

# Syntax and Semantics of $D$

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## 1 Syntax

We present a grammar of  $D$ , the language of decision trees:

Programs	$P$	$::=$	$\{d\}$	definition
Definitions	$d$	$::=$	$\text{val } x = e$	bind name to expression
Expressions	$e$	$::=$	$x$	name
			$\mathcal{D}_\alpha$	decision trees
			$K\{e\}$	value constructor application
			$e_1 e_2$	function application
Decision Tree	$\mathcal{D}_\alpha$	$::=$	$\text{case } x \text{ of } \{ \mid K\{x\} \Rightarrow \mathcal{D}_\alpha \} [ \mid x \Rightarrow \mathcal{D}_\alpha ]$	test node
			$\alpha$	match node
			$\text{if } x \text{ then } \mathcal{D}_\alpha \text{ else } \mathcal{D}_\alpha$	condition with two children
			$\text{let } x = e \text{ in } \mathcal{D}_\alpha$	let-bind a name
Value Constructors	$K$	$::=$	$::$	cons
			$[]$	empty list
			$\#x$	name beginning with #
			$\text{A-Z}x$	name beginning with capital letter
			$[- +](0-9)^+$	signed integer literal

## 2 What is a decision tree?

Scott, Ramsey 2000:

A decision tree is a pattern-matching automaton in which every state except the initial state has a unique predecessor.

*More details will go here as needed.*