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11 ; Semi-supervised multi-objective explanation facility.
12 (defpackage :tiny (:use :cl) (:nicknames "tm"))
13 (in-package :tiny)
14 (mapc #'load '("lib/macros" "lib/matha" "lib/strings"
15               "lib/settings" "lib/structs" "lib/demos" ))
16
17 (defvar my
18   (settings "TOYIN: do stuff
19             (c) 2022 Tim Menzies BSD-2 clause license "
20             '(("file" "h" "help file" " ./data/auto93.lisp")
21               (help "h" "show help" " nil)
22               (keep "k" "items to keep" " 256)
23               (k "k" "ab low attributes classes" " 1)
24               (m "m" "ab low frequency classes" " 2)
25               (seed "s" "random number seed" " 10019)
26               (go "g" "start up action" " ls))))))
27
28 (mapc #'load '("sample" "row" "sym" "num" "about" "data"))
29
30
31 ; Keep up to "max" numbers (after which, replace any old with new).
32 (defstruct+ sample
33   (_kept ; where to keep
34     (make-array 2 :fill-pointer 0 :adjustable t))
35   max ; how many to keep
36   ok) ; nil if items added and list not resorted yet
37
38 (defun make-sample (<optional (max (? my keep-))) (%make-sample :max max))
39
40 (defmethod add ((i sample) (x number))
41   (incf (? i n))
42   (let (size (length (? i _kept)))
43     (cond
44       (setf (? i ok) nil)
45       (vector-push-extend x (? i _kept)))
46     ((< (randf) (/ (? i n) (? i max)))
47       (setf (? i ok) nil)
48       (setf (elt (? i _kept) (randi size)) x))))
49
50 (defmethod sorted ((i sample))
51   (unless (? i ok)
52     (sort (? i _kept) #'<)
53     (setf (? i ok) t))
54   (? i _kept))
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59 ; Hold one record.
60 (defstruct+ row cells ; cells
61   _about ; pointer to someone who can say what are (e.g.) lo,hi
62
63 (defun make-row (about l) (%make-row :cells l :_about about))
64
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67
68 ; Summarize symbolic columns
69 (defstruct+ sym (txt "") ; column name
70   (at 0) ; column position
71   (n 0) ; #items seen
72   kept) ; symbol counts of the items
73
74 (defun make-sym (<optional s n) (%make-sym :txt s :at n))
75
76 (defmethod add ((i sym) (lst cons)) (dolist (x lst i) (add i x)))
77 (defmethod add ((i sym) x)
78   (unless (eq x #?)
79     (incf (? i n)
80     (incf (getf x (? i kept)))))
81
82 (defmethod adds ((i sym) x inc)
83   (incf (? i n) inc)
84   (incf (getf x (? i kept)) inc))
85
86 (defmethod div ((i sym))
87   (labels ((fun (p) (* -1 (* p (log p 2)))))
88     (loop for _ . n in (? i kept) sum (fun (/ n (? i n)))))
89
90 (defmethod mid ((i sym))
91   (loop for (key . n) in (? i kept) maximizing n return key))
92
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95
96 ; Summarize numeric columns.
97 (defstruct+ num (txt "") ; column name
98   (at 0) ; column position
99   (n 0) ; #items seen
100   (w 1) ; (1,-1) = (maximize, minimize)
101   kept) ; make-some))) ; items seen
102
103 (defun make-num (s n) (%make-num :txt s :at n :w (if (eq #\~ (charn s)) -1 1)))
104
105 (defmethod add ((i num) (lst cons)) (dolist (x lst i) (add i x)))
106 (defmethod add ((i num) x)
107   (unless (eq x #?)
108     (incf (? i n)
109     (add (? i kept) x)))
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113
114 ; Factory for making nums or syms. Also controls updating those nums+syms.
