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; Decision Tree learning example 11/08/2001 (revised 11/20)
; Data set is from "Artificial Intelligence: a modern approach"
; by Russell and Norvig
;
; first, highlights from a few manual steps...
(define (log2 x)
  (/ (log x) (log 2)))
; information required to classify the entire training set
(tally-tdata restaurant-data)
;Value: ((no 6) (yes 6))
(+ (* -6/12 (log2 6/12)) ; 6 yes's (-6/12 is a "rational" number)
  (* -6/12 (log2 6/12))) ; 6 no's
;Value: 1.

(split-tdata restaurant-data restaurant-names 'type)
;Value: ((italian ((no (yes yes yes full $$$ no yes italian upto30)))
  (burger ((yes (yes yes yes full $ no no burger upto60))
    (no (no yes yes no full $ yes no burger upto60))
    (no (no yes no no none $ yes no burger upto10))
    (yes (no yes no no some $ no no burger upto10))))-
  (thai ((no (no no no none $ no no thai upto10))
    (yes (no no no yes some $$ yes yes thai upto10))
    (yes (no yes yes full $ no no thai upto30))
    (no (yes no no yes full $ no no thai upto60))))
  (french ((no (yes no no full $$$ no yes french above60))
    (yes (yes no no yes some $$$ no yes french upto10))))))
(+ (* (/ 2 12) 1)
  (* (/ 4 12) 1)
  (* (/ 4 12) 1)
  (* (/ 2 12) 1))
;Value: 1

(split-tdata restaurant-data restaurant-names 'patrons)
;Value: ((none ((no (no no no none $ no no thai upto10))
  (full ((yes (yes yes yes full $ no no burger upto60))
    (no (yes yes yes full $$$ no yes italian upto30))
    (no (no yes yes no full $ yes no burger above60))
    (no (yes no yes no full $$$ no yes french above60))
    (yes (yes no yes yes full $ no no thai upto30))
    (no (yes no no yes full $ no no thai upto60))))
  (some ((yes (no no no yes some $$ yes yes thai upto10))
    (yes (no yes no yes some $$ yes yes italian upto10))
    (yes (no yes no no some $ no no burger upto10))
    (yes (yes no no yes some $$$ no yes french upto10))))))
(+ (* (/ 2 12) 0)
  (* (/ 6 12) (+ (* -2/6 (log2 2/6)) (* -4/6 (log2 4/6))))
  (* (/ 4 12) 0))
;Value: .4591479170272448
(define full-split (second (split-tdata restaurant-data
  restaurant-names 'patrons))))

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(split-tdata full-split restaurant-names 'rain)
;Value: ((yes ((no (no yes yes no full $ yes no burger above60))))
  (no ((no (yes no no yes full $ no no thai upto60))
    (yes (yes no yes yes full $ no no thai upto30))
    (no (yes no yes no full $$$ no yes french above60))
    (no (yes yes yes full $$$ no yes italian upto30))
    (yes (yes yes yes full $ no no burger upto60))))))
(* -3/5 (log2 3/5))
;Value: .44217935649972373

(split-tdata full-split restaurant-names 'hungry)
;Value: ((no ((no (yes no yes no full $$$ no yes french above60))
  (yes (yes no yes no full $ yes no burger above60))))
  (yes ((no (yes no no yes full $ no no thai upto60))
    (yes (yes no yes yes full $ no no thai upto30))
    (no (yes yes yes full $$$ no yes italian upto30))
    (yes (yes yes yes full $ no no burger upto60))))))
(* -4/6 (log2 4/6))
;Value: .38997500048077083

(define hungry=yes:split
  (second (split-tdata full-split restaurant-names 'hungry))))
;Value: hungry=yes:split

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