```lisp
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;;; Settings

; Show copyright
(defun help (lst)
  (format t "~&~%ynot v1 : not-so-supervised multi-objective optimization")
  (format t "~%(c) 2021 Tim Menzies, MIT (2 clause) license~%~%OPTIONS:~%")
  (loop for (x(s y)) on lst by #'cddr do (format t "  -~(~a~) ~a = ~a~%" x s y)))

; Define settings.
(defvar *settings*
  '(help    ("show help         "  nil)
    seed    ("random number seed     "  10019)
    enough  ("how many numbers to keep"  512)
    todo    ("start up action        "  "nothing")
    file    ("load data from file    "  "../data/auto93.csv")))

; List for test cases
(defvar *tests* nil)   ; list of test functions
; Counter for test failures (this number will be the exit status of this code).
(defvar *fails* 0)
; To reset random number generator, reset this variable.
(defvar *seed* 10019)

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;;; Macros.

; Shorthand for accessing settings.
(defmacro ? (x) `(second(getf *settings* ',x)))

; Shorthand for nested struct access.
(defmacro o (s x &rest xs)
  (if xs `(o (slot-value ,s ',x) ,@xs) `(slot-value ,s ',x)))

; Anaphoic if.
(defmacro aif (expr then &optional else)
  `(let (it) (if (setf it ,expr) ,then ,else)))

; Loop over file
(defmacro with-csv ((lst file &optional out) &body body)
  (let ((str (gensym)))
    `(let (,lst)
       (with-open-file (,str ,file)
         (loop while (setf ,lst (read-line ,str nil)) do ,@body)
         ,out))))

; Ensure `a` has a cells `(x . number)` (where number defaults to 0).
(defmacro has (key dictionary)
  `(cdr (or (assoc ,key ,dictionary :test #'equal)
            (car (setf ,dictionary (cons (cons ,key 0) ,dictionary))))))

; Define a test function (see examples at end of file).
(defmacro deftest (name params &body body)
  `(progn (pushnew ',name *tests*) (defun ,name ,params  ,@body)))

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;;; Library functions.

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;; coerce from string
; Cull silly white space.
(defun trim (s) (string-trim '(#\Space #\Tab) s))

; String to atom
(defun asAtom (s &aux (s1 (trim s)))
  (if (equal s1 "?") #\? (let ((x (ignore-errors (read-from-string s1))))
                           (if (numberp x) x s1))))

; String to list of strings
(defun asList (s &optional (sep #\,) (x 0) (y (position sep s :start (1+ x))))
  (cons (subseq s x y) (and y (asList s sep (1+ y)))))

; String to list of atoms
(defun asAtoms(s) (mapcar #'asAtom (asList s)))

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;; Random
; Unlike LISP, it is easy to set the seed of this random number genertor.
(labels ((park-miller (&aux (multiplier 16807.0d0) (modulus 2147483647.0d0))
                      (setf *seed* (mod (* multiplier *seed*) modulus))
                      (/ *seed* modulus)))
  (defun randf (&optional (n 1)) (* n (- 1.0d0 (park-miller))))
  (defun randi (&optional (n 1)) (floor (* n (park-miller)))))

; Return sample from normal distribution.
(defun normal (&optional (mu 0) (sd 1))
  (+ mu (* sd (sqrt (* -2 (log (randf)))) (cos (* 2 pi (randf))))))

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;; Stats
(defun norm(lo,hi,x) (if (< (abs (- hi lo)) 1E-9) 0 (- x lo)/(- hi lo)))

; Return `p`-th item from seq.
(defun per (seq &optional (p .5) &aux (v (coerce seq 'vector)))
  (elt v (floor (* p (length v)))))

; Find sd from a sorted list.
(defun sd (seq &optional (key #'identity))
  (if (<= (length seq) 5) 0
    (/ (- (funcall key (per seq .9)) (funcall key (per seq .1))) 2.56)))

; Return entropy of symbols in an assoc list.
(defun ent (alist &aux (n 0) (e 0))
  (dolist (two alist) (incf n (cdr two)))
  (dolist (two alist e) (let ((p (/ (cdr two) n))) (decf e (* p (log p 2))))))

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;; misc
; For each setting `x`, look for `-x` on the command line.
(defun update-settings-from-command-line (lst)
  (let ((args #+clisp ext:*args*
              #+sbcl  sb-ext:*posix-argv*))
    (loop for (slot (help b4)) on lst by #'cddr do
      (setf (second (getf lst slot))
            (aif (member (format nil "-~a" slot) args :test #'equalp)
              (cond ((eq b4 t)   nil) ; boolean flags flip the default
                    ((eq b4 nil) t)   ; boolean flags flip the default
                    (t (asAtom (elt it 1))))
              b4)))))

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; Handle tests within a test function"
(defun ok (test msg)
  (cond (test (format t "~aPASS ~a~%" #\Tab  msg))
        (t    (incf *fails* )
              (if (? dump)
                (assert test nil msg)
                (format t "~aFAIL ~a~%" #\Tab msg)))))

; Update *options* from command-line. Run the test suite. Before running each
; item, reset the random number seed and the options to standard defaults.
