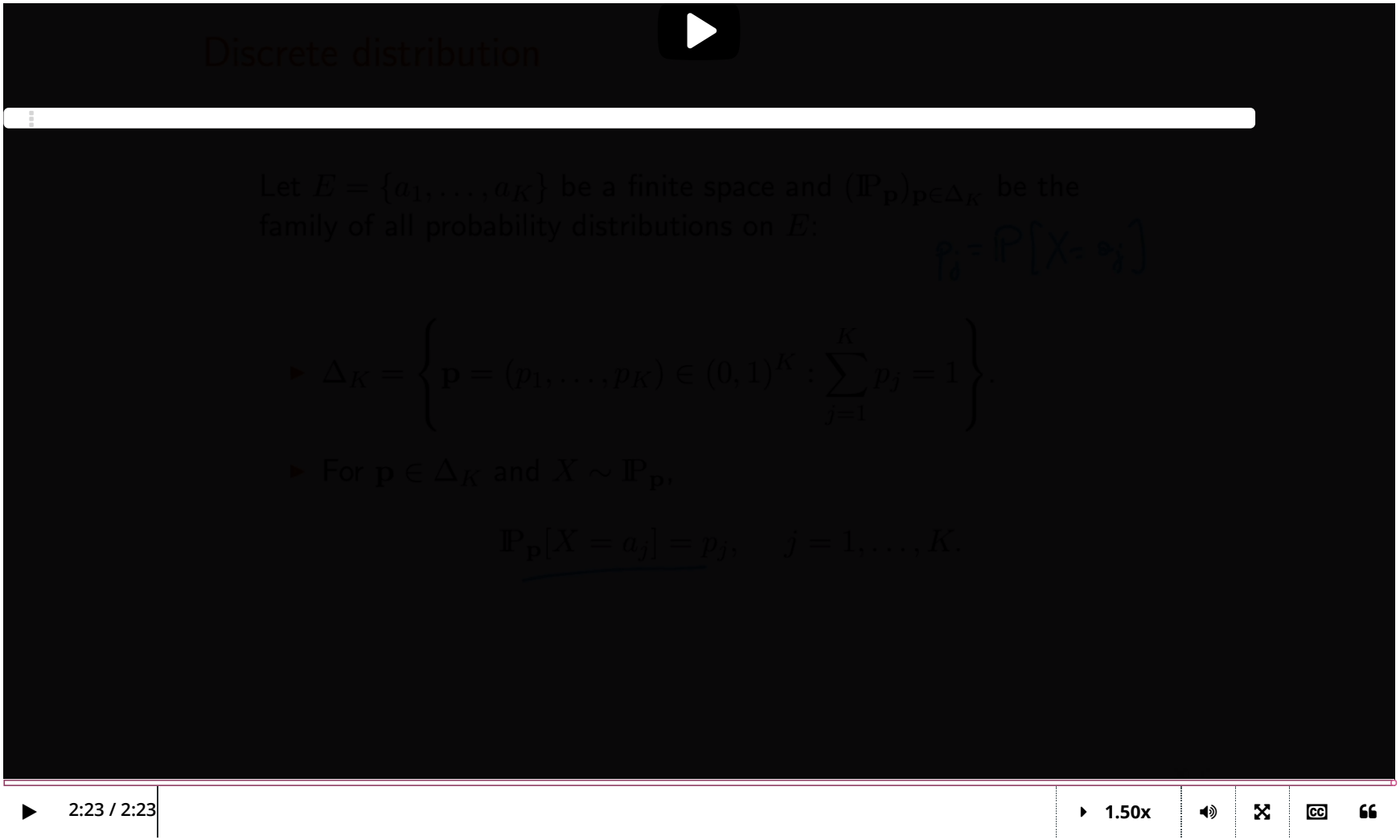
3. The Probability Simplex of Discrete Distributions

The Probability Simplex



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The Probability Simplex in K Dimensions :

The probability simplex in $\mathbb{R}^K$, denoted by Δ_K, is the set of all vectors $\mathbf{p} = [p_1, \ldots, p_K]^T$ (note that we are using subscripts for vector indices for simplicity) such that

$$\mathbf{p} \cdot \mathbf{1} = \mathbf{p}^T \mathbf{1} = 1, \;\; p_i \geq 0 \text{ for all } K$$

where $\mathbf{1}$ denotes the vector $\mathbf{1} = \begin{pmatrix} 1 & 1 & \ldots & 1 \end{pmatrix}^T$. Equivalently, in more familiar notation,

$$\Delta_K = \left\{ \mathbf{p} = (p_1, \ldots, p_K) \in [0,1]^K \; : \; \sum_{i=1}^{K} p_i = 1 \right\}.$$

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