

Refinement types for ML

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The Dilemma

- Find the last element in a list:
`fun last (x::nil) = x | last (x::L) = last(L);`
- What is `last(nil)` ?
- Solution #1: exceptions
 - non-exhaustive match failure (SML)
- Solution #2: **refinement types**
 - `last: `a non-empty-list -> `a`

Refinement types

- A is a refinement of B iff every element of type A also has type B
- Finding the best refinement type is undecidable in general
 - function can run M on x
- Solution: let the programmer specify the refinement types