(defun main (&aux (defaults (copy-tree *settings*)))
  (labels ((stop () #+clisp (exit *fails*)
                    #+sbcl  (sb-ext:exit :code *fails*))
           (test1 (todo) (when (fboundp todo)
                           (format t "~a~%" (type-of todo))
                           (setf *seed* (? seed))
                           (funcall todo)
                           (setf *settings* (copy-tree defaults)))))
    (update-settings-from-command-line *settings*)
    (if (? help)
      (help *settings*)
      (dolist (todo (if (equalp "all" (? todo)) *tests* (list (? todo))))
        (test1 (find-symbol (string-upcase todo)))))
    (stop)))
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;;; Classes

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;; The first/last char of a column name defines meta-knowledge for that column.
(defun is (s kind)
  (let
    ((post '((ignore #\X) (klass #\!) (less #\-) (more #\+) (goal #\+ #\- #\!)))
     (pre  '((num #\$))))
    (or (member (char s (1- (length s))) (cdr (assoc kind post)))
        (member (char s 0)               (cdr (assoc kind pre))))))

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;; Sym
(defstruct (sym  (:constructor %make-sym )) (n 0) at name all mode (most 0))

(defun make-sym (&optional (at 0) (name ""))
  (%make-sym :at at :name name))

(defmethod add ((self sym) x)
  (with-slots (n all mode most) self
    (unless (eq x #\?)
      (incf n)
      (let ((now (incf (has x all))))
        (if (> now most)
          (setf most now
                mode x)))))
  x)

(defmethod div ((self sym)) (ent (sym-all self)))
(defmethod mid ((self sym)) (sym-mode self))

(defmethod dist ((self sym) x y)
  (if (and (eq x #\?) (eq y #\?))
    0
    (if (equal x y) 0 1)))

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;; num
(defstruct (num  (:constructor %make-num ))
  (n 0) at name
  (all (make-array 5 :fill-pointer 0))
  (max (? enough))
  ok w (hi -1E32) (lo 1E32))

(defun make-num (&optional (at 0) (name ""))
  (%make-num :at at :name name :w (if (is name 'less) -1 1)))

(defmethod add ((self num) x)
  (with-slots (n lo hi ok all max) self
    (unless (eq x #\?)
      (incf n)
      (setf lo (min x lo)
            hi (max x hi))
      (cond ((< (length all) max)  (setf ok nil) (vector-push-extend x all))
            ((< (randf) (/ max n)) (setf ok nil)
                                   (setf (elt all (randi (length all))) x)))))
  x)

(defmethod holds ((self num))
  (with-slots (ok all) self
    (unless ok (setf all (sort all #'<)))
    (setf ok t)
    all))

(defmethod div ((self num)) (sd  (holds self)))
(defmethod mid ((self num)) (per (holds self)))

(defmethod dist ((self num) x y)
  (with-slots (lo hi) self
    (cond ((and (eq x #\?) (eq y #\?)) (return-from dist 1))
          ((eq x #\?) (setf y (norm lo  hi y)
                            x (if (< y .5) 1  0)))
          ((eq y #\?) (setf x (norm lo  hi x)
                            y (if (< x .5) 1 0)))
          (t          (setf x (norm lo hi x)
                            y (norm lo hi y))))))

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;; cols
(defstruct (cols (:constructor %make-cols)) all x y klass)

(defun make-cols (names &aux (at -1) x y klass all)
  (dolist (s names (%make-cols :all (reverse all) :x x :y y :klass klass))
    (let ((now (funcall (if (is s 'num)  #'make-num #'make-sym) (incf at) s)))
      (push now all)
      (when (not (is s 'ignore))
        (if (is s 'goal)  (push  now y) (push now x))
        (if (is s 'klass) (setf klass now))))))

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;; egs
(defstruct (egs (:constructor %make-egs)) rows cols)

(defun make-egs (from &aux (self (%make-egs)))
   (if (stringp from) (with-csv (row from) (add self (asAtoms row) )))
   (if (consp from)   (dolist   (row from) (add self row )))
   self)

(defmethod add ((self egs) row)
  (with-slots (rows cols) self
    (if cols
      (push (mapcar #'add (o cols all)  row) rows)
      (setf cols (make-cols row)))))
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;;; Demos

(deftest .egs()
  (let ((eg (make-egs (? file))))
    (holds (second (o eg cols y)))
    (print (o eg cols y))))
(main)
```