115 (defstruct+ about names ; list of column names
116   all ; all the generated columns
117   x ; just the independent columns
118   y ; just the dependent columns
119   klass) ; just the klass col (if it exists)

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120
121 (defun make-about (lst)
122   (let (all x y kl (at -1))
123     (dolist (str lst (%make-about :names lst :x x :y y :klass kl
124                                   :all (reverse all)))
125       (incf at)
126       (let (col (if (eq #\$ (char str 0)) (make-num str at) (make-sym str at)))
127         (push col all)
128         (unless (eq #\~ (charn str))
129           (if (member (charn str) '(#\! #\~ #\+)) (push col y) (push col x))
130           (if (eq #\! (charn str)) (setf kl col))))))
131
132 (defmethod add ((i about) (lst cons)) (add i (make-row i lst)))
133 (defmethod add ((i about) (rowl row))
134   (dolist (cols '(', (? i x) , (? i y)) rowl)
135     (dolist (col cols)
136       (add col (elt (? rowl cells) (? col at)))))
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141 ; Place to hold rows, and their summaries.
142 (defstruct+ data rows ; all the rows
143   about ; summaries of all the columns
144
145 (defun make-data (names <optional src i) (%make-data :about (make-about names)))
146 (if (stringp src)
147   (with-lines src (lambda (line) (add i (cells line))))
148   (dolist (row src) (add i row)))
149 i)
150
151 (defmethod clone ((d data) <optional src) (make-data (? d about names) src))
152
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159 ; Simple alist access
160 (defmacro (l x) `(cdr (assoc 'x , l)))
161
162 ; ? obj x y z == (slot-value (slot-value (slot-value obj 'x) 'y) 'z)
163 (defmacro ? (s x &rest xs)
164   (if (null xs) `(slot-value ,s 'x) `(? (slot-value ,s 'x) ,@xs)))
165
166 ; Endure lst has a slot for 'x'. If missing, initialize it with 'init'.
167 (defmacro geta (x lst <optional (init 0))
168   `(cdr (or (assoc ,x ,lst :test #'equal)
169             (car (setf ,lst (cons (cons ,x ,init) ,lst)))))
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179 ; Random number control (since reseeding in LISP is... strange).
180 (defvar *seed* 10013)
181
182 (defun randf (<optional (n 1.0))
183   (setf *seed* (mod (* 16807.0d0 *seed*) 2147483647.0d0))
184   (* n (- 1.0d0 (/ *seed* 2147483647.0d0))))
185
186 (defun randi (<optional (n 1)) (floor (* n (/ (randf 1000000000.0) 1000000000))))
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195 ; Turn 'x' into a number or string or "?"
196 (defun thing (x &aux (y (trim x)))
197   (if (string= y "??") #?
198       (let ((z (ignore-errors (read-from-string y))))
199         (if (numberp z) z y))))
200
201 ; Divide 'str' on 'char', filtering all items through 'filter'.
202 (defun splits (str &key (char #\,) (filter #'identity))
203   (loop for start = 0 then (1+ finish)
204         for finish = (position char str :start start)
205         collecting (funcall filter (trim (subseq str start finish)))
206         until (null finish))
207
208 ; String to lines or cells of things
209 (defun lines (string) (splits string :char #\Newline))
210 (defun cells (string) (splits string :filter #'thing))
211
212 ; Call 'fun' for each line in 'file'.
213 (defun with-lines (file fun)
214   (with-open-file (s file)
215     (loop (funcall fun (or (read-line s) nil) (return))))))
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243 ; Creates &x for constructor, enables pretty print, hides slots with "_" prefix.
244 (defmacro defstruct+ (x &body body)
245   (let* ((slots (mapcar (lambda (x) (if (consp x) (car x) x)) body))
246         (public (remove-if (lambda (x) (eq #\_ (char (symbol-name x) 0))) slots)))
247     `('progn
248       (defstruct ,x (:constructor , (intern (format nil "%MAKE--a" x))) ,@body)
249       (defmethod print-object ((self ,x) str)
250         (labels ((fun (p) (format nil "~{~a~}~a" y (slot-value self y))))
251           (format str "~a" (cons 'x (mapcar #'fun ',public)))))
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