

Mathematical Notation in Lecture Notes

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Throughout the lecture notes for CS182, we will use a standard set of mathematical notation described in this note. Sometimes this will differ slightly from the notation in the textbook *Artificial Intelligence* (herein AIMA3e). When there is a significant difference we will try to note why and explain the choice.

- Brackets are used to indicate explicit sets and script-case indicates variables with a set type, e.g.

$$\mathcal{X} = \{1, 4, 5\},$$

When convenient, we will use set constructor notation to build new sets:

$$\mathcal{Y} = \{x \in \mathcal{X} : x > 1\} = \{4, 5\}.$$

The notation $x \in \mathcal{X}$ indicates that x is a member of \mathcal{X} . For this example $1 \in \mathcal{X}$ but $2 \notin \mathcal{X}$.

- Following AIMA3e, named functions are in small-caps FUNCTION or have short common names f, g, h . All functions will be given explicit types:

$$\text{FUNCTION} : \mathcal{A} \mapsto \mathcal{B}.$$

This indicates that the domain is from \mathcal{A} and the range is \mathcal{B} .

- The notation $\mathcal{X} \times \mathcal{Y}$ is the Cartesian product of two sets:

$$\mathcal{X} \times \mathcal{Y} = \{(1, 4), (1, 5), (4, 4), (4, 5), (5, 4), (5, 5)\}.$$

This will most often be used to indicate a function that takes two (or more) arguments, in this case the first would be from \mathcal{X} the second from \mathcal{Y} .

- We use the notation $2^{\mathcal{X}}$ to indicate the powerset of a set, e.g. if $\mathcal{X} = \{1, 4, 5\}$ then

$$2^{\mathcal{X}} = \{\{\}, \{1\}, \{1, 4\}, \{1, 5\}, \{4, 5\}, \{1, 4, 5\}\}.$$

This will most often be used to indicate that a function returns a subset of \mathcal{X} .

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